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Calculations of Atomic
Sputtering and Displacement
Cross-Sections in Solid
Elements by Electrons with
Energies from Threshold
to 1.5 MV

by C. R. Bradley

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CALCULATIONS OF ATOMIC SPUTTERING AND DISPLACEMENT CROSS-
SECTIONS IN SOLID ELEMENTS BY ELECTRONS WITH ENERGIES FROM
THRESHOLD TO 1.5 MV.

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Materials Science Division

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CALCULATIONS OF ATOMIC SPUTTERING AND DISPLACEMENT CROSS-SECTIONS IN SOLID ELEMENTS BY ELECTRONS WITH ENERGIES FROM THRESHOLD TO 1.5 MV.

C. R. Bradley

ABSTRACT

The kinetics of knock-on collisions of relativistic electrons with nuclei and details of the numerical evaluation of differential, recoil, and total Mott cross-sections are reviewed and discussed. The effects of electron beam induced displacement and sputtering, in the transmission electron microscope (TEM) environment, on microanalysis are analyzed with particular emphasis placed on the removal of material by knock-on sputtering. The mass loss predicted due to transmission knock-on sputtering is significant for many elements under conditions frequently encountered in microanalysis. Total Mott cross-sections are tabulated for all naturally occurring solid elements up to $Z=92$ at displacement energies of one, two, four, and five times the sublimation energy and for accelerating voltages accessible in the transmission electron microscope. Fortran source code listings for the calculation of the differential Mott cross-section as a function of electron scattering angle (dMottCS), as a function of nuclear recoil angle (RECOIL), and the total Mott cross-section (TOTCS) are included.

INTRODUCTION

During the last decade, the transmission electron microscope has undergone a significant evolution in its configuration and operational mode. In order to enhance its analytical capabilities and image resolution, manufacturers have continued to improve the specimen environment and increase the operating voltage from the 100 - 200 kV range to the 300 - 400 kV regime or higher. At these accelerating voltages the incident electron beam can begin to displace atoms from their equilibrium positions in the solid, thus modifying the local atomic configuration. Estimating the extent of the damage to be expected from this effect requires knowledge of the magnitudes of the various scattering cross-sections involved. This technical memorandum details the method and results of numerical calculations of cross-sections for atomic sputtering and displacement damage by electrons characteristic of the modern TEM environment.

The phenomenon we shall be considering herein is derived from a knock-on collision of a high energy electron and an atom in an impact where the kinetic energy and momentum of the electron is transferred directly to the atomic nucleus. If the collision occurs with an atom which is located on the exit surface of the specimen, then the energy transfer may be sufficient to remove that atom from the sample. On the other hand, if the atom is totally constrained within the lattice of a solid then it may be forced out of its normal equilibrium lattice position. For the purposes of this manuscript we shall term the former atomic (surface) sputtering, and the latter atomic (lattice) displacement.

Lattice displacement studies are not a new phenomenon and have been conducted for over a decade in the high voltage electron microscope (HVEM)[1]. Typically operating at 1 - 1.5 MV, these instruments have been expertly utilized to study point

defect generation, radiation enhanced/induced diffusion, and phase transformations. Since conventional 100 kV TEMs, do not generally impart sufficient kinetic energy to realize this effect in materials of atomic number greater than ~ 12 , the general metallurgical materials science microscopy community has for the most part been exempt from this effect. The limited number of reports of sputtering in the TEM are due mainly to the microscope environment[2-10]. In the past, typical vacuum levels in the TEM have ranged from 10^{-5} to 10^{-7} torr. At these pressures hydrocarbon contamination can effectively trap atoms that might otherwise have been sputtered. Even in instruments with better vacuum systems, it has been pointed out that specimen born contamination can be significant[11].

Modern electron microscopes have significantly improved vacuum system, in-situ specimen preparation facilities and higher accelerating voltages. In addition, these newer microscopes tend to be equipped with LaB_6 or field emission gun (FEG) sources, in order to improve microanalytical performance using x-ray and/or electron energy loss spectroscopies. In solving the contamination problem, improving resolution, and striving for higher counting rates in analytical methods a new set of problems will become important. Spectra derived under these conditions may be functions of dose. Sputtering (and other beam induced phenomena) may modify the sample during observation. Despite these new problems there will also be new opportunities. The first of those opportunities is to improve our knowledge of the interaction of a high energy electron beam with a solid. Secondly, better understanding of sputtering and knock-on processes opens the door to nanometer scale manipulation of samples and possibly new techniques of microanalysis based on the measurement of atomic sputtering.

When the binding energy is sufficiently low and the accelerating voltage is high enough knock-on events are possible, but not necessarily to the exclusion of other processes. It is important to note that knock-on events are one of only several processes that can modify local composition of the specimen. For example, in insulators Electron Stimulated Desorption (ESD) may in some cases produce significant mass loss[39,40]. In metals and semiconductors this is not usually the case; as electronic excitations are screened or delocalized by conduction band electrons so rapidly that bonds binding the atom to the surface are not broken[1,12].

Calculations of displacement cross-sections relevant to electron microscopy have been presented elsewhere[13,14]. In this manuscript we will follow very closely the development and notation of O. S. Oen [14]. Unlike that study, however, we include all solid elements in the periodic table and address sputtering as well as displacement damage. Furthermore, the calculations presented here are carried out at accelerating voltages accessible to, and therefore of interest to, the electron microscopist (0.1-1.5MV). In order to further facilitate use of these results by electron microscopists source code listings are included, and major programs are available in the Electron Microscopy and Microanalysis Public Domain Library[15,16] which is jointly run by the ANL Electron Microscopy Center for Materials Research and the Electron Microscopy Society of America (EMSA).

PRELIMINARIES

KINETICS

The kinetics of a relativistic electron colliding with an atom has been reviewed in several other discussions[17-19], but will be repeated here in the interests of

completeness and to establish notation. In this text we will follow closely the arguments given by Reimer[17].

If we consider an electron with momentum $\vec{p}$ and kinetic energy T incident on a nucleus with mass M , then after a collision the electron will have momentum $\vec{p}'$, kinetic energy T' , and the nucleus will have momentum $\vec{p}_n'$ and kinetic energy T_n as shown in Figure 1. Since, momentum and energy are conserved, we can write

$$p = p' \cos \theta + p_n' \cos \psi \quad \mathbf{1\ a}$$

$$p' \sin \theta = p_n' \sin \psi \quad \mathbf{1\ b}$$

$$T = T' + T_n \quad \mathbf{2}$$

The energy transferred to the nucleus can be obtained from these last equations.

From 1b:

$$\sin \psi = \frac{p'}{p_n'} \sin \theta \quad \mathbf{3}$$

so,

$$\cos^2 \psi = 1 - \left(\frac{p'}{p_n'} \right)^2 \sin^2 \theta \quad \mathbf{4}$$

substituting this into 1a and squaring gives,

$$p^2 + p'^2 \cos^2 \theta - 2pp' \cos \theta = p_n'^2 - p'^2 \sin^2 \theta \quad \mathbf{5\ a}$$

$$p^2 + p'^2 - 2pp' \cos \theta = p_n'^2 \quad \mathbf{5\ b}$$

but $p \approx p'$ so:

$$2p^2 - 2p^2 \cos\theta = p_n'^2 \quad \mathbf{6\ a}$$

$$4p^2 \sin^2\left(\frac{\theta}{2}\right) = p_n'^2 \quad \mathbf{6\ b}$$

Using equation 6 and the fact that $p \approx p'$ equation 3 can be rewritten as

$$\sin \psi = \frac{1}{2} \frac{\sin \theta}{\sin \theta/2} \quad \mathbf{7\ a}$$

or

$$\sin \psi = \cos \frac{\theta}{2} \quad \mathbf{7\ b}$$

For the nucleus the classical relation between kinetic energy and momentum is appropriate.

$$\frac{p_n^2}{2M} = T_n \quad \mathbf{8}$$

For the electron, however, a relativistic expression must be used.

$$E^2 = E_0^2 + (cp)^2 \quad \mathbf{9\ a}$$

$$(E_0 + T)^2 = E_0^2 + (cp)^2 \quad \mathbf{9\ b}$$

$$T(T + 2E_0) = (cp)^2 \quad \mathbf{9\ c}$$

Where $E_0 = m_0 c^2$ is the rest energy of an electron, $T=eV$ is the kinetic energy of the

electron with charge e which has been accelerated through a voltage V , and M is the rest mass of the nucleus, while c is the speed of light.

So combining this with equation 6,

$$T(T + 2E_o) = c^2 \frac{p_n'^2}{4 \sin^2\left(\frac{\theta}{2}\right)} \quad 9 \text{ d}$$

or the energy transferred to the nucleus (the nuclear recoil energy) is

$$T_n = \frac{2T(T + 2E_o)}{Mc^2} \sin^2\left(\frac{\theta}{2}\right) = \frac{2T(T + 2E_o)}{Mc^2} \cos^2 \psi \quad 10$$

This gives a maximum energy transferred to the nucleus of

$$T_m = \frac{2T(T + 2E_o)}{Mc^2} \quad 11$$

The electron scattering angle is θ , and ψ is the nuclear recoil angle as shown in Figure 1. If the maximum energy, T_m , is greater than the binding energy of the atom to the solid surface, T_s , the atom can be sputtered. Similarly if the maximum energy is greater than the displacement energy, T_d , then the atom may be displaced from its lattice site.

BINDING ENERGIES - THRESHOLDS

When the maximum energy transferred to the nucleus is less than the surface binding energy, T_s , we clearly expect no sputtering. The energy at which sputtering just becomes possible, the sputtering threshold T_{th} , can be obtained by substituting T_s for T_m in equation 11.

$$T_{th} = \sqrt{E_o^2 + \frac{T_s Mc^2}{2}} - E_o \quad 12$$

One obtains the bulk displacement threshold from the displacement energy, T_d , in exactly the same way. Likewise the maximum nuclear recoil angle corresponds to the case in which the nuclear recoil energy is just equal to the surface binding energy. Here we substitute T_s for T_n in equation 10 and obtain

$$\psi_{\max} = \arccos \sqrt{\frac{T_s Mc^2}{2 T(T + 2E_0)}} \quad 13$$

To calculate the threshold energy and the maximum recoil angle it is necessary then to have an estimate of the binding energy, T_s . In reality there is not a single surface binding energy. There must be a distribution of binding energies representative of the different binding sites on the surface. Different surfaces, even of the same material, will have different distributions of binding energies. Likewise it is known that bulk displacement energy is not a simple number, but is rather a function of the nuclear recoil direction relative to the crystal lattice. Detailed investigation of this aspect of the problem has been carried out for some materials[1]. For the following discussion we will make the simplifying assumption that both bulk displacement and surface binding energies may be reasonably approximated by discrete values.

For displacement in the bulk Seitz has suggested that 4 to 5 times the sublimation energy is reasonable[20]. Figure 2 shows observed displacement energies plotted against the sublimation energy. The range of 4 to 5 times the sublimation energy is bracketed by the solid lines. It is clear that Seitz's approximation, while not the whole story, is a reasonable estimate. Figure 3 is a plot of sublimation energies and 1/5 the observed displacement energies as a function of atomic number Z . Despite differences it can be seen that there is a strong correlation. For sputtering from the surface the values of sublimation energies are themselves reasonable

approximations of binding energies. We also choose to ignore, for polycrystalline samples, any dependence of surface binding energy on the particular crystal planes which form the surface. These assumptions will, no doubt, be revised as experimental data becomes available. Sublimation energies are listed in Table 1 along with the corresponding sputtering threshold energies obtained from equation 12 assuming a surface binding energy equal to the sublimation energy[21].

Small, but non-zero, displacement cross-sections have been observed at energies well below the threshold described in the previous discussion[1]. We have considered here only systems in which a single electron-atom collision determines the threshold. In a real solid much more complicated processes are possible. For example, it is probable that in multi-component or contaminated systems collision sequences involve light atoms as intermediaries which can result in displacement of heavy atoms at significantly lower energies than in pure heavy atom systems. This manuscript focuses on sputtering and displacement in pure elemental systems.

DIFFERENTIAL CROSS-SECTIONS

To estimate the sputtering yield resulting from electron-atom knock-on collision one needs to know the scattering cross-section for a relativistic electron with an atomic nucleus. This calculation was first done by N. F. Mott[22,23] and was expressed in convenient form by McKinley and Feshbach[24] and Feshbach[25]. The cross-section is obtained from expressions containing the sums of two conditionally convergent series. Repeating in the notation of McKinley and Feshbach, with $q = \frac{\alpha}{\beta}$, $\alpha = \frac{Ze^2}{\hbar c}$, and $\beta = \frac{v}{c} = \sqrt{1 - (1 + eV/m_0 c^2)^{-2}}$

$$k_p^2 \sigma = q^2(1-\beta^2) F^*F \csc^2\left(\frac{\theta}{2}\right) + G^*G \sec^2\left(\frac{\theta}{2}\right) \quad 14$$

where the * represents complex conjugation,

$$F = F_0 + F_1 \quad 15 a$$

$$F_0 = \frac{i}{2} \exp\left(iq \ln\left[\sin^2\left(\frac{\theta}{2}\right)\right]\right) \Gamma(1-iq)\Gamma(1+iq) \quad 15 b$$

$$F_1 = \frac{i}{2} \sum_{k=0}^{\infty} [kD_k + (k+1)D_{k+1}] (-1)^k P_k(\cos\theta) \quad 15 c$$

(where $i = \sqrt{-1}$) and

$$G = G_0 + G_1 \quad 16 a$$

$$G_0 = iq \cot^2\left(\frac{\theta}{2}\right) F_0 \quad 16 b$$

$$G_1 = \frac{i}{2} \sum_{k=0}^{\infty} [k^2 D_k - (k+1)^2 D_{k+1}] (-1)^k P_k(\cos\theta) \quad 16 c$$

In these equations the value of D_k is,

$$D_k = \frac{e^{-\pi i k}}{k+iq} \frac{\Gamma(k-iq)}{\Gamma(k+iq)} - \frac{e^{i\pi \rho_k}}{\rho_k+iq} \frac{\Gamma(\rho_k-iq)}{\Gamma(\rho_k+iq)} \quad 17$$

here Γ is a gamma function which in this case has complex arguments and where

$$\rho_k = (k^2 - \alpha^2)^{1/2} \quad 18$$

and

$$k_p^2 = \frac{1}{\hbar^2} \left(\frac{W^2}{c^2} - m^2 c^2 \right) \quad 19$$

with

$$W = T + E_0 = eV + m_0c^2 \quad 20$$

Evaluation of the above expressions for the cross-section is a very involved process. This is especially so since the series for F_1 and G_1 are only conditionally convergent. We shall expand on this point later. McKinley and Feshbach[24] also derived an asymptotic relation for the differential cross-section which is reasonably accurate for low Z (Figure 4.1) although not so good for high Z (Figure 4.2).

$$\frac{d\sigma}{d\Omega} = \frac{d\sigma_R}{d\Omega} \left[1 - \beta^2 \sin^2 \frac{\theta}{2} + \pi \alpha \beta \sin \frac{\theta}{2} \left(1 - \sin \frac{\theta}{2} \right) \right] \quad 21$$

Here $\alpha = \frac{Ze^2}{\hbar c}$, as above, and σ_R is the classical Rutherford cross-section for the collision of two charged particles.

The classical cross-section is given by the relation:

$$\frac{d\sigma_R}{d\Omega} = \left(\frac{Ze^2}{2m_0c^2} \right)^2 \frac{(1-\beta^2)}{\beta^4} \csc^4 \left(\frac{\theta}{2} \right) \quad 22a$$

In terms of the classical electron radius r_{cl} this is:

$$\frac{d\sigma_R}{d\Omega} = \frac{Z^2 r_{cl}^2}{4} \frac{(1-\beta^2)}{\beta^4} \csc^4 \left(\frac{\theta}{2} \right) \quad 22b$$

EVALUATION OF THE MOTT SERIES

For details of the evaluation of the Mott Series one should refer to the paper by Doggett and Spencer[26] who outline in some detail the calculation. Some of that discussion will be repeated and expanded here. First we will discuss calculation of

the complex gamma functions, then evaluation of the coefficients D_k , calculation of Legendre Polynomials and finally discuss at some length convergence of the series representing F_1 and G_1 .

Complex gamma functions are evaluated by use of an asymptotic relation (Abramowitz and Stegun 6.1.41)[27].

$$\ln \Gamma(z) \sim (z - \frac{1}{2}) \ln z - z + \frac{1}{2} \ln(2\pi) + \frac{1}{12z} - \frac{1}{360z^3} + \frac{1}{1260z^5} - \frac{1}{1680z^7} + \dots \quad 2 \ 3$$

$(z \rightarrow \infty \text{ in } |\arg z| < \pi)$

This expression is a very good approximation when $\text{real}(z)$ is large but is not so accurate when $\text{real}(z)$ is small. When the $\text{real}(z)$ is small an integer is added to it and the log of the recursion relation for gamma functions (Abramowitz and Stegun 6.1.16)[27]

$$\ln \Gamma(n+z) = \ln(n-1+z) + \ln(n-2+z) + \dots + \ln(1+z) + \ln(z) + \ln \Gamma(z) \quad 2 \ 4$$

is used to work back to an accurate estimate at the desired argument.

These expressions yield accurate estimates for the logarithm of the gamma function, agreeing with tabulated values[27] to 13 significant figures. Gamma functions grow very rapidly and since the coefficients D_k are ratios it is best to simply subtract the two logarithms before exponentiation. This avoids dealing with very large numbers which would result in loss of precision.

Legendre Polynomials are conveniently calculated from the recursion relation (Abramowitz and Stegun 8.5.3)[27]

$$(k+1) P_{k+1}(x) = (2k+1) x P_k(x) - k P_{k-1}(x) \quad 2\ 5$$

and the first two values

$$P_0(x) = 1 \quad 2\ 6\ a$$

$$P_1(x) = x \quad 2\ 6\ b$$

Once the terms D_k are calculated the Legendre expansions for F and G (equations 15 and 16) can be completely evaluated.

Unfortunately, as mentioned before, these series are only conditionally convergent. Figure 5.1 shows the values obtained by direct evaluation of the G_1 series taking successively larger partial sums. After 200 terms one is still far from reasonable convergence. McKinley and Feshbach[24] and Feshbach[25] point out that convergence can be accelerated by the use of the Euler Transformation. The Euler Transformation is a systematic reordering of an infinite series which in some cases results in much more rapid convergence[28,29]. When applied here more rapid convergence (Figure 5.2) is obtained. There is still, however, significant oscillation in the partial sums for small angles (Figure 5.3).

Trigonometric terms in equation 14 can be rewritten so as to express the Mott cross-section as

$$k_p^2 \sigma_M = \frac{2q^2(1-\beta^2)F*F}{1-\cos\theta} + \frac{2G*G}{1+\cos\theta} \quad 2\ 7$$

The classical Rutherford cross-section, equation 22, can similarly be written.

$$\frac{d\sigma_R}{d\Omega} = \frac{Z^2 r_{cl}^2 (1-\beta^2)}{(1-\cos\theta)^2 \beta^4} \quad 28$$

The ratio of the Mott cross-section to the Rutherford cross-section is then

$$\frac{Z^2 r_{cl}^2 k_p^2}{2\beta^4} \left(\frac{d\sigma_M/d\Omega}{d\sigma_R/d\Omega} \right) = q^2 F^* F(1-\cos\theta) + \frac{|G(1-\cos\theta)|^2}{(1+\cos\theta)(1-\beta^2)} \quad 29$$

Doggett and Spencer point out that the series for $G(1-\cos\theta)$ converges more rapidly than does the series for G itself. If direct evaluation of $G_1(1 - \cos\theta)$ converges more rapidly this expression can be used to evaluate the ratio directly. Obviously simple evaluation of G_1 multiplied by $(1 - \cos\theta)$ will have the same convergence rate as the series for G_1 . What is needed is a simplification of the expression for $G_1(1 - \cos\theta)$.

This can be obtained by setting $\cos\theta = x$ which gives

$$(1-x)G_1 = (1-x) \frac{i}{2} \left\{ \sum_{k=0}^{\infty} [k^2 D_k - (k+1)^2 D_{k+1}] (-1)^k P_k(x) \right\} \quad 30$$

or defining new notation

$$\begin{aligned} (1-x)G_1 &= (1-x) \frac{i}{2} \sum_{k=0}^{\infty} (-1)^k A_k P_k(x) \\ &= \frac{i}{2} \left\{ \sum_{k=0}^{\infty} (-1)^k A_k (P_k(x) - x P_k(x)) \right\} \end{aligned} \quad 31$$

Using the recursion relation for Legendre Polynomials, equation 25, this becomes (suppressing the variable(x))

$$(1-x)G_1 = \frac{i}{2} \left\{ A_0(1-x) + \sum_{k=1}^{\infty} (-1)^k A_k \left(P_k - \frac{k+1}{2k+1} P_{k+1} - \frac{k}{2k+1} P_{k-1} \right) \right\} \quad 32$$

Renumbering the terms in these series so that P_k only appears in them

$$(1-x)G_1 = \frac{i}{2} \left\{ A_0 P_0 - A_0 P_1 + \sum_{k=1}^{\infty} (-1)^k A_k P_k - \sum_{k=2}^{\infty} (-1)^{k-1} A_{k-1} \left(\frac{k}{2k-1} \right) P_k - \sum_{k=0}^{\infty} (-1)^{k+1} \left(\frac{k+1}{2k+3} \right) A_{k+1} P_k \right\} \quad 33a$$

which is

$$(1-x)G_1 = \frac{i}{2} \left\{ \left(A_0 + \frac{1}{3} A_1 \right) P_0 - \left(A_0 + A_1 + \frac{2}{5} A_2 \right) P_1 + \sum_{k=2}^{\infty} (-1)^k \left(\frac{k}{2k-1} A_{k-1} + A_k + \frac{k+1}{2k+3} A_{k+1} \right) P_k \right\} \quad 33b$$

This can be collapsed into a general form with the summation running from $k=0$ to ∞ ,

$$(1-x)G_1 = \left\{ \frac{i}{2} \sum_{k=0}^{\infty} (-1)^k \left(\frac{k}{2k-1} A_{k-1} + A_k + \frac{k+1}{2k+3} A_{k+1} \right) P_k \right\} \quad 34$$

if A_{-1} is defined to be finite. A_k is defined above(implicitly) as

$$A_k = k^2 D_k - (k+1)^2 D_{k+1} \quad 35$$

If we set D_{-1} equal to zero then expression 35 yields A_{-1} equal to zero which is indeed finite.

Using this, the coefficient of the Legendre Polynomial can be expressed in terms of D_k . The result is

$$(1-x)G_1 = \frac{i}{2} \sum_{k=0}^{\infty} (-1)^k f_k P_k(x) \quad 36a$$

with

$$f_k = \frac{(k-1)^2 k}{2k-1} D_{k-1} + \frac{k^2 (k-1)}{2k-1} D_k \\ - \frac{(k+1)^2 (k+2)}{2k+3} D_{k+1} - \frac{(k+2)^2 (k+1)}{2k+3} D_{k+2} \quad 36b$$

This result can be used in equation 29 to directly evaluate the ratio of the Mott cross-section to the Rutherford cross-section. We note empirically that this does converge more rapidly (Figure 5.3) at small angles.

Doggett and Spencer[26] discussed results of some convergence tests, some of which are shown in Figures 6.1 and 6.2 along with the results of convergence tests preformed as part of this study. Another series of convergence tests are shown in Figures 7.1-7.6. Based on these it was decided to terminate the summation at 75

terms. One can see from these figures that errors to be expected as a result of truncating the series at this point are of the order of a few times 0.001 barns. Discrepancies between independent calculations are also likely to be greatest at small angles. Figures 8.1 and 8.2 are plots of the difference between the results published by Oen[13] and the calculations of this study for Aluminum and Gold respectively. Figure 8.3 is a comparison of the total cross-section of Aluminum tabulated by Oen and that calculated in this study. Figure 8.4 is a similar comparison for Gold.

EVALUATION AT VERY SMALL ANGLES

As θ approaches zero the ratio, σ_M/σ_R , approaches unity. However, both σ_M and σ_R (equations 14,16,22) diverge because $\csc \theta/2$ and $\cot \theta/2$ diverge as $\theta \rightarrow 0$. Furthermore the factor $\exp\left(iq \ln\left[\sin^2\left(\frac{\theta}{2}\right)\right]\right)$ in equation 15 cannot be evaluated by simple substitution. For very small angles ($\theta < 0.5$) the asymptotic relation cited by Doggett and Spencer[26] was used

$$\frac{\sigma_M}{\sigma_R} \sim 1 + \pi\alpha\beta(\cos \chi)\left(\frac{\theta}{2}\right) + O\left(\frac{\theta}{2}\right) \quad 37 a$$

where $O\left(\frac{\theta}{2}\right)$ are terms of order $\frac{\theta}{2}$ or higher and

$$\cos(\chi) = \text{Re} \left\{ \frac{\Gamma(1/2-iq)\Gamma(1+iq)}{\Gamma(1/2+iq)\Gamma(1-iq)} \right\} \quad 37 b$$

The discussion, so far, has been phrased entirely in terms of the electron scattering angle θ . These results can be expressed in terms of the nuclear recoil angle ψ using equation 7b to change variables. Figure 9 is a plot of the differential cross-section as a function of nuclear recoil angle for gold.

TOTAL CROSS-SECTIONS

To calculate the total sputtering yield one needs the total cross-section which is obtained by integrating the differential cross-section over all possible angles. For an isotropic potential well one need only use equation 10 to determine the range of angles for which T_n , the energy transferred to the nucleus, is greater than, T_s , the energy required to remove the atom from the surface. Alternatively one can change variables and integrate from, T_d , the minimum required energy to, T_m , the maximum deliverable energy.

Since the differential cross-section is both calculated numerically (see the previous discussion) and approximated (see equation 21) in terms of a ratio with the Rutherford cross-section, it is convenient to discuss the total-cross-section also in terms of a ratio $M(\theta)$ with the Rutherford cross-section $d\sigma_R/d\Omega$.

$$\sigma_{\text{tot}} = \int_{\phi=0}^{2\pi} \int_{\theta_{\min}}^{\theta_{\max}} \frac{d\sigma_R}{d\Omega} M(\theta) \sin(\theta) d\theta d\phi \quad 38$$

Using equation 7b this can be expressed in terms of ψ the nuclear recoil angle.

$$\sigma_{\text{tot}} = \int_0^{2\pi} \int_0^{\psi_{\text{max}}} \frac{d\sigma_R(\psi)}{d\Omega} M(\psi) \sin\psi \, d\psi \, d\phi \quad 39$$

where $\frac{d\sigma_R(\psi)}{d\Omega}$ is the differential cross-section. Here we note that the Jacobian of the transformation $4\cos\psi$ has been incorporated into the cross-section.

Equations 10 and 11 give

$$\frac{T_n}{T_m} = \sin^2\left(\frac{\theta}{2}\right) \quad 40a$$

and

$$\begin{aligned} \sin\theta \, d\theta &= 2 \sin\frac{\theta}{2} \cos\frac{\theta}{2} \, d\theta \\ &= 2 \left(\frac{T_n}{T_m}\right)^{1/2} 2 \, d\left(\sin\frac{\theta}{2}\right) = 2 \frac{dT_n}{T_m} \end{aligned} \quad 40b$$

Integrating over all ϕ and making these substitutions in equation 38 yields

$$\sigma_{\text{tot}} = 4\pi \int_{T_d}^{T_m} \frac{d\sigma_R}{d\Omega} M(T) \frac{dT_n}{T_m} \quad 41a$$

$$\sigma_{\text{tot}} = \pi \left(\frac{Ze^2}{mc^2} \right)^2 \frac{1-\beta^2}{\beta^4} \int_{T_d}^{T_m} M(T) \left(\frac{T_n}{T_m} \right)^{-2} \frac{dT_n}{T_m} \quad 4.1b$$

Changing variables once more using $x = T_n/T_m$ this becomes

$$\sigma_{\text{tot}} = \pi \left(\frac{Ze^2}{mc^2} \right)^2 \frac{1-\beta^2}{\beta^4} \int_{T_d/T_m}^1 M(x) \left(\frac{dx}{x^2} \right) \quad 4.2$$

This equation can now be evaluated analytically for the McKinley-Feshbach asymptotic approximation of the Mott cross-section[8,30]. From equations 21 and 40 and the above variable changes it is clear that

$$M_{\text{MF}}(x) = 1 - \beta^2 x + \pi \alpha \beta (x^{1/2} - x) \quad 4.3$$

Substituting this result into equation 42 and evaluating the integral one obtains

$$\sigma_{\text{tot}} = \pi \left(\frac{Ze^2}{mc^2} \right)^2 \frac{1-\beta^2}{\beta^4} \xi \quad 4.4a$$

with

$$\xi = \left[\left(\frac{T_m}{T_d} - 1 \right) - \beta^2 \ln \left(\frac{T_m}{T_d} \right) + \pi \alpha \beta \left\{ 2 \left[\left(\frac{T_m}{T_d} \right)^{1/2} - 1 \right] - \ln \left(\frac{T_m}{T_d} \right) \right\} \right] \quad 44b$$

Of course, as with the differential cross-section, this approximation is excellent for low Z (Figure 10.1) but breaks down for high Z (Figure 10.2).

The total Mott cross-section can be obtained by numerically evaluating equation 42. Oen suggests a further change of variables, $x=1/y$, to make the integral better behaved numerically. σ_{tot} is then,

$$\sigma_{tot} = \pi \left(\frac{Ze^2}{mc^2} \right)^2 \frac{1-\beta^2}{\beta^4} \int_1^{T_m/T_d} M(y) (dy) \quad 45$$

INTEGRATION ROUTINES

Using sixteen point Gaussian integration excellent agreement with Oen's calculations is obtained(Figure 8.2). Eight point Gaussian quadrature results in a significant savings in time but an error of a few per cent at high accelerating voltages. A two point integration routine is included in the listing for use when debugging new routines (Abramowitz and Stegun Table 25.4)[27].

CASCADES

Oen also calculates a displacement cascade cross-section using the Kinchin-Pease model[31]. In this model, collision of a highly energetic electron with an atom in a solid displaces the atom and, if enough energy has been delivered, a subsequent

atom-atom collision will displace a second atom. Assuming that each atom leaves a secondary collision with half the initial energy, at least twice the displacement energy must be supplied to a primary atom for a secondary displacement to be possible.

In this formulation the model does not apply to sputtering since a sputtered atom simply leaves the solid. However, the primary collision deposits energy which is propagated and dispersed through the solid in a sequence of collisions. If this energy cascade intersects the surface with an energy greater than the binding energy, a sputtering event will occur. The model calculates the number of atoms at the periphery of such a cascade which have just enough energy to remove an atom from the surface. Since the surface may truncate part of the cascade the observed cross-section will be smaller than that calculated. The Kinchin-Pease cascade model should, therefore, give an upper limit to the sputtering cross-section and straightforward atomic calculation, the primary cross-section, a lower limit (Figure 11).

In Oen's notation the Kinchin-Pease cross-section, is:

$$\sigma_{KP} = \int_{T_d}^{T_M} v(T) \frac{d\sigma_M}{dT} dT \quad v(T) = \begin{cases} 1 & T_d \leq T \leq 2T_d \\ T/2T_d & T > 2T_d \end{cases} \quad 46$$

or

$$\sigma_{KP} = \int_{T_d}^{2T_d} \frac{d\sigma_M}{dT} dT + \int_{2T_d}^{T_M} \frac{T}{2T_d} \frac{d\sigma_M}{dT} dT \quad 47$$

As above we express the above in terms of M the ratio of $d\sigma_M/dT$ to $d\sigma_R/dT$ Making the same changes of variables

$$\sigma_{KP} = \int_{T_d/T_m}^{2T_d/T_m} M(x) \frac{dx}{x^2} + \frac{1}{2} \left(\frac{T_m}{T_d} \right) \int_{2T_d/T_m}^1 M(x) \frac{dx}{x} \quad 48$$

If $1 > 2 T_d/T_m$, otherwise only the first integral is evaluated and there is no correction for cascades. The change of variable $x=1/y$ is again used for the first integral, and for the second Oen suggests the substitution $x = e^{-z}$. In terms of this substitution the second integral is

$$\int_{2T_d/T_m}^1 M(x) \frac{dx}{x} = \int_0^{\ln(T_m/2T_d)} M(z) dz \quad 49$$

This approach to dealing with the complicated cascades of energy and mass within the solid is a simple and reasonable model but should not be expected to provide precise results. Alternatively one may perform a molecular dynamic calculation to accurately simulate the effects of collision cascades on the cross-section. For electron transmission sputtering this has been done only for gold[3].

EXPERIMENTAL VERIFICATION

As mentioned previously, sputtering of specimen material in the electron microscope has to date been observed only occasionally. For example, Cherns used an HVEM to observe sputtering of gold films[2,3]. In these studies crystal orientation was considered, and measurements over a wide range of energies were done. Reasonable agreement with Mott cross-sections was reported and molecular dynamic simulations were done in order to predict the sputtering cross-sections at high energies. Here it was found that cascade effects were important.

Gold was an excellent, and perhaps unique, material to choose for a pilot study. It has a surprisingly high calculated cross-section and being a noble metal its surface does not easily react. Other materials not having such stable surfaces are more difficult to observe even in present day electron microscopes. Sputtering of carbon, near liquid helium temperatures, has been reported[8], and preferential sputtering of Mg from an Al-Mg alloy has been used to explain changes in an X-ray Energy Dispersive Spectrum (XEDS) observed over time[4]. Preferential sputtering of light elements by an intense source has also been observed to result in variations of spectra with dose[10].

CONSEQUENCES OF KNOCK-ON SPUTTERING TO MICROANALYSIS

To date there have been only a few examples of a significant sputtering clearly due to knock-on collisions of electrons with atoms of a specimen observed in an electron microscope. This is expected to change as the number of instruments having accelerating voltages greater than 100kV, more intense sources, and better vacuum systems become common.

In order to develop an intuition for the significance of knock-on sputtering we present here a few relationships between cross-section and sputtering yield. The sputtering yield is defined as the number of atoms sputtered per incident electron or the effective sputtering area per unit physical area.

$$Y = \sigma \rho_s \quad 50$$

where ρ_s is the surface density of atoms. Table 11 lists surface number densities, ρ_s , for naturally occurring elements which are solid at room temperature. Only surface number densities for the {001} planes are listed. For polycrystalline samples one would need a properly weighted average of surface densities. For many purposes, however, a value of 10^{15} atom/cm² is reasonable.

The sputtering rate, S , is given by the current I times the sputtering yield Y .

$$S = IY = I\rho_s\sigma \quad 51$$

This sputtering rate can be expressed in monolayers/sec by dividing by the number of surface atoms in the electron irradiated area. The number of atoms removed per second divided by the number of atoms in a monolayer with an area A equal to the electron probe size is

$$\frac{\# \text{ atoms sputtered/sec}}{\# \text{ atoms/monolayer}} = \frac{\text{monolayers}}{\text{sec}} = \frac{I Y}{\rho_s A} = \frac{Y}{\rho_s} J = \sigma J \quad 52$$

Where J is the current density of the incident electron beam.

Figure 12 shows cross-sections calculated for all solid naturally occurring elements in a 100 kV electron beam assuming a surface binding energy equal to the sublimation energy. A few of these elements have cross-sections large enough to be reasonably observed in the electron microscope. The majority of elements, however, have cross-sections less than 300 barns where the sputtering rate with $J=25 \text{ A/cm}^2$ is $300 \times 10^{-24} \text{ cm}^2 \times 25 \text{ A/cm}^2 \times 6.242 \times 10^{18} \frac{\text{e/sec}}{\text{A}} = 4.7 \times 10^{-2}$ monolayers/sec. It should be noted that while 25 A/cm^2 is reasonably attained in a modern electron microscope it is not the normal operating condition except in microanalysis modes, where high signal rates are desired. Conventional imaging experiments usually employ current densities J on the order of $0.1 - 1 \text{ A/cm}^2$. It is also worth noting that field emission sources provide $10^3 - 10^4 \text{ A/cm}^2$ [33,34] so that sputtering rates on the order of $1.9 - 19$ monolayers/sec can be expected for materials with cross-sections of 300 barns. Figures 13 to 20 plot calculated cross-sections for solid elements at several common accelerating voltages up to 1 MV. By the time one reaches 1 MV all naturally occurring elements are have significant cross-sections.

For samples coated with a hydrocarbon based contamination layer little sputtering is to be expected. At 100kV the C cross-section is only 99 barns corresponding to only 0.015 monolayers/sec sputtered at a current density of 25 A/cm^2 . From experience we know that far more material than this moves into an intense beam as a result of propagation of contamination along a surface[11]. For sputtering rates suggested by these calculations the relatively sparse reports of sputtering can be attributed to this protective and dynamic layer of carbon.

INFLUENCE ON XEDS AND EELS

The characteristic line in an XEDS spectrum and the area under a core loss in an EELS spectrum are both proportional to the number of atoms of a given type in the specimen. The signal rate is

$$S_j = K_j N_j \eta \quad 5.3$$

Where S_j is the signal rate characteristic of element j in the specimen, $\eta = J A$ is the electron flux, N_j is the number of atoms of element j in the area A illuminated by the beam, and K_j is a constant conversion factor. For XEDS K_j is [35, 36]

$$K_{\text{XEDS}} = Q_j \omega_j \alpha_j \epsilon_j C_j \quad 5.4$$

where Q_j is the ionization cross-section of element j , ω_j is the x-ray fluorescence yield of j , α_j is the radiative partition function, ϵ_j is the relative detection efficiency, and C_j is the composition in weight %. For an EELS signal the intensity I_E of an ionization edge can be expressed [37]

$$I_E = I \frac{N}{A} \sigma_E^\beta \quad 5.5$$

where I is the incident beam intensity and σ_E^β is the cross-section integrated over the acceptance angle β and some energy window. Expressing I_E as a detected flux density S_E/A and I as an incident flux density the constant K for EELS is

$$K_{\text{EELS}} = \sigma_E^\beta / A \quad 5.6$$

The number of atoms removed by sputtering is

$$\Delta N = \eta t Y = \eta t \rho_s \sigma_M = J A \rho_s \sigma_M t = D \rho_s \sigma_M \quad 57$$

$D = JAt$ is the electron dose.

Due to mass loss by sputtering the experimental count rate, S , becomes

$$S = K\eta(N_i - \Delta N) \quad 58$$

where N_i is the initial number of atoms illuminated by the electron probe.

Considering the ratio of the count rate at time t to the rate at $t=0$ we obtain

$$R = \frac{S(t)}{S(t=0)} = \frac{KJA(N_i - JA\rho_s\sigma_M t)}{KJAN_i} \quad 59$$

Writing N in terms of the volume number density ρ_v , and T the sample thickness

$$N_i = \rho_v T_i A \quad 60$$

We obtain the ratio

$$R = 1 - J \frac{t}{T_i} \sigma_M \frac{\rho_s}{\rho_v} = 1 - \frac{D \sigma_M \rho_s}{N_i} \quad 61$$

Inserting typical values of $J=25\text{A/cm}^2$, $\sigma = 300$ barns, $T_i = 40\text{nm}$, $\rho_s = 10 \text{ atom/nm}^2$ and $\rho_v = 50 \text{ atom/nm}^3$ we obtain

$$R = 1 - (2.34 \times 10^{-4} \text{ sec}^{-1}) t$$

6 2

If a 2 μ m diameter probe is used with the above values the ratio is given in terms of the electron dose D by

$$R = 1 - (4.77 \times 10^{-17}) D$$

6 3

As seen in figure 21 the strength of the signal is expected to diminish steadily and linearly as a function of time (or dose). The times involved are not much greater than spectral acquisition times that are typically used. For materials with cross-sections exceeding 300 barns one must then beware of electron sputtering during spectral acquisition.

This has been a highly idealized discussion, as multicomponent materials will require considerably more effort to model correctly. Among other things one will have to be concerned with the rates at which constituent materials are moved to the surface where sputtering can occur.

FUTURE WORK

Calculations for sputtering of elements in the electron microscope are presented in this technical memo. There is, however, a great deal of work that remains to be done in this area. First and foremost is the collection of experimental data. There have been some observations of electron sputtering, but much more quantitative work needs to be done. Differential sputtering in multicomponent materials[4,10], radiolysis[38] radiation induced desorption[12,39,40] and beam heating[38] will also have to be evaluated. Resolving these different processes may be one of the more difficult experimental problems. It is not always possible to control experimental conditions so that only one mass-loss process is operative. For example, a specimen

may be both sputtered and simultaneously evaporated due to beam heating effects since very high intensities are required to observe sputtering in a reasonable time. Resolution of two, or more, simultaneous processes will then require observation of secondary features such as the angular or energy distributions of the ejected atoms. There is also a need for more sophisticated theoretical and computer models for the complexes of processes that are possible in real solids.

There are several strong incentives to pursue this line of investigation. First, given the new technology that is just becoming available it is clear that electron sputtering (and other mass-loss processes) will significantly influence present microanalytic methods. Further, it is conceivable, that new microanalytic techniques might be developed that explicitly rely on electron sputtering. Secondary Ion Mass Spectroscopy (SIMS) is a familiar technique based on the detection of sputtered ions. Recently a new and more sensitive technique, surface analysis by resonance ionization of sputtered atoms (SARISA) has been developed[41-44]. Sensitivities of less than a part per billion have been demonstrated for this method. At intermediate and high voltages modest yields (tables 2-10) combined with high incident electron flux may produce detectable numbers of atoms. Thus the possibility exists that an extremely sensitive microanalysis method can be developed. Beyond that there is the potential for the development of microfabrication capabilities of new types of materials based on knock-on and other mass-loss processes in the electron beam[33,45].

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Figure 1: Electron Nucleus Knock-on Collision. An incident electron with momentum $\vec{p}$ collides with a nucleus of mass M . After the collision the electron has momentum $\vec{p}'$ and has been scattered through an angle θ . The nucleus recoils with momentum $\vec{p}'_n$ at an angle ψ relative to the direction of the incident electron.

Figure 2: A plot of displacement energy versus sublimation energy for those materials for which a displacement energy has been measured[1,47,48]. The range of 4 to 5 times the sublimation energy is seen to be a reasonable estimate.

Figure 3: A plot of sublimation energies and measured displacement energies[1,47,48] as functions of the atomic number Z . Despite the differences it can be seen that a strong correlation exists.

Figure 4.1

Figure 4.2

Figure 4: (4.1) $\sigma_{\text{Mott}}/\sigma_{\text{Rutherford}}$ compared to $\sigma_{\text{McKinley-Feshbach}}/\sigma_{\text{Rutherford}}$. The first plot shows a low Z material $Z=6$ and a 400kV accelerating voltage. The McKinley-Feshbach asymptotic approximation is excellent in this regime. The second plot(4.2) is for $Z=79$ at 400kV. The McKinley-Feshbach approximation is clearly quite poor.

Figure 5.1

Figure 5.1 Convergence of the G_1 series at large angle (150° , $Z=80$, $T=1710\text{kV}$). Terms in the series are summed from $k=0$ to n , n is plotted on the abscissa. There is significant oscillation in the estimate of G_1 even after 120 terms are summed. Furthermore there is no clear test of convergence.

Figure 5.2: Applying the Euler Transformation to the G_1 series (at $Z=80$, $T=1710\text{kV}$, $\theta=150^\circ$) results in much more rapid convergence. The steps in the first part of the figure correspond to the least significant digit available in the format statement. The oscillations in the latter part of the figure are the result of other errors. Perhaps errors in the calculation of higher order D_k . Even so all errors displayed here are orders of magnitude less than those in figure 5.1.

Figure 5.3

Figure 5.3: Although the Euler Transformation is very effective, at small angles ($Z=80$, $T=1710\text{kV}$, $\theta=15^\circ$) there is still significant oscillation and no clear test of convergence. The reorganization of the series $(1-\cos\theta)G_1$ described in the text is effective at further accelerating convergence of the series.

Figure 6.1

Figure 6.1: For $Z=80$, $T=1710\text{kV}$, and $\theta=30^\circ$ Doggett and Spencer[26] reported the results of four tests of convergence. These are compared to the results of a convergence test of routines in the program TOTCS.FOR for the same parameters.

Figure 6.2

Figure 6.2: A similar comparison of convergence tests of Doggett and Spencer[26] and those of this study for $Z=80$, $T=1710\text{ kV}$, and $\theta=150^\circ$.

Figure 7.1: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=5^\circ$. Errors here are $\sim 0.5\%$ even after 120 terms have been summed.

Figure 7.2: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=10^\circ$.

Figure 7.3

Figure 7.3: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=15^\circ$.

Figure 7.4

Figure 7.4: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=20^\circ$.

Figure 7.5

Figure 7.5: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=30^\circ$.

Figure 7.6

Figure 7.6: Convergence test with $Z=82$, $T=10,000$. kV, $\theta=40^\circ$.

Figure 8.1

Figure 8.1: The percentage difference between the output of program dMOTTcs.FOR and Oen's tabulated values for the ratio of the differential Mott cross-section to the differential Rutherford cross-section for Aluminum at 100kV. At all angles the error is less than 0.1%

Figure 8.2

Figure 8.2: The percentage difference between the output of program dMOTTcs.FOR and Oen's tabulated values for the ratio of the differential Mott cross-section to the differential Rutherford cross-section for Gold at 600kV.

Figure 8.3

Figure 8.3: A comparison of the total cross-section of Aluminum ($Z=13$, $A=26.980$, $E_d=4.00\text{eV}$) tabulated by Oen and calculated in this study.

Figure 8.4

Figure 8.4: A comparison of the total cross-section of Gold ($Z=79$, $A=196.967$, $E_d=4.00\text{eV}$) tabulated by Oen and calculated in this study.

Figure 9

Figure 9: Gold recoil cross-section at $T=600\text{kV}$ assuming $T_s = 5.00\text{eV}$. The recoil angle is kinematically related to the recoil energy (as shown by equation 10). The abscissa here is labelled both in terms of recoil angle and recoil energy.

Figure 10.1

Figure 10.1 The total Mott cross-section and the total McKinley-Feshbach cross-section for a low Z ($Z=6$, Carbon). Results are nearly identical. Surface binding energy is assumed to be the sublimation energy.

Figure 10.2

Figure 10.2 The total Mott cross-section and the total McKinley-Feshbach cross-section for a high Z ($Z=79$, Gold). There is significant difference. Surface binding energy is assumed to be the sublimation energy.

Figure 11

Figure 11: The primary Mott cross-section for gold as a function of incident electron energy and the Kinchin-Pease cross-section. The Kinchin-Pease cross-section is expected to over-estimate the cross-section. The atomic cross-section is expected to be an under-estimate.

Figure 12: Total Mott Cross-Sections at 100kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 12.1 and 12.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 13.1

Figure 13.2

Figure 13: Total Mott Cross-Sections at 120kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 13.1 and 13.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 14: Total Mott Cross-Sections at 150kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 14.1 and 14.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 15: Total Mott Cross-Sections at 200kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 15.1 and 15.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 16.1

Figure 16.2

Figure 16: Total Mott Cross-Sections at 250kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 16.1 and 16.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 17: Total Mott Cross-Sections at 300kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 17.1 and 17.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 18.1

Figure 18.2

Figure 18: Total Mott Cross-Sections at 350kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 18.1 and 18.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 19.1

Figure 19.2

Figure 19: Total Mott Cross-Sections at 400kV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 19.1 and 19.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 20: Total Mott Cross-Sections at 1MV assuming a surface binding energy equal to the sublimation energy (see Table 2). Note that figures 20.1 and 20.2 are identical data with only the y-axis changed to permit convenient viewing.

Figure 21.1

Figure 21.1: EELS or XEDS signal strength relative to time $t=0$ given by equation 61 for a 40nm thick specimen with a variety of cross-sections(at the accelerating voltage in use), a surface density of 10 atoms/nm², and a volume density of 50 atoms/nm³ exposed to a 25 A/cm² beam.

Figure 21.2

Figure 21.2: EELS or XEDS signal strength relative to time $t=0$ given by equation 61 with the same assumed parameters as Figure 21.1. The probe is assumed to be 2 μ m in diameter.

TABLE 1
THRESHOLD ACCELERATING VOLTAGES

Atomic Number	Element	Atomic Mass	Sublimation Energy (E_s) eV	Threshold Accel. Voltage at E_s	Threshold Accel. Voltage at $2E_s$	Threshold Accel. Voltage at $4E_s$	Threshold Accel. Voltage at $5E_s$
3	Li, Lithium	6.939	1.670	5.3	10.5	20.7	25.7
4	Be, Beryllium	9.012	3.360	13.6	26.9	52.5	64.9
5	B, Boron	10.811	6.030	28.9	56.3	107.5	131.6
6	C, Carbon	12.010	7.430	39.2	75.7	142.7	173.7
11	Na, Sodium	22.990	1.120	11.6	22.9	44.9	55.6
12	Mg, Magnesium	24.312	1.520	16.6	32.6	63.4	78.2
13	Al, Aluminum	26.980	3.420	40.4	78.1	147.0	178.9
14	Si, Silicon	28.090	4.680	56.7	108.3	200.3	242.1
15	P, Phosphorus	30.974	3.440	46.4	89.3	166.9	202.6
16	S, Sulfur	32.060	2.870	40.3	77.9	146.6	178.4
19	K, Potassium	39.100	0.929	16.3	32.1	62.4	76.9
20	Ca, Calcium	40.080	1.850	32.7	63.6	120.8	147.6
21	Sc, Scandium	44.956	3.920	74.8	141.1	256.7	308.4
22	Ti, Titanium	47.900	4.860	96.9	180.3	322.5	385.1
23	V, Vanadium	50.942	5.330	111.5	205.9	364.7	434.1
24	Cr, Chromium	51.996	4.110	89.5	167.3	300.9	360.0
25	Mn, Manganese	54.938	2.940	68.9	130.5	238.6	287.2
26	Fe, Iron	55.847	4.310	99.9	185.6	331.3	395.3
27	Co, Cobalt	58.933	4.440	107.8	199.5	354.1	421.9
28	Ni, Nickel	58.710	4.460	107.9	199.6	354.3	422.1
29	Cu, Copper	63.546	3.500	92.9	173.3	310.8	371.5
30	Zn, Zinc	65.380	1.350	38.7	74.9	141.3	172.1
31	Ga, Gallium	69.72	2.840	83.4	156.5	282.7	338.8
32	Ge, Germanium	72.590	3.880	115.3	212.5	375.4	446.5
33	As, Arsenic	74.922	3.140	97.8	182.0	325.2	388.3
34	Se, Selenium	78.960	2.350	78.5	147.7	267.9	321.5
37	Rb, Rubidium	85.470	0.850	32.1	62.4	118.6	144.9
38	Sr, Strontium	87.620	1.700	63.9	121.3	222.8	268.7
39	Y, Yttrium	88.906	4.400	154.8	279.8	483.8	571.5
40	Zr, Zirconium	91.220	6.310	216.4	381.8	643.6	754.3

TABLE 1
THRESHOLD ACCELERATING VOLTAGES

Atomic Number	Element	Atomic Mass	Sublimation Energy (E_s) eV	Threshold Accel. Voltage at E_s	Threshold Accel. Voltage at $2E_s$	Threshold Accel. Voltage at $4E_s$	Threshold Accel. Voltage at $5E_s$
41	Nb, Niobium	92.906	7.480	253.6	442.0	736.1	859.7
42	Mo, Molybdenum	95.940	6.810	240.9	421.5	704.7	823.9
44	Ru, Ruthenium	101.070	6.740	249.5	435.3	725.8	848.0
45	Rh, Rhodium	102.905	5.770	222.2	391.2	658.1	770.9
46	Pd, Palladium	106.400	3.900	163.0	293.7	505.8	596.8
47	Ag, Silver	107.868	2.950	128.7	235.6	413.0	489.9
48	Cd, Cadmium	112.400	1.160	56.3	107.5	198.9	240.4
49	In, Indium	114.820	2.520	118.2	217.4	383.4	455.8
50	Sn, Tin	118.690	3.130	147.9	268.1	465.2	550.1
51	Sb, Antimony	121.750	2.740	134.3	245.1	428.4	507.7
52	Te, Tellurium	127.600	2.040	107.3	198.6	352.7	420.2
53	I, Iodine	126.904	1.110	60.6	115.3	212.5	256.5
56	Ba, Barium	137.340	1.840	104.4	193.5	344.3	410.5
57	La, Lanthanum	138.906	4.335	224.9	395.6	664.8	778.5
58	Ce, Cerium	140.120	4.380	228.5	401.5	673.9	788.9
59	Pr, Praeseodymium	140.908	3.689	198.3	352.2	597.7	701.9
60	Nd, Neodymium	144.240	3.325	185.0	330.3	563.4	662.7
61	Pm, Promethium	145.000	3.035	171.7	308.1	528.6	622.8
62	Sm, Samarium	150.350	2.140	130.0	237.8	416.5	494.1
63	Eu, Europium	151.960	1.890	117.4	216.0	381.2	453.2
64	Gd, Gadolinium	157.250	2.241	141.1	256.6	446.8	528.9
65	Tb, Terbium	158.925	3.121	190.5	339.3	577.5	678.9
66	Dy, Dysprosium	162.500	3.087	192.3	342.4	582.3	684.4
67	Ho, Holmium	164.930	3.251	203.7	361.0	611.4	717.5
68	Er, Erbium	167.800	3.290	208.8	369.4	624.4	732.5
69	Tm, Thullium	168.934	2.514	166.4	299.3	514.7	606.9
70	Yb, Ytterbium	173.040	1.580	112.2	207.1	366.7	436.4
71	Lu, Lutetium	174.967	3.312	217.6	383.8	646.7	757.9
72	Hf, Hafnium	178.490	6.420	380.4	641.5	1036.6	1200.3
73	Ta, Tantalum	180.948	8.100	460.3	764.1	1218.4	1405.5

TABLE 1
THRESHOLD ACCELERATING VOLTAGES

Atomic Number	Element	Atomic Mass	Sublimation Energy (E_s) eV	Threshold Accel. Voltage at E_s	Threshold Accel. Voltage at $2E_s$	Threshold Accel. Voltage at $4E_s$	Threshold Accel. Voltage at $5E_s$
74	W, Tungsten	183.850	8.810	496.6	819.2	1299.4	1496.9
75	Re, Rhenium	186.200	8.020	467.0	774.2	1233.2	1422.2
76	Os, Osmium	190.200	8.150	480.4	794.6	1263.2	1456.1
77	Ir, Iridium	192.200	6.940	428.2	715.0	1145.9	1323.7
78	Pt, Platinum	195.090	5.860	379.7	640.4	1035.0	1198.5
79	Au, Gold	196.967	3.820	270.9	469.7	778.3	907.7
81	Tl, Thallium	204.370	1.890	153.0	276.9	479.2	566.2
82	Pb, Lead	207.200	2.020	164.3	295.8	509.1	600.5
83	Bi, Bismuth	208.981	2.170	176.2	315.7	540.5	636.5
84	Po, Polonium	209.000	1.444	122.7	225.3	396.3	470.7
85	At, Astatine	210.000	0.936	82.8	155.4	280.9	336.8
88	Ra, Radium	226.025	1.678	150.6	272.8	472.6	558.6
89	Ac, Actinium	227.028	3.988	315.2	539.8	884.4	1028.1
90	Th, Thorium	232.038	5.962	440.4	733.7	1173.5	1354.9
91	Pa, Protactinium	231.036	4.769	368.8	623.5	1009.9	1170.1
92	U, Uranium	238.029	5.460	419.7	702.0	1126.5	1301.9

TABLE 2
CROSS-SECTIONS AT 100kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	331.087	556.125	3.471e-3	4.57
4	Be, Beryllium	198.435	262.042	1.636e-3	5.76
5	B, Boron	113.113	123.677	7.72e-4	0.162
6	C, Carbon	99.35	102.169	6.377e-4	1.80
11	Na, Sodium	1872.224	2576.277	1.608e-2	14.4
12	Mg, Magnesium	1446.088	1813.393	1.132e-2	20.3
13	Al, Aluminum	453.724	464.089	2.897e-3	5.66
14	Si, Silicon	258.385	258.385	1.613e-3	1.75
15	P, Phosphorus	467.812	470.428	2.936e-3	3.25
16	S, Sulfur	701.982	718.253	4.483e-3	8.26
19	K, Potassium	3842.961	4841.142	3.022e-2	17.7
20	Ca, Calcium	1606.494	1707.459	1.066e-2	11.0
21	Sc, Scandium	250.978	250.978	1.567e-3	2.64
22	Ti, Titanium	24.644	24.644	1.538e-4	0.328
23	V, Vanadium	0	0	0e+0	0
24	Cr, Chromium	110.522	110.522	6.899e-4	1.34
25	Mn, Manganese	499.777	499.777	3.12e-3	9.20
26	Fe, Iron	1.173	1.173	7.321e-6	0.0142
27	Co, Cobalt	0	0	0e+0	0
28	Ni, Nickel	0	0	0e+0	0
29	Cu, Copper	108.495	108.495	6.772e-4	1.67
30	Zn, Zinc	2931.847	3018.675	1.884e-2	49.2
31	Ga, Gallium	339.191	339.191	2.117e-3	1.67
32	Ge, Germanium	0	0	0e+0	0
33	As, Arsenic	41.807	41.807	2.61e-4	0.173
34	Se, Selenium	588.391	588.391	3.673e-3	3.57

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 2
CROSS-SECTIONS AT 100kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
37	Rb, Rubidium	6493.131	6935.069	4.329e-2	22.2
38	Sr, Strontium	1668.66	1668.66	1.042e-2	9.03
39	Y, Yttrium	0	0	0e+0	0
40	Zr, Zirconium	0	0	0e+0	0
41	Nb, Niobium	0	0	0e+0	0
42	Mo, Molybdenum	0	0	0e+0	0
44	Ru, Ruthenium	0	0	0e+0	0
45	Rh, Rhodium	0	0	0e+0	0
46	Pd, Palladium	0	0	0e+0	0
47	Ag, Silver	0	0	0e+0	0
48	Cd, Cadmium	4220.852	4220.852	2.635e-2	54.9
49	In, Indium	0	0	0e+0	0
50	Sn, Tin	0	0	0e+0	0
51	Sb, Antimony	0	0	0e+0	0
52	Te, Tellurium	0	0	0e+0	0
53	I, Iodine	4564.117	4564.117	2.849e-2	6.44
56	Ba, Barium	0	0	0e+0	0
57	La, Lanthanum	0	0	0e+0	0
58	Ce, Cerium	0	0	0e+0	0
59	Pr, Praeseodymium	0	0	0e+0	0
60	Nd, Neodymium	0	0	0e+0	0
61	Pm, Promethium	0	0	0e+0	0
62	Sm, Samarium	0	0	0e+0	0
63	Eu, Europium	0	0	0e+0	0
64	Gd, Gadolinium	0	0	0e+0	0
65	Tb, Terbium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 2
CROSS-SECTIONS AT 100kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
66	Dy, Dysprosium	0	0	0e+0	0
67	Ho, Holmium	0	0	0e+0	0
68	Er, Erbium	0	0	0e+0	0
69	Tm, Thullium	0	0	0e+0	0
70	Yb, Ytterbium	0	0	0e+0	0
71	Lu, Lutetium	0	0	0e+0	0
72	Hf, Hafnium	0	0	0e+0	0
73	Ta, Tantalum	0	0	0e+0	0
74	W, Tungsten	0	0	0e+0	0
75	Re, Rhenium	0	0	0e+0	0
76	Os, Osmium	0	0	0e+0	0
77	Ir, Iridium	0	0	0e+0	0
78	Pt, Platinum	0	0	0e+0	0
79	Au, Gold	0	0	0e+0	0
81	Tl, Thallium	0	0	0e+0	0
82	Pb, Lead	0	0	0e+0	0
83	Bi, Bismuth	0	0	0e+0	0
84	Po, Polonium	0	0	0e+0	0
85	At, Astatine	6509.38	6509.38	4.063e-2	
88	Ra, Radium	0	0	0e+0	0
89	Ac, Actinium	0	0	0e+0	
90	Th, Thorium	0	0	0e+0	0
91	Pa, Protactinium	0	0	0e+0	0
92	U, Uranium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 3
CROSS-SECTIONS AT 120kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	291.954	510.678	3.188e-3	4.19
4	Be, Beryllium	177.896	245.894	1.535e-3	5.41
5	B, Boron	105.378	120.337	7.511e-4	0.158
6	C, Carbon	95.91	102.179	6.378e-4	1.80
11	Na, Sodium	1672.771	2408.945	1.504e-2	13.5
12	Mg, Magnesium	1306.563	1716.216	1.071e-2	19.2
13	Al, Aluminum	441.574	467.07	2.915e-3	5.70
14	Si, Silicon	275.111	276.387	1.725e-3	1.87
15	P, Phosphorus	468.305	482.777	3.013e-3	3.33
16	S, Sulfur	683.575	723.302	4.515e-3	8.32
19	K, Potassium	3471.904	4583.232	2.861e-2	16.8
20	Ca, Calcium	1521.507	1684.418	1.051e-2	10.8
21	Sc, Scandium	328.541	328.541	2.051e-3	3.45
22	Ti, Titanium	132.797	132.797	8.289e-4	1.77
23	V, Vanadium	44.167	44.167	2.757e-4	0.486
24	Cr, Chromium	234.598	234.598	1.464e-3	2.84
25	Mn, Manganese	600.535	600.535	3.749e-3	11.0
26	Fe, Iron	159.235	159.235	9.939e-4	1.93
27	Co, Cobalt	94.319	94.319	5.887e-4	1.73
28	Ni, Nickel	101.593	101.593	6.341e-4	1.64
29	Cu, Copper	302.173	302.173	1.886e-3	4.65
30	Zn, Zinc	2843.277	3032.76	1.893e-2	49.4
31	Ga, Gallium	547.17	547.17	3.415e-3	2.69
32	Ge, Germanium	48.621	48.621	3.035e-4	0.303
33	As, Arsenic	310.143	310.143	1.936e-3	1.28
34	Se, Selenium	831.366	831.366	5.189e-3	5.05
37	Rb, Rubidium	6138.748	6837.369	4.268e-2	21.9

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 3
CROSS-SECTIONS AT 120kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
38	Sr, Strontium	1897.235	1897.235	1.184e-2	10.3
39	Y, Yttrium	0	0	0e+0	0
40	Zr, Zirconium	0	0	0e+0	0
41	Nb, Niobium	0	0	0e+0	0
42	Mo, Molybdenum	0	0	0e+0	0
44	Ru, Ruthenium	0	0	0e+0	0
45	Rh, Rhodium	0	0	0e+0	0
46	Pd, Palladium	0	0	0e+0	0
47	Ag, Silver	0	0	0e+0	0
48	Cd, Cadmium	4490.674	4514.618	2.818e-2	58.7
49	In, Indium	53.745	53.745	3.355e-4	0.255
50	Sn, Tin	0	0	0e+0	0
51	Sb, Antimony	0	0	0e+0	0
52	Te, Tellurium	499.601	499.601	3.118e-3	2.91
53	I, Iodine	5009.577	5013.441	3.129e-2	7.07
56	Ba, Barium	788.404	788.404	4.921e-3	3.13
57	La, Lanthanum	0	0	0e+0	0
58	Ce, Cerium	0	0	0e+0	0
59	Pr, Praeseodymium	0	0	0e+0	0
60	Nd, Neodymium	0	0	0e+0	0
61	Pm, Promethium	0	0	0e+0	0
62	Sm, Samarium	0	0	0e+0	0
63	Eu, Europium	165.686	165.686	1.034e-3	0.780
64	Gd, Gadolinium	0	0	0e+0	0
65	Tb, Terbium	0	0	0e+0	0
66	Dy, Dysprosium	0	0	0e+0	0
67	Ho, Holmium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 3
CROSS-SECTIONS AT 120kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
68	Er, Erbium	0	0	0e+0	0
69	Tm, Thullium	0	0	0e+0	0
70	Yb, Ytterbium	738.916	738.916	4.612e-3	4.91
71	Lu, Lutetium	0	0	0e+0	0
72	Hf, Hafnium	0	0	0e+0	0
73	Ta, Tantalum	0	0	0e+0	0
74	W, Tungsten	0	0	0e+0	0
75	Re, Rhenium	0	0	0e+0	0
76	Os, Osmium	0	0	0e+0	0
77	Ir, Iridium	0	0	0e+0	0
78	Pt, Platinum	0	0	0e+0	0
79	Au, Gold	0	0	0e+0	0
81	Tl, Thallium	0	0	0e+0	0
82	Pb, Lead	0	0	0e+0	0
83	Bi, Bismuth	0	0	0e+0	0
84	Po, Polonium	0	0	0e+0	0
85	At, Astatine	9789.747	9789.747	6.111e-2	
88	Ra, Radium	0	0	0e+0	0
89	Ac, Actinium	0	0	0e+0	
90	Th, Thorium	0	0	0e+0	0
91	Pa, Protactinium	0	0	0e+0	0
92	U, Uranium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 4
CROSS-SECTIONS AT 150kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	252.361	463.02	2.89e-3	3.80
4	Be, Beryllium	156.351	228.18	1.424e-3	5.02
5	B, Boron	96.002	115.834	7.23e-4	0.152
6	C, Carbon	90.097	100.958	6.302e-4	1.78
11	Na, Sodium	1465.056	2227.363	1.39e-2	12.5
12	Mg, Magnesium	1156.968	1607.064	1.003e-2	18.0
13	Al, Aluminum	417.901	464.395	2.899e-3	5.67
14	Si, Silicon	278.807	288.899	1.803e-3	1.96
15	P, Phosphorus	453.472	488.605	3.05e-3	3.37
16	S, Sulfur	647.387	719.676	4.492e-3	8.28
19	K, Potassium	3073.513	4293.676	2.68e-2	15.7
20	Ca, Calcium	1407.277	1644.124	1.026e-2	10.6
21	Sc, Scandium	377.23	377.877	2.359e-3	3.97
22	Ti, Titanium	210.63	210.63	1.315e-3	2.80
23	V, Vanadium	138.518	138.518	8.646e-4	1.52
24	Cr, Chromium	321.827	321.827	2.009e-3	3.89
25	Mn, Manganese	659.001	664.258	4.146e-3	12.2
26	Fe, Iron	274.702	274.702	1.715e-3	3.32
27	Co, Cobalt	226.376	226.376	1.413e-3	4.14
28	Ni, Nickel	244.966	244.966	1.529e-3	3.94
29	Cu, Copper	441.194	441.194	2.754e-3	6.79
30	Zn, Zinc	2684.353	3012.356	1.88e-2	49.1
31	Ga, Gallium	690.3	690.3	4.309e-3	3.39
32	Ge, Germanium	249.368	249.368	1.557e-3	1.56
33	As, Arsenic	506.477	506.477	3.161e-3	2.09
34	Se, Selenium	993.287	993.399	6.201e-3	6.03
37	Rb, Rubidium	5665.916	6671.335	4.164e-2	21.3

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 4
CROSS-SECTIONS AT 150kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
38	Sr, Strontium	2015.368	2049.698	1.279e-2	11.1
39	Y, Yttrium	0	0	0e+0	0
40	Zr, Zirconium	0	0	0e+0	0
41	Nb, Niobium	0	0	0e+0	0
42	Mo, Molybdenum	0	0	0e+0	0
44	Ru, Ruthenium	0	0	0e+0	0
45	Rh, Rhodium	0	0	0e+0	0
46	Pd, Palladium	0	0	0e+0	0
47	Ag, Silver	338.032	338.032	2.11e-3	4.06
48	Cd, Cadmium	4556.174	4729.783	2.952e-2	61.5
49	In, Indium	642.881	642.881	4.013e-3	3.05
50	Sn, Tin	32.755	32.755	2.045e-4	0.0966
51	Sb, Antimony	293.418	293.418	1.832e-3	1.32
52	Te, Tellurium	1162.148	1162.148	7.254e-3	6.78
53	I, Iodine	5191.688	5325.151	3.324e-2	7.51
56	Ba, Barium	1590.779	1590.779	9.93e-3	6.32
57	La, Lanthanum	0	0	0e+0	0
58	Ce, Cerium	0	0	0e+0	0
59	Pr, Praeseodymium	0	0	0e+0	0
60	Nd, Neodymium	0	0	0e+0	0
61	Pm, Promethium	0	0	0e+0	0
62	Sm, Samarium	705.56	705.56	4.404e-3	6.84
63	Eu, Europium	1397.702	1397.702	8.724e-3	6.58
64	Gd, Gadolinium	311.323	311.323	1.943e-3	2.71
65	Tb, Terbium	0	0	0e+0	0
66	Dy, Dysprosium	0	0	0e+0	0
67	Ho, Holmium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 4
CROSS-SECTIONS AT 150kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
68	Er, Erbium	0	0	0e+0	0
69	Tm, Thullium	0	0	0e+0	0
70	Yb, Ytterbium	2422.436	2422.436	1.512e-2	16.1
71	Lu, Lutetium	0	0	0e+0	0
72	Hf, Hafnium	0	0	0e+0	0
73	Ta, Tantalum	0	0	0e+0	0
74	W, Tungsten	0	0	0e+0	0
75	Re, Rhenium	0	0	0e+0	0
76	Os, Osmium	0	0	0e+0	0
77	Ir, Iridium	0	0	0e+0	0
78	Pt, Platinum	0	0	0e+0	0
79	Au, Gold	0	0	0e+0	0
81	Tl, Thallium	0	0	0e+0	0
82	Pb, Lead	0	0	0e+0	0
83	Bi, Bismuth	0	0	0e+0	0
84	Po, Polonium	3041.299	3041.299	1.898e-2	3.83
85	At, Astatine	11730.585	11730.585	7.322e-2	
88	Ra, Radium	0	0	0e+0	0
89	Ac, Actinium	0	0	0e+0	
90	Th, Thorium	0	0	0e+0	0
91	Pa, Protactinium	0	0	0e+0	0
92	U, Uranium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 5
CROSS-SECTIONS AT 200kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	212.507	413.697	2.582e-3	3.40
4	Be, Beryllium	133.983	209.223	1.306e-3	4.60
5	B, Boron	85.189	110.373	6.889e-4	0.145
6	C, Carbon	82.177	98.712	6.162e-4	1.74
11	Na, Sodium	1250.37	2034.411	1.27e-2	11.4
12	Mg, Magnesium	998.526	1488.19	9.289e-3	16.7
13	Al, Aluminum	383.746	456.988	2.853e-3	5.58
14	Si, Silicon	270.626	297.593	1.858e-3	2.02
15	P, Phosphorus	424.608	488.955	3.052e-3	3.37
16	S, Sulfur	594.866	708.77	4.424e-3	8.15
19	K, Potassium	2650.306	3978.12	2.483e-2	14.6
20	Ca, Calcium	1265.842	1589.324	9.92e-3	10.2
21	Sc, Scandium	399.37	415.214	2.592e-3	4.36
22	Ti, Titanium	260.942	262.135	1.636e-3	3.49
23	V, Vanadium	203.852	203.852	1.272e-3	2.24
24	Cr, Chromium	375.379	380	2.372e-3	4.60
25	Mn, Manganese	678.14	715.615	4.467e-3	13.2
26	Fe, Iron	351.543	352.402	2.200e-3	4.26
27	Co, Cobalt	317.607	317.608	1.982e-3	5.81
28	Ni, Nickel	344.259	344.26	2.149e-3	5.54
29	Cu, Copper	530.258	534.626	3.337e-3	8.23
30	Zn, Zinc	2457.918	2962.221	1.849e-2	48.3
31	Ga, Gallium	773.435	790.092	4.932e-3	3.88
32	Ge, Germanium	392.689	392.689	2.451e-3	2.45
33	As, Arsenic	637.429	639.842	3.994e-3	2.64
34	Se, Selenium	1079.544	1113.013	6.947e-3	6.76
37	Rb, Rubidium	5076.946	6445.451	4.023e-2	20.6

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 5
CROSS-SECTIONS AT 200kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
38	Sr, Strontium	2027.758	2173.599	1.357e-2	11.8
39	Y, Yttrium	217.796	217.796	1.359e-3	1.89
40	Zr, Zirconium	0	0	0.000e+0	0
41	Nb, Niobium	0	0	0.000e+0	0
42	Mo, Molybdenum	0	0	0.000e+0	0
44	Ru, Ruthenium	0	0	0.000e+0	0
45	Rh, Rhodium	0	0	0.000e+0	0
46	Pd, Palladium	250.539	250.539	1.564e-3	3.31
47	Ag, Silver	735.869	735.869	4.593e-3	8.83
48	Cd, Cadmium	4420.348	4883.152	3.048e-2	63.5
49	In, Indium	1068.502	1068.502	6.670e-3	5.08
50	Sn, Tin	518.956	518.956	3.239e-3	1.53
51	Sb, Antimony	798.093	798.093	4.982e-3	3.60
52	Te, Tellurium	1623.438	1623.478	1.013e-2	9.46
53	I, Iodine	5114.344	5562.946	3.472e-2	7.84
56	Ba, Barium	2138.385	2139.451	1.335e-2	8.49
57	La, Lanthanum	0	0	0.000e+0	0
58	Ce, Cerium	0	0	0.000e+0	0
59	Pr, Praeseodymium	16.572	16.572	1.034e-4	0.142
60	Nd, Neodymium	177.445	177.445	1.108e-3	1.53
61	Pm, Promethium	401.784	401.784	2.508e-3	
62	Sm, Samarium	1586.578	1586.578	9.903e-3	15.4
63	Eu, Europium	2260.327	2260.327	1.411e-2	10.6
64	Gd, Gadolinium	1317.782	1317.782	8.226e-3	11.5
65	Tb, Terbium	139.274	139.274	8.693e-4	1.24
66	Dy, Dysprosium	115.95	115.95	7.238e-4	1.04
67	Ho, Holmium	0	0	0.000e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 5
CROSS-SECTIONS AT 200kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
68	Er, Erbium	0	0	0.000e+0	0
69	Tm, Thullium	755.211	755.211	4.714e-3	6.96
70	Yb, Ytterbium	3553.939	3553.939	2.218e-2	23.6
71	Lu, Lutetium	0	0	0.000e+0	0
72	Hf, Hafnium	0	0	0.000e+0	0
73	Ta, Tantalum	0	0	0.000e+0	0
74	W, Tungsten	0	0	0.000e+0	0
75	Re, Rhenium	0	0	0.000e+0	0
76	Os, Osmium	0	0	0.000e+0	0
77	Ir, Iridium	0	0	0.000e+0	0
78	Pt, Platinum	0	0	0.000e+0	0
79	Au, Gold	0	0	0.000e+0	0
81	Tl, Thallium	2140.106	2140.106	1.336e-2	20.7
82	Pb, Lead	1549.325	1549.325	9.671e-3	12.6
83	Bi, Bismuth	978.019	978.019	6.105e-3	4.65
84	Po, Polonium	5295.712	5295.712	3.306e-2	6.67
85	At, Astatine	12487.081	12839.528	8.014e-2	
88	Ra, Radium	3182.336	3182.336	1.986e-2	19.1
89	Ac, Actinium	0	0	0.000e+0	
90	Th, Thorium	0	0	0.000e+0	0
91	Pa, Protactinium	0	0	0.000e+0	0
92	U, Uranium	0	0	0.000e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 6
CROSS-SECTIONS AT 250kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	188.636	384.085	2.397e-3	3.15
4	Be, Beryllium	120.31	197.737	1.234e-3	4.35
5	B, Boron	78.162	106.965	6.677e-4	0.140
6	C, Carbon	76.605	97.208	6.068e-4	1.71
11	Na, Sodium	1119.268	1917.561	1.197e-2	10.7
12	Mg, Magnesium	900.179	1415.713	8.837e-3	15.9
13	Al, Aluminum	358.97	451.799	2.820e-3	5.51
14	Si, Silicon	260.814	302.187	1.886e-3	2.05
15	P, Phosphorus	401.471	488.277	3.048e-3	3.37
16	S, Sulfur	556.553	701.055	4.376e-3	8.06
19	K, Potassium	2386.501	3785.277	2.363e-2	13.9
20	Ca, Calcium	1169.427	1554.066	9.700e-3	9.98
21	Sc, Scandium	401.42	436.645	2.726e-3	4.58
22	Ti, Titanium	279.651	289.429	1.807e-3	3.85
23	V, Vanadium	231.093	234.347	1.463e-3	2.58
24	Cr, Chromium	393.272	412.652	2.576e-3	4.99
25	Mn, Manganese	672.615	744.779	4.649e-3	13.7
26	Fe, Iron	381.397	392.723	2.451e-3	4.75
27	Co, Cobalt	355.294	361.799	2.258e-3	6.62
28	Ni, Nickel	385.384	392.399	2.449e-3	6.32
29	Cu, Copper	562.298	586.018	3.658e-3	9.02
30	Zn, Zinc	2291.641	2926.383	1.827e-2	47.7
31	Ga, Gallium	797.114	847.694	5.291e-3	4.16
32	Ge, Germanium	454.738	459.34	2.867e-3	2.87
33	As, Arsenic	687.848	710.572	4.435e-3	2.93
34	Se, Selenium	1097.652	1181.932	7.378e-3	7.17
37	Rb, Rubidium	4669.52	6297.024	3.931e-2	20.2

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 6
CROSS-SECTIONS AT 250kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
38	Sr, Strontium	1986.506	2241.853	1.399e-2	12.1
39	Y, Yttrium	339.249	339.249	2.118e-3	2.94
40	Zr, Zirconium	72.032	72.032	4.496e-4	0.800
41	Nb, Niobium	0	0	0.000e+0	0
42	Mo, Molybdenum	17.838	17.838	1.113e-4	0.180
44	Ru, Ruthenium	1.122	1.122	7.004e-6	0.0177
45	Rh, Rhodium	76.817	76.817	4.795e-4	1.06
46	Pd, Palladium	438.32	438.32	2.736e-3	5.79
47	Ag, Silver	917.565	918.951	5.736e-3	11.0
48	Cd, Cadmium	4241.581	4958.534	3.095e-2	64.5
49	In, Indium	1255.105	1264.748	7.895e-3	6.01
50	Sn, Tin	750.595	750.595	4.685e-3	2.21
51	Sb, Antimony	1031.399	1031.578	6.439e-3	4.65
52	Te, Tellurium	1812.025	1846.804	1.153e-2	10.8
53	I, Iodine	4940.877	5683.621	3.548e-2	8.01
56	Ba, Barium	2353.612	2408.747	1.504e-2	9.56
57	La, Lanthanum	133.198	133.198	8.314e-4	1.09
58	Ce, Cerium	116.313	116.313	7.260e-4	0.874
59	Pr, Praseodymium	385.731	385.731	2.408e-3	3.31
60	Nd, Neodymium	576.138	576.138	3.596e-3	4.97
61	Pm, Promethium	825.443	825.443	5.152e-3	
62	Sm, Samarium	1979.511	1981.727	1.237e-2	19.2
63	Eu, Europium	2622.466	2645.227	1.651e-2	12.5
64	Gd, Gadolinium	1778.621	1778.621	1.110e-2	15.5
65	Tb, Terbium	651.033	651.033	4.064e-3	5.80
66	Dy, Dysprosium	652.895	652.895	4.075e-3	5.85
67	Ho, Holmium	500.038	500.038	3.121e-3	4.51

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 6
CROSS-SECTIONS AT 250kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
68	Er, Erbium	447.334	447.334	2.792e-3	4.08
69	Tm, Thullium	1382.1	1382.1	8.627e-3	12.7
70	Yb, Ytterbium	3994.869	4052.088	2.529e-2	26.9
71	Lu, Lutetium	379.754	379.754	2.370e-3	3.56
72	Hf, Hafnium	0	0	0.000e+0	0
73	Ta, Tantalum	0	0	0.000e+0	0
74	W, Tungsten	0	0	0.000e+0	0
75	Re, Rhenium	0	0	0.000e+0	0
76	Os, Osmium	0	0	0.000e+0	0
77	Ir, Iridium	0	0	0.000e+0	0
78	Pt, Platinum	0	0	0.000e+0	0
79	Au, Gold	0	0	0.000e+0	0
81	Tl, Thallium	3175.093	3175.093	1.982e-2	30.6
82	Pb, Lead	2680.466	2680.466	1.673e-2	21.9
83	Bi, Bismuth	2195.972	2195.972	1.371e-2	10.4
84	Po, Polonium	6152.46	6184.428	3.860e-2	7.79
85	At, Astatine	12351.259	13384.8	8.355e-2	
88	Ra, Radium	4537.328	4537.328	2.832e-2	27.2
89	Ac, Actinium	0	0	0.000e+0	
90	Th, Thorium	0	0	0.000e+0	0
91	Pa, Protactinium	0	0	0.000e+0	0
92	U, Uranium	0	0	0.000e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 7
CROSS-SECTIONS AT 300kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
3	Li, Lithium	172.849	365.022	2.278e-3	3.00
4	Be, Beryllium	111.178	190.469	1.189e-3	4.19
5	B, Boron	73.337	104.937	6.55e-4	0.137
6	C, Carbon	72.653	96.448	6.02e-4	1.70
11	Na, Sodium	1031.573	1843.145	1.15e-2	10.3
12	Mg, Magnesium	833.834	1370.1	8.552e-3	15.3
13	Al, Aluminum	341.082	449.438	2.805e-3	5.48
14	Si, Silicon	252.656	306.117	1.911e-3	2.08
15	P, Phosphorus	384.12	489.072	3.053e-3	3.37
16	S, Sulfur	528.752	697.573	4.354e-3	8.02
19	K, Potassium	2207.776	3663.436	2.287e-2	13.4
20	Ca, Calcium	1101.187	1533.814	9.574e-3	9.85
21	Sc, Scandium	398.869	452.415	2.824e-3	4.75
22	Ti, Titanium	288.183	308.934	1.928e-3	4.11
23	V, Vanadium	245.204	255.919	1.597e-3	2.82
24	Cr, Chromium	400.196	436.088	2.722e-3	5.28
25	Mn, Manganese	662.768	766.478	4.784e-3	14.1
26	Fe, Iron	395.587	421.421	2.63e-3	5.10
27	Co, Cobalt	374.46	393.135	2.454e-3	7.19
28	Ni, Nickel	406.31	426.514	2.662e-3	6.87
29	Cu, Copper	575.888	622.656	3.887e-3	9.59
30	Zn, Zinc	2169.187	2908.11	1.815e-2	47.4
31	Ga, Gallium	803.108	888.992	5.549e-3	4.36
32	Ge, Germanium	487.572	505.849	3.157e-3	3.16
33	As, Arsenic	711.013	760.676	4.748e-3	3.14
34	Se, Selenium	1096.778	1231.426	7.687e-3	7.47
37	Rb, Rubidium	4376.336	6207.734	3.875e-2	19.9
38	Sr, Strontium	1939.436	2292.241	1.431e-2	12.4

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 7
CROSS-SECTIONS AT 300kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
39	Y, Yttrium	410.245	411.065	2.566e-3	3.56
40	Zr, Zirconium	145.981	145.981	9.112e-4	1.62
41	Nb, Niobium	63.395	63.395	3.957e-4	0.582
42	Mo, Molybdenum	95.569	95.569	5.965e-4	0.965
44	Ru, Ruthenium	86.008	86.008	5.369e-4	1.36
45	Rh, Rhodium	176.145	176.145	1.099e-3	2.43
46	Pd, Palladium	549.491	549.599	3.431e-3	7.25
47	Ag, Silver	1017.102	1037.708	6.477e-3	12.5
48	Cd, Cadmium	4080.729	5015.293	3.131e-2	65.2
49	In, Indium	1352.285	1398.016	8.726e-3	6.64
50	Sn, Tin	883.594	887.98	5.543e-3	2.62
51	Sb, Antimony	1160.517	1177.645	7.351e-3	5.31
52	Te, Tellurium	1901.247	2000.739	1.249e-2	11.7
53	I, Iodine	4769.509	5769.699	3.601e-2	8.14
56	Ba, Barium	2448.831	2592.878	1.618e-2	10.3
57	La, Lanthanum	327.488	327.488	2.044e-3	2.69
58	Ce, Cerium	319.062	319.062	1.992e-3	2.40
59	Pr, Praeseodymium	613.507	613.507	3.829e-3	5.26
60	Nd, Neodymium	817.309	817.309	5.102e-3	7.05
61	Pm, Promethium	1075.856	1075.856	6.715e-3	
62	Sm, Samarium	2186.025	2229.04	1.391e-2	21.6
63	Eu, Europium	2797.404	2900.183	1.81e-2	13.7
64	Gd, Gadolinium	2029.667	2049.055	1.279e-2	17.8
65	Tb, Terbium	960.587	960.587	5.996e-3	8.56
66	Dy, Dysprosium	977.966	977.966	6.104e-3	8.76
67	Ho, Holmium	839.512	839.512	5.24e-3	7.56
68	Er, Erbium	801.942	801.942	5.006e-3	7.31
69	Tm, Thullium	1741.818	1741.822	1.087e-2	16.0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 7
CROSS-SECTIONS AT 300kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
70	Yb, Ytterbium	4182.793	4380.27	2.734e-2	29.1
71	Lu, Lutetium	785.415	785.415	4.903e-3	7.36
72	Hf, Hafnium	0	0	0e+0	0
73	Ta, Tantalum	0	0	0e+0	0
74	W, Tungsten	0	0	0e+0	0
75	Re, Rhenium	0	0	0e+0	0
76	Os, Osmium	0	0	0e+0	0
77	Ir, Iridium	0	0	0e+0	0
78	Pt, Platinum	0	0	0e+0	0
79	Au, Gold	272.388	272.388	1.7e-3	3.27
81	Tl, Thallium	3718.265	3729.214	2.328e-2	36.0
82	Pb, Lead	3293.473	3293.801	2.056e-2	26.9
83	Bi, Bismuth	2873.942	2873.942	1.794e-2	13.6
84	Po, Polonium	6501.538	6716.217	4.192e-2	8.46
85	At, Astatine	11979.838	13711.191	8.558e-2	
88	Ra, Radium	5208.315	5230.832	3.265e-2	31.4
89	Ac, Actinium	0	0	0e+0	
90	Th, Thorium	0	0	0e+0	0
91	Pa, Protactinium	0	0	0e+0	0
92	U, Uranium	0	0	0e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 8
CROSS-SECTIONS AT 350kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	161.702	352.241	2.199e-3	2.89
4	Be, Beryllium	104.697	185.79	1.160e-3	4.09
5	B, Boron	69.868	103.832	6.481e-4	0.136
6	C, Carbon	69.77	96.255	6.008e-4	1.69
11	Na, Sodium	969.177	1794.618	1.120e-2	10.0
12	Mg, Magnesium	786.394	1341.214	8.372e-3	15.0
13	Al, Aluminum	327.847	449.35	2.805e-3	5.48
14	Si, Silicon	246.251	310.198	1.936e-3	2.10
15	P, Phosphorus	371.035	491.466	3.068e-3	3.39
16	S, Sulfur	508.082	697.518	4.354e-3	8.02
19	K, Potassium	2079.426	3585.792	2.238e-2	13.1
20	Ca, Calcium	1050.95	1524.132	9.514e-3	9.78
21	Sc, Scandium	395.488	465.833	2.908e-3	4.89
22	Ti, Titanium	292.734	324.687	2.027e-3	4.32
23	V, Vanadium	253.72	273.07	1.704e-3	3.00
24	Cr, Chromium	403.11	455.183	2.841e-3	5.51
25	Mn, Manganese	653.141	785.312	4.902e-3	14.4
26	Fe, Iron	403.386	444.415	2.774e-3	5.38
27	Co, Cobalt	385.721	418.03	2.609e-3	7.65
28	Ni, Nickel	418.581	453.588	2.831e-3	7.30
29	Cu, Copper	582.267	652.164	4.071e-3	10.0
30	Zn, Zinc	2076.562	2903.873	1.813e-2	47.3
31	Ga, Gallium	803.048	922.715	5.760e-3	4.53
32	Ge, Germanium	507.4	542.426	3.386e-3	3.38
33	As, Arsenic	722.926	800.582	4.997e-3	3.31
34	Se, Selenium	1090.211	1272.135	7.941e-3	7.72
37	Rb, Rubidium	4156.813	6160.079	3.845e-2	19.7
38	Sr, Strontium	1896.425	2336.313	1.458e-2	12.6

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 8
CROSS-SECTIONS AT 350kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield ×10 ⁻⁷
39	Y, Yttrium	456.861	464.732	2.901e-3	4.03
40	Zr, Zirconium	197.841	197.841	1.235e-3	2.20
41	Nb, Niobium	113.875	113.875	7.108e-4	1.05
42	Mo, Molybdenum	151.477	151.477	9.455e-4	1.53
44	Ru, Ruthenium	147.764	147.764	9.223e-4	2.33
45	Rh, Rhodium	246.398	246.398	1.538e-3	3.40
46	Pd, Palladium	622.823	629.72	3.931e-3	8.31
47	Ag, Silver	1077.731	1128.946	7.047e-3	13.5
48	Cd, Cadmium	3944.528	5069.468	3.164e-2	65.9
49	In, Indium	1408.049	1500.404	9.365e-3	7.13
50	Sn, Tin	968.312	991.384	6.188e-3	2.92
51	Sb, Antimony	1239.57	1289.074	8.046e-3	5.81
52	Te, Tellurium	1946.068	2118.985	1.323e-2	12.4
53	I, Iodine	4617.922	5845.636	3.649e-2	8.24
56	Ba, Barium	2491.175	2733.479	1.706e-2	10.9
57	La, Lanthanum	465.082	465.082	2.903e-3	3.82
58	Ce, Cerium	463.246	463.246	2.892e-3	3.48
59	Pr, Praseodymium	768.759	768.759	4.799e-3	6.59
60	Nd, Neodymium	978.146	979.493	6.114e-3	8.44
61	Pm, Promethium	1238.676	1246.448	7.780e-3	
62	Sm, Samarium	2303.366	2413.972	1.507e-2	23.4
63	Eu, Europium	2885.798	3090.867	1.929e-2	14.6
64	Gd, Gadolinium	2178.309	2249.81	1.404e-2	19.6
65	Tb, Terbium	1166.633	1167.111	7.285e-3	10.4
66	Dy, Dysprosium	1194.507	1194.756	7.458e-3	10.7
67	Ho, Holmium	1069.369	1069.369	6.675e-3	9.64
68	Er, Erbium	1043.508	1043.508	6.514e-3	9.51
69	Tm, Thullium	1967.138	1985.874	1.240e-2	18.3

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 8
CROSS-SECTIONS AT 350kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
70	Yb, Ytterbium	4257.109	4621.724	2.885e-2	30.7
71	Lu, Lutetium	1063.875	1063.875	6.641e-3	9.97
72	Hf, Hafnium	0	0	0.000e+0	0
73	Ta, Tantalum	0	0	0.000e+0	0
74	W, Tungsten	0	0	0.000e+0	0
75	Re, Rhenium	0	0	0.000e+0	0
76	Os, Osmium	0	0	0.000e+0	0
77	Ir, Iridium	0	0	0.000e+0	0
78	Pt, Platinum	0	0	0.000e+0	0
79	Au, Gold	646.209	646.209	4.034e-3	7.75
81	Tl, Thallium	4020.909	4108.529	2.565e-2	39.6
82	Pb, Lead	3649.903	3693.062	2.305e-2	30.1
83	Bi, Bismuth	3282.122	3297.453	2.058e-2	15.7
84	Po, Polonium	6621.396	7088.213	4.424e-2	8.93
85	At, Astatine	11556.299	13943.246	8.703e-2	
88	Ra, Radium	5550.824	5694.655	3.555e-2	34.2
89	Ac, Actinium	338.983	338.983	2.116e-3	
90	Th, Thorium	0	0	0.000e+0	0
91	Pa, Protactinium	0	0	0.000e+0	0
92	U, Uranium	0	0	0.000e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 9
CROSS-SECTIONS AT 400kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	153.454	343.483	2.144e-3	2.82
4	Be, Beryllium	99.891	182.802	1.141e-3	4.02
5	B, Boron	67.281	103.357	6.452e-4	0.135
6	C, Carbon	67.606	96.475	6.022e-4	1.70
11	Na, Sodium	922.755	1762.914	1.100e-2	9.85
12	Mg, Magnesium	750.988	1323.327	8.260e-3	14.8
13	Al, Aluminum	317.79	450.947	2.815e-3	5.50
14	Si, Silicon	241.245	314.589	1.964e-3	2.13
15	P, Phosphorus	360.983	495.169	3.091e-3	3.42
16	S, Sulfur	492.301	700.013	4.369e-3	8.05
19	K, Potassium	1983.219	3537.215	2.208e-2	12.9
20	Ca, Calcium	1012.707	1521.863	9.499e-3	9.77
21	Sc, Scandium	392.283	478.143	2.985e-3	5.02
22	Ti, Titanium	295.495	338.381	2.112e-3	4.50
23	V, Vanadium	259.457	287.713	1.796e-3	3.16
24	Cr, Chromium	404.39	471.944	2.946e-3	5.71
25	Mn, Manganese	644.714	802.929	5.012e-3	14.8
26	Fe, Iron	408.178	464.227	2.898e-3	5.62
27	Co, Cobalt	393.067	439.268	2.742e-3	8.04
28	Ni, Nickel	426.551	476.659	2.975e-3	7.67
29	Cu, Copper	585.449	677.75	4.230e-3	10.4
30	Zn, Zinc	2004.543	2910.041	1.816e-2	47.4
31	Ga, Gallium	800.825	952.42	5.945e-3	4.68
32	Ge, Germanium	520.517	573.265	3.578e-3	3.58
33	As, Arsenic	729.514	834.768	5.211e-3	3.45
34	Se, Selenium	1082.18	1308.31	8.166e-3	7.94
37	Rb, Rubidium	3986.865	6141.655	3.834e-2	19.7
38	Sr, Strontium	1859.046	2378.056	1.484e-2	12.9

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 9
CROSS-SECTIONS AT 400kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
39	Y, Yttrium	489.826	508.904	3.177e-3	4.41
40	Zr, Zirconium	236.709	236.912	1.479e-3	2.63
41	Nb, Niobium	152.935	152.935	9.546e-4	1.40
42	Mo, Molybdenum	194.255	194.255	1.213e-3	1.96
44	Ru, Ruthenium	195.406	195.406	1.220e-3	3.09
45	Rh, Rhodium	299.219	299.279	1.868e-3	4.13
46	Pd, Palladium	674.536	695.034	4.338e-3	9.17
47	Ag, Silver	1117.199	1203.881	7.515e-3	14.4
48	Cd, Cadmium	3830.059	5125.425	3.199e-2	66.6
49	In, Indium	1441.874	1584.715	9.892e-3	7.53
50	Sn, Tin	1025.846	1075.431	6.713e-3	3.17
51	Sb, Antimony	1291.042	1379.858	8.613e-3	6.22
52	Te, Tellurium	1968.376	2216.686	1.384e-2	12.9
53	I, Iodine	4486.99	5919.351	3.695e-2	8.35
56	Ba, Barium	2507.278	2849.207	1.778e-2	11.3
57	La, Lanthanum	567.675	567.704	3.544e-3	4.66
58	Ce, Cerium	571.071	571.071	3.565e-3	4.29
59	Pr, Praseodymium	880.386	885.698	5.528e-3	7.59
60	Nd, Neodymium	1091.336	1105.654	6.901e-3	9.53
61	Pm, Promethium	1350.35	1381.869	8.626e-3	
62	Sm, Samarium	2372.224	2562.027	1.599e-2	24.9
63	Eu, Europium	2929.015	3244.223	2.025e-2	15.3
64	Gd, Gadolinium	2269.985	2409.287	1.504e-2	21.0
65	Tb, Terbium	1310.787	1323.946	8.264e-3	11.8
66	Dy, Dysprosium	1345.997	1358.188	8.478e-3	12.2
67	Ho, Holmium	1232.608	1237.652	7.725e-3	11.2
68	Er, Erbium	1215.933	1218.978	7.609e-3	11.1
69	Tm, Thullium	2114.686	2176.797	1.359e-2	20.0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 9
CROSS-SECTIONS AT 400kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
70	Yb, Ytterbium	4274.55	4813.713	3.005e-2	32.0
71	Lu, Lutetium	1263.655	1264.539	7.893e-3	11.8
72	Hf, Hafnium	45.122	45.122	2.817e-4	0.510
73	Ta, Tantalum	0	0	0.000e+0	0
74	W, Tungsten	0	0	0.000e+0	0
75	Re, Rhenium	0	0	0.000e+0	0
76	Os, Osmium	0	0	0.000e+0	0
77	Ir, Iridium	0	0	0.000e+0	0
78	Pt, Platinum	64.243	64.243	4.010e-4	0.835
79	Au, Gold	932.552	932.552	5.821e-3	11.2
81	Tl, Thallium	4189.846	4395.884	2.744e-2	42.4
82	Pb, Lead	3860.783	3994.046	2.493e-2	32.6
83	Bi, Bismuth	3534.316	3612.456	2.255e-2	17.2
84	Po, Polonium	6626.908	7370.287	4.601e-2	9.29
85	At, Astatine	11140.551	14131.503	8.821e-2	
88	Ra, Radium	5715.164	6037.093	3.768e-2	36.2
89	Ac, Actinium	753.364	753.364	4.702e-3	
90	Th, Thorium	0	0	0.000e+0	0
91	Pa, Protactinium	210.047	210.047	1.311e-3	1.37
92	U, Uranium	0	0	0.000e+0	0

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 10
CROSS-SECTIONS AT 1000kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
3	Li, Lithium	121.356	331.867	2.072e-3	2.72
4	Be, Beryllium	81.216	186.499	1.164e-3	4.10
5	B, Boron	57.325	112.684	7.034e-4	0.148
6	C, Carbon	59.358	109.128	6.812e-4	1.92
11	Na, Sodium	739.27	1776.257	1.109e-2	9.93
12	Mg, Magnesium	610.315	1367.505	8.536e-3	15.3
13	Al, Aluminum	277.438	511.356	3.192e-3	6.24
14	Si, Silicon	221.066	376.189	2.348e-3	2.55
15	P, Phosphorus	319.944	572.432	3.573e-3	3.95
16	S, Sulfur	427.554	792.394	4.946e-3	9.11
19	K, Potassium	1593.484	3639.474	2.272e-2	13.3
20	Ca, Calcium	853.316	1673.331	1.044e-2	10.7
21	Sc, Scandium	376.011	602.566	3.761e-3	6.33
22	Ti, Titanium	304.296	456.26	2.848e-3	6.07
23	V, Vanadium	280.826	405.951	2.534e-3	4.47
24	Cr, Chromium	404.495	620.922	3.876e-3	7.51
25	Mn, Manganese	601.309	990.247	6.181e-3	18.2
26	Fe, Iron	421.309	629.637	3.930e-3	7.62
27	Co, Cobalt	416.373	610.245	3.809e-3	11.2
28	Ni, Nickel	450.92	661.601	4.130e-3	10.7
29	Cu, Copper	585.601	896.354	5.595e-3	13.8
30	Zn, Zinc	1682.883	3241.026	2.023e-2	52.8
31	Ga, Gallium	771.64	1220.129	7.616e-3	5.99
32	Ge, Germanium	559.733	810.587	5.060e-3	5.06
33	As, Arsenic	734.421	1115.162	6.961e-3	4.61
34	Se, Selenium	1017.275	1644.226	1.026e-2	9.98
37	Rb, Rubidium	3225.641	6634.472	4.141e-2	21.2
38	Sr, Strontium	1646.888	2840.683	1.773e-2	15.4

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 10
CROSS-SECTIONS AT 1000kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
39	Y, Yttrium	605.07	812.991	5.075e-3	7.05
40	Zr, Zirconium	399.285	487.547	3.043e-3	5.41
41	Nb, Niobium	330.3	386.083	2.410e-3	3.54
42	Mo, Molybdenum	381.453	452.59	2.825e-3	4.57
44	Ru, Ruthenium	405.679	477.306	2.979e-3	7.54
45	Rh, Rhodium	514.692	626.354	3.910e-3	8.64
46	Pd, Palladium	842.928	1125.745	7.027e-3	14.9
47	Ag, Silver	1201.33	1726.038	1.077e-2	20.7
48	Cd, Cadmium	3202.802	5883.943	3.673e-2	76.5
49	In, Indium	1475.317	2184.529	1.364e-2	10.4
50	Sn, Tin	1177.632	1630.771	1.018e-2	4.81
51	Sb, Antimony	1394.256	1992.808	1.244e-2	8.99
52	Te, Tellurium	1908.619	2931.192	1.830e-2	17.1
53	I, Iodine	3724.334	6814.915	4.254e-2	9.61
56	Ba, Barium	2359.621	3693.643	2.306e-2	14.7
57	La, Lanthanum	941.236	1155.925	7.215e-3	9.49
58	Ce, Cerium	964.269	1179.758	7.364e-3	8.86
59	Pr, Praeseodymium	1232.311	1579.209	9.857e-3	13.5
60	Nd, Neodymium	1414.448	1857.131	1.159e-2	16.0
61	Pm, Promethium	1627.914	2194.925	1.370e-2	
62	Sm, Samarium	2373.472	3518.753	2.196e-2	34.1
63	Eu, Europium	2776.807	4272.653	2.667e-2	20.1
64	Gd, Gadolinium	2344.278	3400.089	2.122e-2	29.6
65	Tb, Terbium	1692.748	2222.117	1.387e-2	19.8
66	Dy, Dysprosium	1743.463	2285.712	1.427e-2	20.5
67	Ho, Holmium	1687.616	2173.984	1.357e-2	19.6
68	Er, Erbium	1702.644	2178.865	1.360e-2	19.8
69	Tm, Thullium	2356.224	3270.982	2.042e-2	30.1

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 10
CROSS-SECTIONS AT 1000kV

Atomic Number	Element	Cross-Section (Barns/atom)	Cascade Cross-Section (Barns/atom)	Cascade Rate@1.0A/cm ² (Monolayers/sec)	Cascade* Yield x10 ⁻⁷
70	Yb, Ytterbium	3805.285	6090.763	3.802e-2	40.4
71	Lu, Lutetium	1823.619	2313.878	1.444e-2	21.7
72	Hf, Hafnium	793.874	847.263	5.289e-3	9.57
73	Ta, Tantalum	555.768	569.698	3.556e-3	5.20
74	W, Tungsten	484.162	490.735	3.063e-3	4.91
75	Re, Rhenium	590.887	604.441	3.773e-3	9.19
76	Os, Osmium	578.767	589.477	3.679e-3	9.08
77	Ir, Iridium	786.211	817.888	5.105e-3	11.1
78	Pt, Platinum	1041.712	1115.763	6.965e-3	14.5
79	Au, Gold	1863.581	2221.206	1.386e-2	26.7
81	Tl, Thallium	3990.481	5941.619	3.709e-2	57.3
82	Pb, Lead	3822.425	5555.806	3.468e-2	45.3
83	Bi, Bismuth	3660.239	5192.276	3.241e-2	24.7
84	Po, Polonium	5488.659	9041.817	5.644e-2	11.4
85	At, Astatine	8199.737	15827.896	9.880e-2	
88	Ra, Radium	5039.719	7789.136	4.862e-2	46.7
89	Ac, Actinium	2206.52	2531.554	1.580e-2	
90	Th, Thorium	1312.549	1363.034	8.508e-3	10.6
91	Pa, Protactinium	1876.8	2046.741	1.278e-2	13.3
92	U, Uranium	1563.668	1644.27	1.026e-2	11.3

* Cascade yields are calculated from cascade cross-sections using relation 50 of the text.
The surface number densities used are those listed in Table 11.

TABLE 11

ATOMIC NUMBER	ELEMENT	CRYSTAL	SURFACE NUM DENSITY $\times 10^{14}(\text{atom}/\text{cm}^2)$
3	Li, Lithium	BCC	8.21
4	Be, Beryllium	HCP	22.0
5	B, Boron	TET	1.31
6	C, Carbon (graphite)	HCP	17.6
11	Na, Sodium	BCC	5.59
12	Mg, Magnesium	HCP	11.2
13	Al, Aluminum	FCC	12.2
14	Si, Silicon	DIA	6.78
15	P, Phosphorus (black)	ORC	6.90
16	S, Sulfur	*	11.5
19	K, Potassium	BCC	3.66
20	Ca, Calcium	FCC	6.42
21	Sc, Scandium	HCP	10.5
22	Ti, Titanium	HCP	13.3
23	V, Vanadium	BCC	11.0
24	Cr, Chromium	BCC	12.1
25	Mn, Manganese	*	18.4
26	Fe, Iron	BCC	12.1
27	Co, Cobalt	HCP	18.3
28	Ni, Nickel	FCC	16.1
29	Cu, Copper	FCC	15.4
30	Zn, Zinc	HCP	16.3
31	Ga, Gallium	ORC	4.91
32	Ge, Germanium	DIA	6.24
33	As, Arsenic	RHL	4.13
34	Se, Selenium	HCP	6.07
37	Rb, Rubidium	BCC	3.20
38	Sr, Strontium	FCC	5.41
39	Y, Yttrium	HCP	8.67
40	Zr, Zirconium	HCP	11.1
41	Nb, Niobium	BCC	9.18
42	Mo, Molybdenum	BCC	10.1
44	Ru, Ruthenium	HCP	15.8
45	Rh, Rhodium	HCP	13.8
46	Pd, Palladium	FCC	13.2
47	Ag, Silver	FCC	12.0
48	Cd, Cadmium	HCP	13.0
49	In, Indium	TET	4.75
50	Sn, Tin	TET	2.95
51	Sb, Antimony	RHL	4.51
52	Te, Tellurium	HCP	5.83
53	I, Iodine	ORC	1.41
56	Ba, Barium	BCC	3.97
57	La, Lanthanum	HCP	8.21
58	Ce, Cerium	FCC	7.51
59	Pr, Praeseodymium	HCP	8.57
60	Nd, Neodymium	HCP	8.62
61	Pm, Promethium		

TABLE 11

ATOMIC NUMBER	ELEMENT	CRYSTAL	SURFACE NUM DENSITY $\times 10^{14}(\text{atom}/\text{cm}^2)$
62	Sm, Samarium	*	9.70
63	Eu, Europium	BCC	4.71
64	Gd, Gadolinium	HCP	8.71
65	Tb, Terbium	HCP	8.91
66	Dy, Dysprosium	HCP	8.96
67	Ho, Holmium	HCP	9.01
68	Er, Erbium	HCP	9.11
69	Tm, Thullium	HCP	9.21
70	Yb, Ytterbium	FCC	6.64
71	Lu, Lutetium	HCP	9.37
72	Hf, Hafnium	HCP	11.3
73	Ta, Tantalum	BCC	9.13
74	W, Tungsten	BCC	10.0
75	Re, Rhenium	HCP	15.2
76	Os, Osmium	HCP	15.4
77	Ir, Iridium	FCC	13.6
78	Pt, Platinum	FCC	13.0
79	Au, Gold	FCC	12.0
81	Tl, Thallium	HCP	9.65
82	Pb, Lead	FCC	8.16
83	Bi, Bismuth	RHL	4.75
84	Po, Polonium	SC	1.26
85	At, Astatine		
88	Ra, Radium	*	6
89	Ac, Actinium		
90	Th, Thorium	FCC	7.75
91	Pa, Protactinium	TET	6.51
92	U, Uranium	ORC	6.90

Surface densities are appropriate to the {001} face of the crystal. Real crystal surfaces are, of course, very complicated. Careful work should take into consideration the actual surface.

* For crystals with complicated unit cells approximate surface densities are derived from the density, ρ , and atomic mass without regard to crystal structure using the relation:

$$[(\rho/W) \cdot (N_0) \cdot (\text{units conversion})]^{2/3} = \left[(\rho/W) \times (6.02257 \times 10^{23}) \right]^{2/3} \text{ atom/nm}^2$$

where W = atomic weight in AMU, N_0 = Avagadro's Number and ρ = the density. These results should be of the correct order of magnitude and a satisfactory approximation for polycrystalline and amorphous samples.

TABLE 12
CONSTANTS AND CONVERSION FACTORS[46]

<u>Constant</u>	<u>Description</u>	<u>Value</u>
$r_{cl} = e^2/mc^2$	classical radius of the electron	$2.81785 \times 10^{13} \text{ cm}$
e	electron charge	$1.60206 \times 10^{-19} \text{ C}$
c	speed of light	$2.997930 \times 10^{10} \text{ cm/sec}$
$\hbar$	Plank's Constant	$6.5817 \times 10^{-16} \text{ eV sec}$
amu	atomic mass unit	931141 keV
m_0c^2	electron mass	510.976 keV
$fsc = \alpha = e^2/\hbar c$	fine structure constant	$1/137.0373$
N_0	Avagadro's Number	$6.02486 \times 10^{23} \text{ (gram mole)}^{-1}$
barn		10^{-24} cm^2 10^{-10} nm^2
C	Coulomb	$6.24196 \times 10^{18} \text{ electrons}$
A/cm^2		$6.24196 \times 10^{-6} \text{ e-/sec/barn}$
J/mole		$1.036 \times 10^{-5} \text{ eV/molecule}$
Kcal/mole		$4.3363 \times 10^{-2} \text{ eV/molecule}$

PROGRAMS

Documentation for program TOTCS.FOR

Title	:TOTCS
Keywords	:Sputtering,Defects,Displacement :Damage, EELS, XEDS, HVEM
Computer	:DEC VAX 11/785
Operating System	:VAX/VMS
Programming Language	:VAX Fortran V4.0
Hardware Requirements	:None
Author(s)	:Charles R. Bradley
Correspondence Address	:Argonne Nat. Lab, Electron Microscopy Center, Bldg 212 :Materials Science Division, Argonne, Illinois 60439, USA

Description:

Version:
2.0

Purpose:

Compute the total Mott cross-section for a range of accelerating voltages running up to 1500KV. The calculation method of Doggett and Spencer is used and results agree with O. S. Oen's implementation of that calculation to within 0.5%. The program requires as input Z - the atomic number, A - the atomic mass, and Ed the assumed displacement energy. Preliminary results of this study are to be published in:

Proceedings of the Workshop on Analytical Electron Microscopy
San Francisco Press, Fall 1987

References:

McKinley & Feshbach
Phys Rev **74**,1759(1948)

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Phys Rev **88**,295(1952)

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O. S. Oen
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IN SOLIDS BY FAST ELECTRONS
ORNL Report # TM-4897,(1973)

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NUMERICAL ANALYSIS

Schaum's Outline Series
McGraw Hill Book Co. 1968

Abromowitz and Stegun
HANDBOOK OF MATHEMATICAL FUNCTIONS
Dover, New York 1972

James W. Corbett
ELECTRON RADIATION DAMAGE IN SEMICONDUCTORS AND METALS
in: Solid State Physics Advances in Research and Applications
Supplement 7, Ed. Frederick Seitz and David Turnbull
Academic Press, New York 1966

Compilation Procedure:

Using VAX-Fortran compiler

1. Rename file to TOTCS.FOR
2. At DCL prompt type FORTRAN/EXTEND/NOF77 TOTCS

Linking Procedure:

At DCL prompt type LINK TOTCS

Input/Output:

UNIT 1	input	(to be assigned)
UNIT 2	output	(to be assigned)

Test Data:

This routine is designed to read input from a data file
with the format (3F10.3).

Input file format:

Z,A,Es
(EOF)

where; Z = atomic number
 A = atomic mass(amu)
 Es = Displacement/sputtering energy(eV). The energy
 required to produce the defect or sputter an atom from the
 surface. The atom is bound by an isotropic square well of
 depth Es.

example:

13.000,26.980,3.420
(EOF)

General Comments:

To run the program it is convenient to create a DCL command file
which assigns fortran device 1 to the input file and device 2 to an output
file.

```
$ASSIGN filename.INP FOR001
$ASSIGN filename.OUT FOR002
$RUN TOTCS
```

Since the program takes a substantial amount of CPU time to run, it is usually submitted to a batch queue. This can be done in VAX/VMS by typing:

```
submit/noprint/notify <fn>
```

where <fn> is the above command file's name.

VAX/VMS CPU time is approximately 30 seconds for each point calculated. The number of points varies since the threshold is a function of the atomic mass, and Z. For the example here 1 hr 35 min 56.61 sec of CPU time was used.

Subroutines and function subprograms required are included in the listing. Among those included are:

- D** which returns coefficients in the legendre expansions which express the cross-section.
- EULER** which preforms an euler transformation of an alternating series and returns the sum of the series.
- LGDR** which returns legendre polynomials.
- LNGAM** which returns the complex value of the log of a gamma function with complex arguments
- SIGMR** which returns the ratio of the Mott cross-section to the Rutherford Cross-section.
- QATRGL** a 16-point Gauss-Legendre numerical quadrature routine

Sample Output:

The following is output generated by the above sample input which corresponds to Al with an assumed $E_s=3.420$ eV.

```
Atomic number of target =    13.  
Atomic mass of target   =   26.980  
Sputtering Energy      =    3.420  
Threshold Energy (KeV) =   40.436
```

Accelerating Voltage(KV)	Cross-Section (Barns/atom)	Cascade CS (Barns/atom)
40.436	0.000	0.000
41.000	22.380	22.380
42.000	59.264	59.264
43.000	92.871	92.871
44.000	123.530	123.530
45.000	151.533	151.533
46.000	177.140	177.140
47.000	200.578	200.578
48.000	222.052	222.052
49.000	241.743	241.743
50.000	259.813	259.813
55.000	330.434	330.434
60.000	377.058	377.058
65.000	407.918	407.918
70.000	428.164	428.164

75.000	441.128	441.128
80.000	449.016	449.143
85.000	453.328	454.798
90.000	455.099	458.956
95.000	455.058	461.966
100.000	453.724	464.089
110.000	448.570	466.425
120.000	441.574	467.070
130.000	433.788	466.693
140.000	425.790	465.713
150.000	417.901	464.395
160.000	410.290	462.909
170.000	403.045	461.366
180.000	396.203	459.837
190.000	389.773	458.368
200.000	383.746	456.988
210.000	378.107	455.714
220.000	372.833	454.556
230.000	367.901	453.517
240.000	363.288	452.599
250.000	358.970	451.799
260.000	354.926	451.114
270.000	351.133	450.541
280.000	347.573	450.074
290.000	344.228	449.708
300.000	341.082	449.438
310.000	338.120	449.259
320.000	335.327	449.165
330.000	332.692	449.152
340.000	330.202	449.215
350.000	327.847	449.350
360.000	325.618	449.551
370.000	323.505	449.815
380.000	321.501	450.138
390.000	319.598	450.517
400.000	317.790	450.947
450.000	309.961	453.772
500.000	303.738	457.487
550.000	298.703	461.847
600.000	294.563	466.672
650.000	291.114	471.828
700.000	288.205	477.219
750.000	285.726	482.769
800.000	283.592	488.422
850.000	281.742	494.137
900.000	280.124	499.880
950.000	278.700	505.626
1000.000	277.438	511.356
1050.000	276.314	517.054
1100.000	275.307	522.709
1150.000	274.401	528.313
1200.000	273.580	533.857
1250.000	272.836	539.338
1300.000	272.156	544.751

1350.000	271.534	550.095
1400.000	270.963	555.366
1450.000	270.437	560.565
1500.000	269.951	565.691

Source code for TOTCS.FOR

Title :TOTCS
Keywords :Sputtering, Defects, Displacement
Damage, EELS, XEDS, HVEM
Computer :DEC VAX 11/785
Operating System :VAX/VMS
Programming Language :VAX Fortran
Hardware Requirements :None
Author(s) :Charles R. Bradley
Correspondence Address :Argonne Nat. Lab, Electron Microscopy
Center, Bldg 212, Materials Science
Division, Argonne, Illinois 60439, USA

Code:

```
* .....
*
* PROGRAM TOTCS
*
*      Version          Date          Initials      Reason
*-----
*      1.0              6/25/87        CRB           Creation
*      1.1              7/21/87        CRB           Modify AV selected
*      2.0              8/31/87        CRB           Add Kinchin and Pease
*                                     cascade
*
* Purpose
*      Compute the total mott cross-section
*      for a range of accelerating voltages
*      running up to AVmax set here to 1500KV
*
* Subroutines and function subprograms required
*      are included in this listing
*
* REFERENCES:
*      McKinley & Feshbach
*      Phys Rev 74,1759(1948)
*
*      Feshbach
*      Phys Rev 88,295(1952)
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*      Doggett & Spencer
*      Phys Rev 103,1597(1956)
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*      O. S. Oen
*      CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS
*      IN SOLIDS BY FAST ELECTRONS
*      ORNL Report # TM-4897,(1973)
*
*      G. H. Kinchin & R. S. Pease
*      Repts. Progr. Phys. 18,1 (1955)
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*      T. J. I'A Bromwich
*      AN INTRODUCTION TO THE THEORY OF
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*      NUMERICAL ANALYSIS
*      Schaum's Outline Series
*      McGraw Hill Book Co. 1968
*
*      ABROMOWITZ AND STEGUN
*      HANDBOOK OF MATHEMATICAL FUNCTIONS
*      DOVER, NEW YORK 1972
*
*
* .....

```

```

program totcs

```

```

COMMON Z,AV,A,Ed
COMMON /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
COMMON /REPEAT/AVold

```

```

integer*2 ke      ! utility counter

```

```

real*8 fun ! function to integrate
real*8 fcn ! another function to integrate
real*8 twoEd      ! integration limit
real*8 minusz
real*8 xl      ! lower limit
real*8 xu      ! upper limit
real*8 y      ! integral approximation
real*8 halfxl
real*8 zero
real*8 xulog
real*8 intgl ! integral approximation
real*8 intgl2      ! integral approximation
real*8 rth ! Rutherford C-S
real*8 CS ! cross-section in barns (E-24 cm**2)
real*8 CASCs      ! apparent cross-section in barns (E-24 cm**2)
! after cascade
real*16 Z ! atomic number of target
real*16 AV ! accelerating voltage
real*16 AVmax ! max accelerating voltage
real*16 Th ! threshold incident KE that delivers Ed
real*16 AVbase ! accelerating voltage base
real*16 AVb2 ! accelerating voltage base
real*16 AVb3 ! accelerating voltage base
real*16 AVb4 ! accelerating voltage base
real*16 AVb5 ! accelerating voltage base
real*16 Ed ! Displacement or sputtering energy
real*16 A ! Atomic mass of sputter target
real*16 Em ! Maximum energy transfered
real*16 beta ! Relativistic beta
real*16 alpha ! Z*fine structure constant

```

```

*      declaration for common block REPEAT

```

```

real*16 AVold      ! repeated calculation at the same energy?

*
declarations for common block const - constants
real*16 elmass      ! rest mass of electron (KeV)
real*16 amu ! atomic mass unit (KeV)
real*16 evpKeV      ! ev/KeV conversion
real*16 fsc ! fine structure constant
real*16 CLrad        ! classical radius of the electron
                    ! in E-12 cm -- e**2/mc**2
real*16 hbar         ! h bar quantum mechanical const.(eV s)
real*16 c            ! speed of light(cm/s)
real*16 pi           ! constant
real*16 one          ! constant

external qatrgl      ! integration routine
external fun         ! integrand
external fcn         ! integrand

*-----INPUT Z,A,Ed ---- from DEVICE 1 -----
*      Z = atomic number
*      A = atomic mass
*      Ed = sputtering or displacement energy (ev)

      read(1,20) Z,A,Ed
20      format(3F10.3)

*-----OUTPUT TO DEVICE 2 -----
      write(2,40) Z
40      format(' ','Atomic number of target =',F10.0)
      write(2,50) A
50      format(' ','Atomic mass of target =',F10.3)
      write(2,60) Ed
60      format(' ','Sputtering Energy =',F10.3)

*-----INITIALIZE CONSTANTS IN COMMON-----
      AVold = -1.0      ! new calc

      elmass = 510.976  ! rest mass of electron (KeV)
      amu = 931141.      ! atomic mass unit (KeV)
      evpKeV = 10**3     ! ev/KeV conversion
      fsc = 1./137.0370  ! fine structure constant
      CLrad = 0.281785   ! classical radius of the electron
                    ! in E-12 cm -- e**2/mc**2
      hbar = 6.5817E-16  ! h bar (eV s)
      c = 2.997930E10    ! speed of light (cm/s)
      one = 1.0
      PI = 4. * qatan(one) ! calculate pi for latter use

      alpha = Z * fsc

      Th = -1.*elmass + qsqrt(elmass**2 + A*amu*Ed/(2.*evpKeV))
*      type*,'th =',Th
      write(2,70) Th
70      format(' ','Threshold Energy (KeV) =',F10.3)

```

```

write(2,80)
80  format(' ',' ')
write(2,85)
85  format(' ','Accelerating   Cross-Section   Cascade CS')
write(2,90)
90  format(' ','Voltage(KV)   (Barns/atom)   (Barns/atom)')
write(2,80)

AVbase = qfloat(int(Th)+1)
AVb2 = 10.*qfloat(int(AVbase/10.)+1)
AVb3 = 20.*qfloat(int(AVb2/20.)+3)
AVb4 = 50.*qfloat(int(AVb3/50.)+4)
AVb5 = 100.*qfloat(int(AVb4/100.)+1)

ke = 0
AVmax = 1500.0

do 2000 while (AV.lt.AVmax)      ! carry calculation to 1500.0 kV
if(ke.eq.0) then
  AV = Th                        ! energy in KeV
  ke = ke + 1
else if(ke.eq.1)then
  AV = AVbase
  ke = ke + 1
  if (AV.gt.AVb5) then
    AV = 50.*qfloat(int(AV/50.)+1)
  else
    endif
else if(AV.ge.AVb5.and.AV.le.AVmax) then
  AV = AV + 50.0
else if(AV.ge.AVb3) then
  AV = AV + 10.0
else if(AV.ge.AVb2.and.AV.lt.AVb3) then
  AV = AV + 5.0
else if(AV.ge.AVbase.and.AV.lt.AVb2) then
  AV = AV + 1.0
endif

beta = sqrt(1. - 1./(1.+ AV/elmass)**2)
Em = (2./amu)*evpKeV * AV * (AV + 2.*elmass)/A      ! threshold

xl = Em/Ed      ! Integration limits
twoEd = 2.*Ed
halfxl = 0.5*xl
xu = 1.0
zero = 0.0
xulog = dlog(halfxl)
Rth = pi*(Z*Clrad)**2*(1.-beta**2)/beta**4

IF(Em.le.Ed) then
  CASCS = 0.0      ! cross-section is zero if max energy
  cs = 0.0         ! transfer <= the sputtering energy
else
  call qatrgl(xu,xl,fun,intgl)

```

```

    cs = intgl * Rth
endif

if(Em.gt.Ed.and.Em.le.twoEd) then
    cascs = cs                ! no cascade

else if(Em.gt.twoEd) then
    call qatrgl(halfxl,xl,fun,intgl)
    call qatrgl(zero,xulog,fcn,intgl2)
    intgl = intgl + 0.5*xl*intgl2
    cascs = intgl*Rth
endif

    write(2,95) AV , cs, CASCs
95    format(' ',F10.3,2(' ',F10.3))
2000 continue

3000 continue
    call exit
end

```

Documentation for program dMOTTcs.for

Title :dMOTTcs
Keywords :Sputtering,Defects,Displacement
Damage, EELS, XEDS, HVEM
Computer :DEC VAX 11/785
Operating System :VAX/VMS
Programming Language :VAX Fortran V4.0
Hardware Requirements :None
Author(s) :Charles R. Bradley
Correspondence Address :Argonne Nat. Lab, Electron Microscopy
Center, Bldg 212 Materials Science Division, Argonne,
Illinois 60439, USA
Description of the code. :Outline/Description and the purpose
Version:
1.0

Purpose: This program calculates differential Mott cross-sections of elemental nuclei in collisions with relativistic electrons. These cross-sections are useful in the study of displacement damage and electron transmission sputtering. For medium and high voltage transmission electron microscopes now available, having clean vacuum systems and high brightness sources, modification of sample composition due to sputtering and/or displacement by the probe will become an important consideration during microanalysis or imaging.

References:

McKinley & Feshbach
Phys Rev 74,1759(1948)

Feshbach
Phys Rev 88,295(1952)

Doggett & Spencer
Phys Rev 103,1597(1956)

O. S. Oen
CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS IN SOLIDS
BY FAST ELECTRONS
ORNL Report # TM-4897,(1973)

T. J. I'A Bromwich
AN INTRODUCTION TO THE THEORY OF
INFINITE SERIES, 2nd ed.
Macmillan 1955

Francis Scheid
NUMERICAL ANALYSIS
Schaum's Outline Series
McGraw Hill Book Co. 1968

Abromowitz and Stegun

HANDBOOK OF MATHEMATICAL FUNCTIONS
Dover, New York 1972

James W. Corbett
ELECTRON RADIATION DAMAGE IN SEMICONDUCTORS AND METALS
in: Solid State Physics Advances in Research and Applications
Supplement 7, Ed. Frederick Seitz and David Turnbull Academic Press,
New York 1966

Compilation Procedure:

Using VAX-Fortran compiler .
1. Rename file to dMOTTcs.FOR
2. At DCL prompt type FORTRAN/EXTEND/NOF77 dMOTTcs

Linking Procedure:

At DCL prompt type LINK dMOTTcs

Input/Output:

UNIT 5	input TT:	
UNIT 7	output	TT:
UNIT 2	output	(to be assigned)

Test Data:

This routine is designed to read input from the keyboard

General Comments:

Subroutines and function subprograms required are included in the listing. Among those included are:

- D which returns coefficients in the legendre expansions which express the cross-section.
- EULER which preforms an euler transformation of an alternating series and returns the sum of the series.
- LGDRE which returns legendre polynomials.
- LNGAM which returns the complex value of the log of a gamma function with complex arguments
- SIGMR which returns the ratio of the Mott cross-section to the Rutherford Cross-section.

Sample run:

```
prompt>assign test.out for002
%DCL-I-SUPERSEDE, previous value of FOR002 has been superseded
prompt>run dmottcs
Atomic Number of target: 13.
Accelerating Voltage (kV): 100.
```

One or two minutes will be required before the prompt is displayed again. Output is directed to the file named TEST.OUT

Sample Output:

The following is output generated by the above sample input which corresponds to Al

```
Atomic number of target =    13.
Accelerating Voltage(kV) =  100.000
```

Angle	Ratio = $\frac{\text{differential Mott CS}}{\text{diff Rutherford CS}}$
0.000	1.00000
5.000	1.00616
10.000	1.01151
15.000	1.01527
20.000	1.01742
25.000	1.01795
30.000	1.01680
35.000	1.01399
40.000	1.00958
45.000	1.00362
50.000	0.99619
55.000	0.98739
60.000	0.97732
65.000	0.96612
70.000	0.95389
75.000	0.94079
80.000	0.92694
85.000	0.91251
90.000	0.89763
95.000	0.88246
100.000	0.86716
105.000	0.85187
110.000	0.83675
115.000	0.82195
120.000	0.80759
125.000	0.79384
130.000	0.78080
135.000	0.76861
140.000	0.75738
145.000	0.74721
150.000	0.73820
155.000	0.73044
160.000	0.72398
165.000	0.71890
170.000	0.71524
175.000	0.71302
179.990	0.71228

Source code for dMOTTcs.FOR

Title :dMOTTcs
 Keywords :Sputtering,Defects,Displacement
 Damage,EELS,XEDS,HVEM
 Computer :DEC VAX 11/785
 Operating System :VAX/VMS
 Programming Language :VAX Fortran
 Hardware Requirements :None
 Author(s) :Charles R. Bradley
 Correspondence Address :Argonne Nat. Lab,
 :Electron Microscopy Center,Bldg 212
 :Materials Science Division, Argonne,
 Illinois 60439, USA

Code:

```
* .....
*
* PROGRAM dMOTTcs
*
* Version          Date          Initials      Reason
*-----
* 1.0              12/22/87      CRB            Creation by modification
*                                         of TOTCS version 2.0
*
* Purpose
* Compute the ratio of the differential Mott cross-section
* to the differential Rutherford cross-section
*
* Subroutines and function subprograms required
* are included in this listing
*
* I/O UNITS used;
* UNIT=2          (to be assigned)  output
* UNIT=5          TT:               input
* UNIT=7          TT:               output
*
* REFERENCES:
* McKinley & Feshbach
* Phys Rev 74,1759(1948)
*
* Feshbach
* Phys Rev 88,295(1952)
*
* Doggett & Spencer
* Phys Rev 103,1597(1956)
*
* O. S. Oen
* CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS
* IN SOLIDS BY FAST ELECTRONS
* ORNL Report # TM-4897,(1973)
*
* G. H. Kinchin & R. S. Pease
```



```

*-----INPUT Z,A,Ed ---- from DEVICE 1 -----
*      Z  = atomic number
*      A  = atomic mass
*      Ed = sputtering or displacement energy (ev)

      write(7,10)
10     format('$','Atomic Number of target: ')
      read(5,FMT=*) Z          ! input atomic number
      write(7,20)
20     format('$','Accelerating Voltage (kV): ')
      read(5,FMT=*) AV ! input accel. voltage

*-----OUTPUT TO DEVICE 2 -----
      write(2,40) Z
40     format(' ','Atomic number of target =',F10.0)
      write(2,50) AV
50     format(' ','Accelerating Voltage(kV)  =',F10.3)
      write(2,55)
55     format(' ',' ')
      write(2,60)
60     format(' ','          differential Mott CS')
      write(2,65)
65     format(' ','Angle          Ratio = -----')
      write(2,67)
67     format(' ','          diff Rutherford CS')

*-----INITIALIZE CONSTANTS IN COMMON-----
      AVold = -1.0          ! new calc

      elmass = 510.976      ! rest mass of electron (KeV)
      amu = 931141.         ! atomic mass unit (KeV)
      evpKeV = 10**3        ! ev/KeV conversion
      fsc = 1./137.0370      ! fine structure constant
      CLrad = 0.281785      ! classical radius of the electron
                          ! in E-12 cm -- e**2/mc**2
      hbar = 6.5817E-16     ! h bar (eV s)
      c = 2.997930E10       ! speed of light (cm/s)
      one = 1.0
      PI = 4. * qatan(one)   ! calculate pi for latter use

      alpha = Z * fsc

      write(2,80)
80     format(' ',' ')

      do 2000 i=0,180,5

      theta = float(i)
      beta = sqrt(1. - 1./(1.+ AV/elmass)**2)
      Rth = pi*(Z*CLrad)**2*(1.-beta**2)/beta**4 ! Rutherford CS

      call sigmr(Z,AV,theta,ratio)
      MottCS = Rth*ratio

```

```
      write(2,95) theta,ratio
95    format(' ',F10.3,' ',F10.5)

2000  continue

3000  continue
      call exit
      end
```

Documentation for Program RECOIL.FOR

Title :recoil
Keywords :Sputtering,Defects,Displacement Damage,EELS,XEDS,HVEM
Computer :DEC VAX 11/785
Operating System :VAX/VMS
Programming Language :VAX Fortran V4.0
Hardware Requirements :None
Author(s) :Charles R. Bradley
Correspondence Address :Argonne Nat. Lab, Electron Microscopy Center, Bldg 212
:Materials Science Division, Argonne, Illinois 60439, USA
Description :Outline/Description and the purpose of the code.

Version:
1.0

Purpose:

This program calculates differential Mott cross-sections of elemental nuclei in collisions with relativistic electrons. The cross-sections are output as functions of the nuclear recoil angle and are proportional to the probability that a nucleus will recoil in a given direction. These cross-sections are useful in the study of displacement damage and electron transmission sputtering. For medium and high voltage transmission electron microscopes now available, having clean vacuum systems and high brightness sources, modification of sample composition due to sputtering and/or displacement by the probe will become an important consideration during microanalysis or imaging.

References:

McKinley & Feshbach
Phys Rev 74,1759(1948)

Feshbach
Phys Rev 88,295(1952)

Doggett & Spencer
Phys Rev 103,1597(1956)

O. S. Oen
CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS
IN SOLIDS BY FAST ELECTRONS
ORNL Report # TM-4897,(1973)

T. J. I'A Bromwich
AN INTRODUCTION TO THE THEORY OF
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Francis Scheid
NUMERICAL ANALYSIS
Schaum's Outline Series
McGraw Hill Book Co. 1968

Abromowitz and Stegun

HANDBOOK OF MATHEMATICAL FUNCTIONS
Dover, New York 1972

James W. Corbett
ELECTRON RADIATION DAMAGE IN SEMICONDUCTORS AND METALS
in: Solid State Physics Advances in Research and Applications
Supplement 7, Ed. Frederick Seitz and David Turnbull
Academic Press, New York 1966

D. Cherns, F. J. Minter, and R. S. Nelson
Nuclear Instruments and Methods 132,369(1976)

Compilation Procedure:

Using VAX-Fortran compiler

1. Rename file to RECOIL.FOR
2. At DCL prompt type FORTRAN/EXTEND/NOF77 RECOIL

Linking Procedure:

At DCL prompt type LINK RECOIL

Input/Output:

UNIT 5	input TT:	
UNIT 7	output	TT:
UNIT 2	output	(to be assigned)

Test Data:

This routine is designed to read input from the keyboard

General Comments:

Subroutines and function subprograms required are included in the listing. Among those included are:

- D which returns coefficients in the legendre expansions which express the cross-section.
- EULER which preforms an euler transformation of an alternating series and returns the sum of the series.
- LGDRE which returns legendre polynomials.
- LNGAM which returns the complex value of the log of a gamma function with complex arguments
- SIGMR which returns the ratio of the Mott cross-section to the Rutherford Cross-section.

Sample run:

```
prompt>assign test.out for002
%DCL-I-SUPERSEDE, previous value of FOR002 has been superseded
prompt>run recoil
    Atomic Number of target:      79
    Atomic Mass of target: 196.967
Surface Binding Energy of target: 3.820
    Accelerating Voltage (kV):    400.
```

One or two minutes will be required before the prompt is displayed again. Output is directed to the file named TEST.OUT

Sample Output:

The following is output generated by the above sample input which corresponds to Au with the assumption that the surface binding energy is equal to the sublimation energy.

Atomic number of target = 79.
Atomic mass of target(amu) = 196.967
Surface Binding Energy(eV) = 3.820
Accelerating Voltage(kV) = 400.000
Maximum Recoil Angle = 38.300

Recoil Angle	Mott Cross-Section
-----------------	-----------------------

1.000	277.851
2.000	279.282
3.000	281.670
4.000	285.020
5.000	289.339
6.000	294.634
7.000	300.917
8.000	308.200
9.000	316.498
10.000	325.827
11.000	336.207
12.000	347.659
13.000	360.207
14.000	373.878
15.000	388.701
16.000	404.708
17.000	421.935
18.000	440.420
19.000	460.206
20.000	481.339
21.000	503.869
22.000	527.851
23.000	553.345
24.000	580.414
25.000	609.130
26.000	639.569
27.000	671.815
28.000	705.958
29.000	742.098
30.000	780.343
31.000	820.811
32.000	863.631
33.000	908.944
34.000	956.905
35.000	1007.686
36.000	1061.472
37.000	1118.471
38.000	1178.909
38.300	1197.719

Source Code for RECOIL.FOR

Title :recoil
 Keywords :Sputtering,Defects,Displacement
 Damage,EELS,XEDS,HVEM
 Computer :DEC VAX 11/785
 Operating System :VAX/VMS
 Programming Language :VAX Fortran
 Hardware Requirements :None
 Author(s) :Charles R. Bradley
 Correspondence Address :Argonne Nat. Lab, Electron Microscopy Center, Bldg 212
 :Materials Science Division, Argonne, Illinois 60439, USA

Code:

```
*
* .....
*
* PROGRAM recoil
*
* Version          Date          Initials      Reason
*-----
* 1.0              05/10/88      CRB           Creation by modification
*                                           of dMOTTcs version 1.0
*
* Purpose
*   Compute the differential Mott cross-section
*   as a function of the nuclear recoil angle
*
* Subroutines and function subprograms required
* are included in this listing
*
* I/O UNITS used;
* UNIT=2          (to be assigned)  output
* UNIT=5          TT:               input
* UNIT=7          TT:               output
*
* REFERENCES:
* McKinley & Feshbach
* Phys Rev 74,1759(1948)
*
* Feshbach
* Phys Rev 88,295(1952)
*
* Doggett & Spencer
* Phys Rev 103,1597(1956)
*
* O. S. Oen
* CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS
* IN SOLIDS BY FAST ELECTRONS
* ORNL Report # TM-4897,(1973)
*
* G. H. Kinchin & R. S. Pease
* Repts. Progr. Phys. 18,1 (1955)
*
* T. J. I'A Bromwich
* AN INTRODUCTION TO THE THEORY OF
```

```

* INFINITE SERIES, 2nd ed.
* Macmillan 1955
*
* Francis Scheid
* NUMERICAL ANALYSIS
* Schaum's Outline Series
* McGraw Hill Book Co. 1968
*
* ABROMOWITZ AND STEGUN
* HANDBOOK OF MATHEMATICAL FUNCTIONS
* DOVER, NEW YORK 1972
*
*

```

```

.....

program recoil

COMMON /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
COMMON /REPEAT/AVold

integer*2 ke      ! utility counter

real*8 zero
real*8 xulog
real*8 rth ! Rutherford C-S
real*8 Mottcs ! Mott Cross-Section
real*8 CS ! cross-section in barns (E-24 cm**2)
real*16 Z ! atomic number of target
real*16 AV ! accelerating voltage
real*16 Ts ! sputtering energy
real*16 Th ! threshold incident KE that delivers Ts
real*16 A ! Atomic mass of sputter target
real*16 Em ! Maximum energy transfered
real*16 beta ! Relativistic beta
real*16 alpha ! Z*fine structure constant
real*16 theta ! scattering angle
real*16 psi ! nuclear recoil angle
real*16 psilim ! Max nuclear recoil angle
real*16 ratio ! ratio of cross-sections
real*16 jacobi ! jacobian of transformation from theta to psi
real*16 util

* declaration for common block REPEAT
real*16 AVold ! repeated calculation at the same energy?

*
declarations for common block const - constants
real*16 elmass ! rest mass of electron (KeV)
real*16 amu ! atomic mass unit (KeV)
real*16 evpKeV ! ev/KeV conversion
real*16 fsc ! fine structure constant
real*16 CLrad ! classical radius of the electron
! in E-12 cm -- e**2/mc**2
real*16 hbar ! h bar quantum mechanical const.(eV s)
real*16 c ! speed of light(cm/s)
real*16 pi ! constant
real*16 one ! constant

```

```

*-----INITIALIZE CONSTANTS IN COMMON-----
      AVold = -1.0          ! new calc

      elmass = 510.976      ! rest mass of electron (KeV)
      amu = 931141.         ! atomic mass unit (KeV)
      evpKeV = 10**3        ! ev/KeV conversion
      fsc = 1./137.0370     ! fine structure constant
      CLrad = 0.281785      ! classical radius of the electron
                          ! in E-12 cm -- e**2/mc**2
      hbar = 6.5817E-16     ! h bar (eV s)
      c = 2.997930E10       ! speed of light (cm/s)
      one = 1.0
      PI = 4. * qatan(one)   ! calculate pi for latter use

*-----INPUT Z,A,Ed ---- from DEVICE 1 -----
*      Z = atomic number
*      A = atomic mass
*      Ts = sputtering or displacement energy (ev)

      write(7,10)
10      format('$,'          Atomic Number of target: ')
      read(5,FMT=*) Z        ! input atomic number
      write(7,11)
11      format('$,'          Atomic Mass of target: ')
      read(5,FMT=*) A        ! input atomic mass
      write(7,12)
12      format('$','Surface Binding Energy of target: ')
      read(5,FMT=*) Ts      ! input atomic number
      write(7,20)
20      format('$,'          Accelerating Voltage (kV): ')
      read(5,FMT=*) AV      ! input accel. voltage

*-----initial calc -----

      alpha = Z * fsc
      util = Ts*A*amu/(evpkev*2.*AV*(AV+2.*elmass))
      if(util.lt.1.)then
          psilim = qacosd(sqrt(Ts*A*amu/(evpkev*2.*AV*(AV+2.*elmass))))
      else
          endif

*-----OUTPUT TO DEVICE 2 -----
      write(2,40) Z
40      format(' ',          Atomic number of target = ',F10.0)
      write(2,41) A
41      format(' ',          Atomic mass of target(amu) = ',F10.3)
      write(2,42) Ts
42      format(' ',          Surface Binding Energy(eV) = ',F10.3)
      write(2,50) AV
50      format(' ',          Accelerating Voltage(kV) = ',F10.3)
      write(2,500) psilim
500     format(' ',          Maximum Recoil Angle = ',F10.3)
      if(util.gt.1.)then

```

```

        Th = -1.*elmass + qsqrt(elmass**2 + A*amu*Ts/(2.*evpKeV))
        write(2,510) Th
510    format(' ','Accelerating voltage is below the threshold of ',F10.3,'kV')
        goto 3000
    else
    endif

    write(2,55)
55    format(' ',' ')
    write(2,60)
60    format(' ','Recoil          Mott')
    write(2,65)
65    format(' ','Angle          Cross-Section')
    write(2,67)
67    format(' ','          ')

*-----

    write(2,80)
80    format(' ',' ')

    psi = 0.000
    psiinc = 1.000      ! increment in psi used for calculation of table values

    do 2000 while(psi.lt.psilim)
    psi = psi + psiinc
    if(psi.gt.psilim) then
        psi = psilim
    else
    endif

    theta = 2.0*qasind(qcosd(psi))
    beta = sqrt(1. - 1./(1.+ AV/elmass)**2)
c    Rth = (Z*Clrad)**2*(1.-beta**2)/(4.*(beta*qasind(theta/2.))**4) ! Rutherford CS
    Rth = (Z*Clrad)**2*(1.-beta**2)/(4.*(beta*qcosd(psi))**4)      ! Rutherford CS

    call sigmr(Z,AV,theta,ratio)
    psi = qacosd(qsind(theta/2.)) ! update psi since sigmr may modify
    jacobi = 4.0*qcosd(psi)
    MottCS = Rth*ratio*jacobi

    write(2,95) psi,mottcs
95    format(' ',F10.3,'          ',F12.3)

2000 continue

3000 continue
    call exit
end

```

SUBROUTINES

```
*
* .....
*
* FUNCTION FCN
*
* PURPOSE
*   Compute one of the integrands required by
*   integration routine qatrgl
*
* USAGE
*   X = FCN(W)
*
* DESCRIPTION OF PARAMETERS
*   W      - Arguement of the integrand
*
* REMARKS
*   returns real*8 value
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*   SIGMR
*
* METHOD
*   Implements two simple variable changes as
*   suggested by O. S. OEN
*   ORNL REPORT # TM-4897,(1973)
*   and then calls subroutine sigmr
* .....
*
* function fcn(W)
*
* COMMON Z,AV,A,Ed
* COMMON /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
* COMMON /REPEAT/AVold
*
* real*8 fcn
* real*8 x
* real*8 W
*
* real*16 Z          ! atomic number of target
* real*16 AV          ! incident beam K.E.
* real*16 A           ! atomic mass
* real*16 Ed          ! sputtering energy
* real*16 theta       ! scattering angle
* real*16 ratio        ! ratio of Mott CS to Rutherford
*
* DECLARATIONS FOR COMMON BLOCK REPEAT
* real*16 AVold       ! repeated energy ?
*
* DECLARATIONS FOR COMMON BLOCK CONST - CONSTANTS
* real*16 elmass      ! rest mass of electron (KeV)
* real*16 amu         ! atomic mass unit (KeV)
```

```

real*16 evpKeV    ! ev/KeV conversion
real*16 fsc       ! fine structure constant
real*16 CLrad      ! classical radius of the electron
                  ! in E-12 cm -- e**2/mc**2
real*16 hbar       ! h bar quantum mechanical const.(eV s)
real*16 c          ! speed of light(cm/s)
real*16 pi         ! constant
real*16 one        ! constant

external sigmr     ! calc differential mott CS

*   Initialize values

x = 1.0/dexp(W)
theta = qextd(2.*dasind(dsqrt(x)))    ! chg variables again

call sigmr(Z,AV,theta,ratio)

fcn = ratio

return
end

```

```

*
* .....
*
* FUNCTION FUN
*
* PURPOSE
*     Compute the integrand required by
*     integration routine qatrgl
*
* USAGE
*     X = FUN(Y)
*
* DESCRIPTION OF PARAMETERS
*     Y      - Arguement of the integrand
*
* REMARKS
*     returns real*8 value
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*     SIGMR
*
* METHOD
*     Implements two simple variable changes as
*     suggested by O. S. OEN
*     ORNL REPORT # TM-4897,(1973)
*     and then calls subroutine sigmr
* .....
*
function  fun(y)

COMMON Z,AV,A,Ed
COMMON /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
COMMON /REPEAT/AVold

real*8  fun
real*8  x
real*8  y
real*16 Z      ! atomic number of target
real*16 AV     ! incident beam K.E.
real*16 A      ! atomic mass
real*16 Ed     ! sputtering energy
real*16 theta  ! scattering angle
real*16 ratio  ! ratio of Mott CS to Rutherford
*
DECLARATIONS FOR COMMON BLOCK REPEAT
real*16 AVold  ! repeated energy ?

*
DECLARATIONS FOR COMMON BLOCK CONST - CONSTANTS
real*16 elmass ! rest mass of electron (KeV)
real*16 amu    ! atomic mass unit (KeV)
real*16 evpKeV ! ev/KeV conversion
real*16 fsc    ! fine structure constant
real*16 CLrad  ! classical radius of the electron
                ! in E-12 cm -- e**2/mc**2
real*16 hbar   ! h bar quantum mechanical const.(eV s)

```

```

real*16 c      ! speed of light(cm/s)
real*16 pi     ! constant
real*16 one    ! constant

external  sigmr      ! calc differential mott CS

*
  Initialize  values
  x = 1./y                      ! chg variables
  theta = qextd(2.*dasind(dsqrt(x))) ! chg variables again

  call  sigmr(Z,AV,theta,ratio)
  fun = ratio

  return
end

```



```

*
* .....
*
* function D (k,Z,AV)
*
* PURPOSE
*     Calculate precursors of the coefficients
*     of the Mott cross-section
*
* USAGE
*     x = D(k,Z,AV)
*
* DESCRIPTION OF PARAMETERS
*     k - order of the coefficient
*     Z - Atomic number of sputter target
*     AV - KE of incident electrons
*
* REMARKS
*     real*16
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*     LNGAM - natural logarithm of complex gamma fcn
*
* METHOD
*     see -
*         McKinley & Feshbach
*         Phys Rev 74,1759(1948)
*
* .....
*
* function D(k,Z,AV)
*
* COMMON /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
*
* integer*2 k ! order of the coefficient
*
* real*16 Z ! Atomic number of sputter target
* real*16 q ! parameter
* real*16 AV ! KE of incident electrons
* real*16 alpha ! fine structure constant * Z
*
*
* DECLARATIONS FOR COMMON BLOCK CONST - CONSTANTS
* real*16 elmass ! rest mass of electron (KeV)
* real*16 amu ! atomic mass unit (KeV)
* real*16 evpKeV ! ev/KeV conversion
* real*16 fsc ! fine structure constant
* real*16 CLrad ! classical radius of the electron
* ! in E-12 cm -- e**2/mc**2
* real*16 hbar ! h bar quantum mechanical const.(eV s)
* real*16 c ! speed of light(cm/s)
* real*16 pi ! constant
* real*16 one ! constant
*
* real*16 beta ! relativistic beta
* real*16 zero ! constant

```

```

complex*16 D      ! coefficient
complex*16 rho    ! parameter
complex*16 ratioA,ratioB ! ratio of gamma functions in coef
complex*16 zz      ! utility variable
complex*16 Im      ! utility variable
complex*16 lngam ! logarithm of gamma function

EXTERNAL lngam      ! ln(gamma) function routine

*
  Initialize values
  alpha = Z * fsc
  zero = 0.0
  Im = dcplx(zero,one) ! imaginary unit
  beta = sqrt(1. - 1./(1.+ AV/elmass)**2)

  q = alpha / beta
  zz = qfloat(k)**2 - alpha**2 + zero*Im
  rho = cdsqrt(zz)

  zz = qfloat(k) - Im*q
  ratioA = lngam(zz) - lngam(dconjg(zz))
  ratioA = cdexp(ratioA)
  ratioA = ratioA/dconjg(zz)
  ratioA = ratioA * cdexp(-1.*pi*Im*k)

  zz = rho - Im*q
  ratioB = lngam(zz)
  zz = rho + Im*q
  ratioB = ratioB - lngam(zz)
  ratioB = cdexp(ratioB)
  ratioB = ratioB/zz
  ratioB = ratioB * cdexp (-1.*pi*rho*Im)

  D = ratioA - ratioB

  return
end

```

```

* SUBROUTINE EULER
*
* PURPOSE
*   Accelerate convergence of oscillating series y(i)
*   and return the sum of that series sumy
*
* USAGE
*   CALL EULER (Y,NTERMS,SUMY)
*
* DESCRIPTION OF PARAMETERS
*   y      -   input array - series to sum
*               sequence to sum, sequence has form:
*               y = y(1) - y(2) + y(3) - y(4) + ...
*   nterms -   number of terms in y
*   sumy   -   result
*
* REMARKS
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*
* METHOD
*   see T. J. I'A Bromwich
*   AN INTRODUCTION TO THE THEORY OF
*   INFINITE SERIES, 2nd ed.
*   Macmillan 1955
*   pg 63
*   and Francis Scheid
*   NUMERICAL ANALYSIS
*   Schaum's Outline Series
*   McGraw Hill Book Co. 1968
*   pg 24,39,75,160
*
* .....
*
*   subroutine  euler(y,nterms,sumy)
*
*   parameter (mxterm = 120)          ! max number of terms in y(i)
*
*   integer*2  maxdif                ! max number of finite differences
*   integer*2  nterms                ! number of terms to use in sums
*   integer*2  istart                ! start calculating differences at
*                                   ! this term in the series
*
*   real*16  cor                    ! correction to estimate of sumy
*   real*16  y(mxterm)              ! input array - series to sum
*   real*16  sumy                    ! estimated sum
*   real*16  B(mxterm,0:mxterm)     ! binomial coefficient
*   real*16  sigma                  ! utility sum
*   real*16  delta(0:mxterm)        ! finite difference of order ()
*
* Initialize  constants
*
*   istart = 10                      ! start at y(10)
*
*   maxdif = nterms - istart - 1     ! max number of differences

```

```

                                ! that can be generated
if(maxdif.lt.2) then                                ! quit
  type*, 'too few points SUBROUTINE EULER'
  stop
else
endif

*   sum the first istart terms

sumy = 0.
do 70 i=1,istart
sumy = sumy + y(i)*(-1)**(i-1)
70  continue

*   Generate Binomial Coefficients

*           ( k )      k!
*   B(k,n) = (  ) = -----
*           ( n )      n!(k-n)!

*   using the recursion relation:

*           (k+1)
*           (n+1) = ( k ) + ( k )
*                   (n+1)   n

B(1,1) = 1.
do 100 k=1,maxdif
100  B(k,0) = 1.

do 200 k=2,maxdif
do 200 n=1,k
B(k,n) = B(k-1,n) + B(k-1,n-1)
200  continue

*   Generate finite differences of the series to be summed
*   using the relations:

*       delta = 1-E , delta**2 = (1-E)**2
*       where Ey(n) = y(n+1)

*   see Scheid pg 39 & 160

do 310 k=1,maxdif
do 300 i=0,k
  if(i.eq.0) then
    sigma = 0.
  else
    endif

    sigma = sigma + (-1)**(i)*B(k,i)*y(k-i+istart+1)

300  continue
310  continue

```

```

310  delta(k) = sigma
*    Now sum Euler Transformed Series
    delta(0) = y(istart+1)      ! first term in series
    do 400 i=0,maxdif
    cor = (-1)**(i+istart)*delta(i)/(2.**(i+1))
400  sumy = sumy + cor

    return
    end

```

```

*
* .....
*
* SUBROUTINE LGDRE
*
* PURPOSE
*     Calculate legendre polynomials
*
* USAGE
*     CALL lgdre (k,x,P)
*
* DESCRIPTION OF PARAMETERS
*     K      - MAX ORDER OF POLYNOMIAL TO BE GENERATED
*     X      - ARGUMENT
*     P      - ARRAY OF LEGENDRE POLYNOMIALS RETURNED
*
* REMARKS
*     real*16
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*
* METHOD
*     Use the recursion relation of
*     Handbook of Mathematical Functions
*     Dover, New York 1972
*     Abramowitz & Stegun -
*     8.5.3 with mu=0
*      $(n+1)P_{n+1}(x) = (2n+1)xP_n(x) - nP_{n-1}(x)$ 
*
* .....
*
*     subroutine  lgdre(k,x,P)
*
*     parameter(maxord = 120)
*
*     real*16      P(0:maxord) ! values of legendre functions
*                               ! up to k th order
*     real*16 x      ! argument of the polynomial
*     integer*2 k    ! order of the polynomial
*
*     check  ranges
*
*     if(k.lt.0.or.k.gt.maxord) then
*         type*, 'Legendre Polynomial order must be >= 0'
*         type*, 'and <=', maxord
*     else if(k.eq.0) then
*         P(0) = 1.0
*     else if(k.eq.1) then
*         P(1) = x
*     else
*         P(0) = 1.0
*         P(1) = x
*         do 100 m=1,k-1
*             P(m+1) = (2*m+1)*x*P(m) - m*P(m-1)

```

```
100      P(m+1) = P(m+1)/(m+1)
      endif
      return
    end
```

```

*
* .....
*
*      function lngam(q)
*
* PURPOSE
*      Calculate the natural logarithm
*      of the complex gamma function
*
* USAGE
*      x = lngam(q)
*
* DESCRIPTION OF PARAMETERS
*      q      - complex*16 input value
*
* REMARKS
*      complex*16 result
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*
* METHOD
*      Use the asymptotic approximation of
*      Abromowitz & Stegun -
*      6.1.41
*      STERLING'S APPROXIMATION
*      and
*      the recursion relation
*      Abromowitz & Stegun-
*      6.1.16
* .....
*
*      function  lngam(q)
*
*      complex*16 q           ! input value
*      complex*16 z           ! input value + inc
*      complex*16 lngam ! value of the ln(gamma) function
*      complex*16 pi         ! value of constant pi
*      complex*16 corr       ! correction for integer increment
*                           ! added to accelerate convergence
*      real*16  tangt         ! tangent pi/4
*      real*16  pix          ! real part of pi
*      real*16  piy          ! imaginary part of pi
*      integer*2 flag         ! increment added flag recursion
*                           ! correction required
*      integer*2 inc          ! convergence acceleration increment
*
*      initialize  variables
*
*      tangt = 1.
*      pix = 4.*qatan(tangt)
*      piy = 0.
*      pi = dcmlpx(pix,piy)
*      inc = 10

```



```

    if(dreal(q).le.10.) then
        z = q + inc          ! add integer to accelerate
                             ! convergence
*
        calculate ln gamma using A&S 6.1.41

        lngam = (z - 0.5)*cdlog(z) - z + 0.5 * cdlog(2*pi) + 1./(12.*z)
@      - 1./(360 * z**3) + 1./(1260. * z**5) - 1./(1680. * z**7)

*
        Since convergence has been accelerated by addition of
*
        an integer to the real part of q then use
*
        the log of recursion relation A&S 6.1.16 to extract
*
        the correct value

        corr = 0.
        do 100 k=1,inc
100      corr = corr + cdlog((k-1)+q)
          lngam = lngam - corr

        else

*
        calculate ln gamma using A&S 6.1.41

        lngam = (q - 0.5)*cdlog(q) - q + 0.5 * cdlog(2*pi) + 1./(12.*q)
@      - 1./(360 * q**3) + 1./(1260. * q**5) - 1./(1680. * q**7)

        endif

        return
    end

```

```

*
* .....
*
* SUBROUTINE SIGMR
*
* PURPOSE
*     Calculate the ratio of the differential Mott Cross-section
*     to the differential Rutherford Cross-section
*
* USAGE
*     CALL SIGMR (Z,AV,THETA,RATIO)
*
* DESCRIPTION OF PARAMETERS
*     Z       - atomic number of target
*     AV      - accelerating voltage
*     theta   - electron scattering angle
*     ratio   - ratio of Mott Cross-section to Rutherford CS returned
*
* REMARKS
*     real*16
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*     EULER   - euler transformation
*     LGDRE   - legendre function
*     D       - coefficient precursors
*     LNGAM   - natural logarithm of complex gamma functions
*
* METHOD
*     Direct evaluation of the series
*     G1 and F1 convergence accelerated by use of
*     the euler transformation
*
*     see:
*         McKinley & Feshbach
*         Phys Rev 74,1759(1948)
*     and;
*         Feshbach
*         Phys Rev 88,295(1952)
*     and;
*         Doggett & Spencer
*         Phys Rev 103,1597(1956)
*     and;
*         O. S. Oen
*         CROSS-SECTIONS FOR ATOMIC DISPLACEMENTS
*         IN SOLIDS BY FAST ELECTRONS
*         ORNL Report # TM-4897,(1973)
*
* .....

```

```

subroutine  sigmr(Z,AV,theta,ratio)

```

```

COMMON  /CONST/elmass,amu,evpKeV,fsc,CLrad,hbar,c,pi,one
COMMON  /REPEAT/AVold

```

```

parameter(maxord = 120) ! max number of coefficients to evaluate
                           ! near 125 the parameter 2**(i+1) in subroutine
                           ! euler will overflow.
*
variables used

character*1 comma      ! comma

integer*2 k             ! coef order
integer*2 nterms        ! num terms to use in sums

real*16 Z               ! atomic number of target
real*16 AV              ! incident beam K.E.
real*16 theta           ! scattering angle
real*16 ratio           ! ratio of Mott CS to Rutherford
real*16 x               ! cosine of the scattering angle
real*16 kr              ! real translation of k
real*16 P(0:maxord)     ! values of legendre fcns
real*16 zero            ! constants
real*16 alpha           ! fsc * Z
real*16 beta            ! relativistic beta = v/c
real*16 q               ! McKinley Feshbach variable, alpha/beta
real*16 kpsqr           ! (momentum/hbar)**2
                           ! in E-12 cm -- e**2/mc**2
real*16 y(maxord)       ! input array - terms in series to sum
real*16 sumy            ! estimated sum
real*16 zz              ! auxiliary variable
real*16 trad            ! theta in radians

*
DECLARATIONS FOR COMMON BLOCK REPEAT
real*16 AVold           ! repeated energy ?

*
DECLARATIONS FOR COMMON BLOCK CONST - CONSTANTS
real*16 elmass          ! rest mass of electron (KeV)
real*16 amu             ! atomic mass unit (KeV)
real*16 evpKeV          ! ev/KeV conversion
real*16 fsc             ! fine structure constant
real*16 CLrad           ! classical radius of the electron
                           ! in E-12 cm -- e**2/mc**2
real*16 hbar            ! h bar quantum mechanical const.(eV s)
real*16 c               ! speed of light(cm/s)
real*16 pi              ! constant
real*16 one             ! constant

complex*16 coschi       ! cos(CHI) in small angle asymptotic reln
complex*16 arga, argb, ga, gb ! utility variables
complex*16 Im           ! i
complex*16 Aco, B, S, V ! partial evaluation of coef in series
complex*16 F0, G0       ! terms in Mott Cross-Section
complex*16 F1(0:maxord) ! terms in Mott Cross-Section
complex*16 G1(0:maxord) ! terms in Mott Cross-Section
complex*16 Fcoef(0:maxord) ! F1 = f0 + f1*P1 + f2*P2
complex*16 Gcoef(0:maxord) ! similarly
complex*16 sumF1        ! F1 sum
complex*16 sumG1        ! G1 sum

```

```

complex*16 F,G          ! Mott series sums
complex*16 D            ! series coefficient precursors
complex*16 lngam ! ln gamma fcns

external euler          ! use Euler Transformation to sum series
external lgdre          ! subroutine to calc legendre fcns
external D              ! function to calc coefficients
external lngam          ! natural log of the complex gamma fcn

*-----

*      INITIALIZE VARIABLES

comma = ','
zero = 0.
Im = dcmplx(zero,one)
alpha = Z*fsc
beta = sqrt(1.-1./(1.+AV/elmass)**2)
q = alpha/beta
kpsqr = ((AV+elmass)**2 - elmass**2)*evpKeV**2/((hbar*c)**2) ! (cm**-2)
kpsqr = kpsqr*1E-24          ! convert units to barns**-1

*      AVOID DIVERGENCE AT 180 DEGREES
if(theta.eq.180.) theta = 179.99

x = qcosd(theta)
call lgdre(maxord,x,P)          ! generate legendre polynomials

*      GENERATE RATIO USING ASYMPTOTIC RELN
*      cited by Doggett & Spencer
*      if angle less than 0.5 degrees

arga = 0.5 - Im*q
argb = one + Im*q
ga = lngam(arga)
gb = lngam(argb)
coschi = cdexp(ga+gb-conjg(ga)-conjg(gb))
trad = theta*pi/180.
if(theta.le.0.5) then
    ratio = dreal(coschi)*pi*alpha*beta*trad/2. + 1.
*    type*, 'asymtotic reln used'
    goto 250
else
endif

nterms = 75          ! fixed number of terms to evaluate

*      EVALUATE SERIES

zz = (qsind(theta/2.))**2
F0 = Im*0.5*cdexp(Im*q*qlog(zz))
@    *cdexp(lngam(one-Im*q))/cdexp(lngam(one+Im*q))

```

```

zz = (qtand(theta/2.))**2
G0 = -1.*Im*q*F0*(1.- x)/zz      ! (1-cos)G0

if(AV.eq.AVold) goto 150 ! if accel voltage unchanged
AVold = AV                ! do not re-evaluate coeff.

*   Evaluate Fcoef, Gcoef
*   The series G1 has been multiplied by (1-cos(theta))
*   and the result expanded in Legendre Polynomials.
*   The coefficients are expressed in terms of the coefficients
*   D sub k . This results in faster convergence near 5 to 15 degrees

k = 0      ! zeroth term
Aco = 0.
B = D(k,Z,AV)
S = D(k+1,Z,AV)
do 100 k=0,nterms
  kr = qfloat(k)
  V = D(k+2,Z,AV)
  Fcoef(k) = B*kr+S*(kr+1.)
  Gcoef(k) = (kr-1.)**2*kr*Aco/(2.*kr-1.)
  Gcoef(k) = Gcoef(k) + kr**2*(kr-1.)*B/(2.*kr-1.)
  Gcoef(k) = Gcoef(k) - (kr+1.)**2*(kr+2.)*S/(2.*kr+3.)
  Gcoef(k) = Gcoef(k) - (kr+2.)**2*(kr+1.)*V/(2.*kr+3.)
  Aco = B      ! increment functions
  B = S      ! should be faster than recomputing
  S = V      ! functions each time
100 continue
150 continue
do 200 k=0,nterms
  G1(k) = Gcoef(k)*P(k)
200 F1(k) = Fcoef(k)*P(k)

*   CALCULATE SUM F1 AND SUM G1

do 550 i=1,maxord      ! Im(sumF1)
550 y(i) = dreal(F1(i-1))
  call euler(y,nterms,sumy)
  sumF1 = Im*0.5*dcmplx(sumy,zero)

do 575 i=1,maxord      ! Re(sumF1)
575 y(i) = dimag(F1(i-1))
  call euler(y,nterms,sumy)
  sumF1 = sumF1 - 0.5*sumy

do 650 i=1,maxord      ! Im(sumG1)
650 y(i) = dreal(G1(i-1))
  call euler(y,nterms,sumy)
  sumG1 = Im*0.5*dcmplx(sumy,zero)

do 675 i=1,maxord      ! Re(sumG1)
675 y(i) = dimag(G1(i-1))
  call euler(y,nterms,sumy)
  sumG1 = sumG1 - 0.5*sumy

```

```

*      SUM SERIES

      F = F0 + sumF1
      G = G0 + sumG1

*      Evaluate the ratio of the Mott cross-section
*      to the Rutherford cross-section

      ratio = q**2*conjg(F)*F*(1.-x) + conjg(G)*G/((1.+x)*(1.-beta**2))
      ratio = 2.*beta**4*ratio/(z**2*CLrad**2*kpsqr)

1000  continue

250   continue
      return
      END

*
* .....
*
* SUBROUTINE QATRGL
*
* PURPOSE
*      Compute an approximation for integral(fct(x), summed
*      over x from xl to xu).
*
* USAGE
*      CALL QATR (XL,XU,FCN,INT)
*      parameter fcn requires an external statement.
*
* DESCRIPTION OF PARAMETERS
*      XL      - The lower bound of the interval.
*      XU      - The upper bound of the interval.
*      FCN      - The name of the external function subprogram used.
*      INT      - The resulting approximation for the integral value.
*
* REMARKS
*
* SUBROUTINES AND FUNCTION SUBPROGRAMS REQUIRED
*      the external function subprogram fcn(x) must be coded by
*      the user.
*
* METHOD
*      Uses gauss legendre quadrature
*
* SEE:
*      Abromowitz and Stegun
*      HANDBOOK OF MATHEMATICAL FUNCTIONS
*      25.4.30, AND PG 916
*      Dover
*      and,
*      NUMERICAL ANALYSIS
*      Francis Scheid
*      SCHAUM'S OUTLINE SERIES
*      MCGRAW HILL CO

```

```

* .....
*
SUBROUTINE QATRGL(XL,XU,FCN,INT)
*
COMMON /REPEAT/AVold

real*8 xl    ! lower limit
real*8 xu    ! upper limit
real*8 int   ! integral value

real*8 x(8)  ! evaluation points
real*8 w(8)  ! weights
real*8 y     ! utility variable
*
*   DECLARATIONS FOR COMMON BLOCK REPEAT
real*16 AVold    ! repeated energy ?

data x/0.095012509837637440185,0.281603550779258913230,
@ 0.458016777657227386342,0.617876244402643748447,
@ 0.755404408355003033895,0.865631202387831743880,
@ 0.944575023073232576078,0.989400934991649932596/

data w/0.189450610455068496285,0.182603415044923588867,
@ 0.169156519395002538189,0.149595988816576732081,
@ 0.124628971255533872052,0.095158511682492784810,
@ 0.062253523938647892863,0.027152459411754094852/
*
int = 0.0    ! zero integral
do 100 i=1,8 ! 16 point integration
do 100 k=1,2
y = (xu-xl)*x(i)*(-1.)**k/2. + (xu + xl)/2.
100 int = int+fcn(y)*w(i)
int = (xu - xl)*int/2.0
*
RETURN
END

```

```

*
* The following is a two point integration
* which should provide only modest results,
* but can be patched in when debugging to
* make the program run more quickly.
* The patch is effected by changing the
* name of the subroutine in the call statement
* from QATRGL to xQATRGL.
* The two point integration is identical
* except for the printing of a warning.
*
SUBROUTINE xQATRGL(XL,XU,FCN,INT)
*
COMMON /REPEAT/AVold

real*8 xl    ! lower limit
real*8 xu    ! upper limit
real*8 int    ! integral value
real*8 x(1)  ! evaluation points
real*8 w(1)  ! weights
real*8 y     ! utility variable
*
* DECLARATIONS FOR COMMON BLOCK REPEAT
real*16 AVold    ! repeated energy ?

data x/0.577350269189626/

data w/1.0/
*
write(2,200)
200 format(' ','WARNING - two point integration in use')
*
int = 0.0      ! zero integral
do 100 k=1,2
y = (xu-xl)*x(i)*(-1.)**k/2. + (xu + xl)/2.
100 int = int+fcn(y)*w(i)
int = (xu - xl)*int/2.0
*
RETURN
END

```


INTRODUCTION TO THE TABLES

The following tables list total Mott cross-sections as a function of accelerating voltage for solid naturally occurring elements (shaded entries to the periodic table on the next page). The calculations are repeated for a variety of assumed displacement energies which should cover the range of interest for electron microscopy.

Surface binding energy, the energy required to remove an atom from the surface, is assumed to be equal to the sublimation energy. The Mott cross-section is calculated assuming this value and, since there have been suggestions that this value is too low, the calculation is repeated assuming a surface binding energy of twice the sublimation energy. Physically one expects a distribution of binding energies appropriate to the different binding sites on the surface. One and two times the sublimation energy should bracket this distribution.

Cross-sections are also listed for displacement energy equal to four and five times the sublimation energy. As seen in figure 2 this roughly brackets observed bulk displacement energy for many elements. In those cases where displacement energy has been experimentally observed[1,47,48] the Mott cross-section has also been calculated and listed using the observed value of displacement energy.

Kinchin-Pease cascade cross-sections are tabulated as functions of the accelerating voltage as well for all these assumed displacement energies. For sputtering this is expected to be an upper limit to actually observed cross-sections(see the discussion on page 22).

PERIODIC TABLE OF THE ELEMENTS

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh												

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

Li, Lithium

A = 6.939

Z=3

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	1.670		3.340		6.680		8.350			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
5.250	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
6.000	577.792	577.792	-.----	-.----	-.----	-.----	-.----	-.----		
7.000	993.810	993.810	-.----	-.----	-.----	-.----	-.----	-.----		
8.000	1198.355	1198.355	-.----	-.----	-.----	-.----	-.----	-.----		
9.000	1293.864	1293.864	-.----	-.----	-.----	-.----	-.----	-.----		
10.000	1330.279	1330.279	-.----	-.----	-.----	-.----	-.----	-.----		
10.450	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
11.000	-.----	-.----	63.013	63.013	-.----	-.----	-.----	-.----		
12.000	-.----	-.----	149.702	149.702	-.----	-.----	-.----	-.----		
13.000	-.----	-.----	210.256	210.256	-.----	-.----	-.----	-.----		
14.000	-.----	-.----	252.839	252.839	-.----	-.----	-.----	-.----		
15.000	1226.915	1281.561	282.797	282.797	-.----	-.----	-.----	-.----		
16.000	-.----	-.----	303.729	303.729	-.----	-.----	-.----	-.----		
17.000	-.----	-.----	318.111	318.111	-.----	-.----	-.----	-.----		
18.000	-.----	-.----	327.684	327.684	-.----	-.----	-.----	-.----		
19.000	-.----	-.----	333.694	333.694	-.----	-.----	-.----	-.----		
20.000	1056.275	1178.254	337.041	337.041	-.----	-.----	-.----	-.----		
20.690	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
21.000	-.----	-.----	-.----	-.----	4.763	4.763	-.----	-.----		
22.000	-.----	-.----	-.----	-.----	18.716	18.716	-.----	-.----		
23.000	-.----	-.----	-.----	-.----	30.314	30.314	-.----	-.----		
24.000	-.----	-.----	-.----	-.----	39.991	39.991	-.----	-.----		
25.000	916.172	1082.547	332.030	336.802	48.089	48.089	-.----	-.----		
25.740	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
26.000	-.----	-.----	-.----	-.----	54.880	54.880	2.076	2.076		
27.000	-.----	-.----	-.----	-.----	60.583	60.583	9.558	9.558		
28.000	-.----	-.----	-.----	-.----	65.378	65.378	16.005	16.005		
29.000	-.----	-.----	-.----	-.----	69.409	69.409	21.575	21.575		
30.000	807.206	1001.287	313.191	327.786	72.795	72.795	26.397	26.397		
35.000	721.830	933.114	292.221	316.285	82.968	82.968	42.531	42.531		
40.000	653.719	875.627	272.428	304.482	86.553	86.553	50.594	50.594		
45.000	598.359	826.692	254.652	293.188	86.972	87.380	54.500	54.500		
50.000	552.587	784.612	238.948	282.687	85.830	87.299	56.152	56.152		
55.000	514.171	748.079	225.131	273.040	83.932	86.707	56.540	56.744		
60.000	481.505	716.081	212.961	264.223	81.695	85.823	56.210	56.926		

Li, Lithium

A=6.939

Z=3

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d
Displacement	T _s	2T _s		4T _s	5T _s					
Energy(eV)=	1.670	3.340		6.680	8.350					
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	
65.000	----	----	202.203	256.174	79.342	84.781	55.472	56.844		
70.000	429.001	662.723	192.652	248.823	76.996	83.661	54.509	56.592		
75.000	----	----	184.132	242.099	74.718	82.513	53.431	56.232		
80.000	388.715	620.042	176.495	235.935	72.543	81.368	52.306	55.804		
90.000	356.869	585.153	163.399	225.058	68.546	79.156	50.058	54.847		
100.000	331.087	556.125	152.603	215.791	65.023	77.101	47.934	53.854		
110.000	309.806	531.620	143.567	207.827	61.933	75.226	45.988	52.885		
120.000	291.954	510.678	135.905	200.924	59.220	73.528	44.228	51.970		
130.000	276.773	492.597	129.334	194.898	56.831	71.997	42.644	51.118		
140.000	263.712	476.846	123.642	189.602	54.719	70.617	41.221	50.335		
150.000	252.361	463.020	118.667	184.921	52.842	69.374	39.941	49.617		
160.000	242.411	450.803	114.285	180.762	51.166	68.253	38.786	48.962		
170.000	233.620	439.946	110.398	177.050	49.663	67.241	37.743	48.366		
180.000	225.801	430.246	106.930	173.723	48.309	66.326	36.797	47.823		
190.000	218.803	421.541	103.817	170.730	47.085	65.499	35.937	47.330		
200.000	212.507	413.697	101.009	168.030	45.974	64.749	35.152	46.882		
210.000	206.812	406.604	98.464	165.585	44.961	64.069	34.435	46.475		
220.000	201.640	400.168	96.149	163.368	44.035	63.452	33.777	46.106		
230.000	196.922	394.313	94.033	161.350	43.185	62.892	33.171	45.770		
240.000	192.604	388.970	92.094	159.512	42.404	62.382	32.613	45.466		
250.000	188.636	384.085	90.311	157.834	41.683	61.919	32.097	45.191		
260.000	184.980	379.608	88.666	156.299	41.017	61.498	31.620	44.942		
270.000	181.600	375.498	87.144	154.894	40.399	61.116	31.176	44.716		
280.000	178.469	371.717	85.732	153.606	39.824	60.768	30.763	44.513		
290.000	175.559	368.235	84.420	152.424	39.290	60.452	30.378	44.330		
300.000	172.849	365.022	83.197	151.338	38.791	60.165	30.019	44.165		
350.000	161.702	352.241	78.161	147.087	36.730	59.092	28.533	43.573		
400.000	153.454	343.483	74.430	144.289	35.199	58.471	27.427	43.273		
450.000	147.134	337.438	71.571	142.478	34.026	58.162	26.580	43.177		
500.000	142.159	333.296	69.320	141.361	33.104	58.074	25.914	43.225		
550.000	138.155	330.529	67.509	140.746	32.364	58.145	25.381	43.377		
600.000	134.874	328.781	66.027	140.501	31.759	58.333	24.946	43.607		
650.000	132.146	327.801	64.796	140.536	31.258	58.609	24.587	43.893		
700.000	129.847	327.408	63.759	140.782	30.838	58.950	24.286	44.221		
750.000	127.890	327.472	62.878	141.191	30.482	59.341	24.031	44.580		

Li, Lithium

A = 6.939

Z=3

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 1.670		2T _s 3.340		4T _s 6.680		5T _s 8.350			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
800.000	126.206	327.893	62.121	141.725	30.177	59.768	23.814	44.963		
850.000	124.746	328.595	61.465	142.358	29.913	60.223	23.626	45.362		
900.000	123.471	329.520	60.893	143.067	29.684	60.700	23.464	45.774		
950.000	122.349	330.623	60.390	143.836	29.484	61.191	23.322	46.194		
1000.000	121.356	331.867	59.946	144.650	29.307	61.693	23.198	46.620		
1050.000	120.472	333.225	59.552	145.501	29.151	62.202	23.087	47.048		
1100.000	119.682	334.672	59.200	146.378	29.012	62.716	22.990	47.479		
1150.000	118.972	336.191	58.884	147.275	28.887	63.233	22.902	47.909		
1200.000	118.332	337.766	58.599	148.187	28.776	63.750	22.824	48.339		
1250.000	117.752	339.384	58.342	149.109	28.675	64.267	22.754	48.766		
1300.000	117.225	341.036	58.108	150.037	28.584	64.782	22.691	49.191		
1350.000	116.745	342.713	57.896	150.969	28.502	65.294	22.633	49.612		
1400.000	116.305	344.409	57.701	151.903	28.427	65.802	22.581	50.030		
1450.000	115.902	346.116	57.523	152.835	28.358	66.307	22.534	50.444		
1500.000	115.532	347.830	57.360	153.764	28.295	66.808	22.491	50.853		

Be, Beryllium

A=9.012

Z=4

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.360		6.720		13.440		16.800			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
13.610	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
14.000	37.321	37.321	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
15.000	116.791	116.791	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
16.000	176.955	176.955	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
17.000	222.790	222.790	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
18.000	257.836	257.836	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
19.000	284.656	284.656	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
20.000	305.138	305.138	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
25.000	351.498	351.498	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
26.880	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	
27.000	-.----	-.----	1.524	1.524	-.----	-.----	-.----	-.----	-.----	
28.000	-.----	-.----	13.494	13.494	-.----	-.----	-.----	-.----	-.----	
29.000	-.----	-.----	23.870	23.870	-.----	-.----	-.----	-.----	-.----	
30.000	354.895	356.778	32.888	32.888	-.----	-.----	-.----	-.----	-.----	
35.000	343.977	352.918	63.419	63.419	-.----	-.----	-.----	-.----	-.----	
40.000	328.564	345.697	79.150	79.150	-.----	-.----	-.----	-.----	-.----	
45.000	312.340	337.203	87.184	87.184	-.----	-.----	-.----	-.----	-.----	
50.000	296.722	328.410	90.993	90.993	-.----	-.----	-.----	-.----	-.----	
52.480	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	
53.000	-.----	-.----	-.----	-.----	0.868	0.868	-.----	-.----	-.----	
54.000	-.----	-.----	-.----	-.----	2.458	2.458	-.----	-.----	-.----	
55.000	282.219	319.778	92.398	92.495	3.938	3.938	-.----	-.----	-.----	
56.000	-.----	-.----	-.----	-.----	5.317	5.317	-.----	-.----	-.----	
57.000	-.----	-.----	-.----	-.----	6.601	6.601	-.----	-.----	-.----	
58.000	-.----	-.----	-.----	-.----	7.799	7.799	-.----	-.----	-.----	
59.000	-.----	-.----	-.----	-.----	8.917	8.917	-.----	-.----	-.----	
60.000	268.961	311.523	92.406	93.119	9.961	9.961	-.----	-.----	-.----	
64.850	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	
65.000	256.923	303.736	91.597	93.246	14.251	14.251	0.127	0.127	-.----	
66.000	-.----	-.----	-.----	-.----	-.----	-.----	0.990	0.990	-.----	
67.000	-.----	-.----	-.----	-.----	-.----	-.----	1.804	1.804	-.----	
68.000	-.----	-.----	-.----	-.----	-.----	-.----	2.573	2.573	-.----	
69.000	-.----	-.----	-.----	-.----	-.----	-.----	3.300	3.300	-.----	
70.000	246.013	296.444	90.316	93.046	17.345	17.345	3.986	3.986	-.----	
75.000	236.124	289.641	88.772	92.632	19.599	19.599	6.904	6.904	-.----	

Be, Beryllium

A=9.012

Z=4

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d	
Displacement		T _s	2T _s		4T _s	5T _s					
Energy(eV)=		3.360	6.720		13.440	16.800					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
80.000	227.144	283.307	87.097	92.077	21.248	21.248	9.137	9.137			
85.000	-----	-----	-----	-----	22.457	22.457	10.861	10.861			
90.000	211.516	271.922	83.641	90.738	23.340	23.340	12.203	12.203			
95.000	-----	-----	-----	-----	23.980	23.980	13.254	13.254			
100.000	198.435	262.042	80.295	89.278	24.436	24.436	14.081	14.081			
105.000	-----	-----	-----	-----	24.753	24.777	14.733	14.733			
110.000	187.364	253.433	77.185	87.818	24.963	25.057	15.248	15.248			
115.000	-----	-----	-----	-----	25.091	25.288	15.654	15.654			
120.000	177.896	245.894	74.346	86.416	25.155	25.480	15.975	15.975			
130.000	169.721	239.259	71.774	85.100	25.148	25.772	16.421	16.444			
140.000	162.601	233.392	69.452	83.879	25.023	25.976	16.684	16.804			
150.000	156.351	228.180	67.355	82.756	24.829	26.119	16.827	17.089			
160.000	150.826	223.532	65.458	81.727	24.597	26.220	16.890	17.319			
170.000	145.911	219.371	63.740	80.787	24.345	26.293	16.898	17.509			
180.000	141.513	215.633	62.179	79.930	24.086	26.346	16.871	17.668			
190.000	137.557	212.265	60.757	79.150	23.828	26.387	16.819	17.805			
200.000	133.983	209.223	59.459	78.441	23.576	26.419	16.753	17.924			
210.000	130.738	206.468	58.270	77.796	23.332	26.446	16.676	18.031			
220.000	127.781	203.968	57.178	77.211	23.097	26.470	16.595	18.127			
230.000	125.077	201.695	56.173	76.681	22.874	26.493	16.511	18.216			
240.000	122.595	199.625	55.246	76.200	22.662	26.517	16.426	18.299			
250.000	120.310	197.737	54.388	75.765	22.461	26.542	16.342	18.377			
260.000	118.201	196.013	53.593	75.371	22.271	26.568	16.260	18.453			
270.000	116.248	194.437	52.854	75.016	22.091	26.597	16.180	18.526			
280.000	114.436	192.996	52.166	74.696	21.922	26.628	16.103	18.597			
290.000	112.750	191.677	51.525	74.409	21.762	26.662	16.029	18.668			
300.000	111.178	190.469	50.926	74.151	21.611	26.698	15.958	18.737			
310.000	-----	-----	-----	-----	21.469	26.738	15.890	18.806			
320.000	-----	-----	-----	-----	21.334	26.780	15.826	18.874			
330.000	-----	-----	-----	-----	21.207	26.824	15.764	18.943			
340.000	-----	-----	-----	-----	21.088	26.871	15.706	19.012			
350.000	104.697	185.790	48.444	73.237	20.974	26.921	15.651	19.081			
360.000	-----	-----	-----	-----	20.867	26.973	15.598	19.150			
370.000	-----	-----	-----	-----	20.766	27.028	15.549	19.219			
380.000	-----	-----	-----	-----	20.670	27.085	15.501	19.289			

Be, Beryllium

A=9.012

Z=4

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$		$4T_s$	$5T_s$		T_d			
Energy(eV)=	3.360	6.720		13.440	16.800					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
390.000	----	----	----	----	20.579	27.143	15.457	19.359		
400.000	99.891	182.802	46.597	72.796	20.493	27.204	15.414	19.430		
450.000	96.204	180.965	45.179	72.685	20.125	27.535	15.234	19.788		
500.000	93.301	179.939	44.065	72.809	19.838	27.901	15.096	20.156		
550.000	90.966	179.501	43.171	73.103	19.612	28.294	14.989	20.529		
600.000	89.054	179.496	42.442	73.521	19.431	28.704	14.907	20.907		
650.000	87.466	179.815	41.839	74.032	19.285	29.127	14.844	21.286		
700.000	86.129	180.380	41.334	74.610	19.166	29.558	14.794	21.666		
750.000	84.993	181.132	40.907	75.239	19.069	29.994	14.756	22.044		
800.000	84.017	182.029	40.541	75.904	18.988	30.431	14.726	22.419		
850.000	83.172	183.037	40.227	76.597	18.920	30.868	14.703	22.791		
900.000	82.435	184.131	39.953	77.309	18.863	31.303	14.685	23.158		
950.000	81.788	185.290	39.715	78.034	18.815	31.736	14.672	23.521		
1000.000	81.216	186.499	39.505	78.768	18.774	32.164	14.662	23.879		
1050.000	80.709	187.745	39.319	79.506	18.739	32.588	14.654	24.232		
1100.000	80.256	189.019	39.155	80.245	18.709	33.008	14.649	24.580		
1150.000	79.849	190.313	39.007	80.984	18.684	33.422	14.645	24.922		
1200.000	79.483	191.619	38.876	81.721	18.661	33.830	14.643	25.259		
1250.000	79.153	192.933	38.757	82.454	18.642	34.233	14.642	25.590		
1300.000	78.853	194.251	38.650	83.181	18.626	34.630	14.642	25.916		
1350.000	78.579	195.569	38.553	83.903	18.611	35.021	14.643	26.236		
1400.000	78.330	196.884	38.464	84.618	18.599	35.407	14.644	26.551		
1450.000	78.102	198.194	38.384	85.326	18.588	35.786	14.646	26.861		
1500.000	77.892	199.497	38.310	86.026	18.578	36.160	14.648	27.166		

B, Boron

A = 10.811

Z = 5

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->					T _d		
Displacement		T _s	2T _s		4T _s		5T _s					
Energy(eV)=		6.030	12.060		24.120		30.150					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)		
28.880	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
29.000	1.919	1.919	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
30.000	17.078	17.078	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
35.000	69.228	69.228	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
40.000	97.161	97.161	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
45.000	112.331	112.331	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
50.000	120.381	120.381	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
55.000	124.296	124.296	-.----	-.----	-.----	-.----	-.----	-.----	-.----			
56.290	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----			
57.000	-.----	-.----	1.485	1.485	-.----	-.----	-.----	-.----	-.----			
58.000	-.----	-.----	3.479	3.479	-.----	-.----	-.----	-.----	-.----			
59.000	-.----	-.----	5.343	5.343	-.----	-.----	-.----	-.----	-.----			
60.000	125.742	125.981	7.089	7.089	-.----	-.----	-.----	-.----	-.----			
65.000	125.691	126.796	14.309	14.309	-.----	-.----	-.----	-.----	-.----			
70.000	124.728	127.046	19.593	19.593	-.----	-.----	-.----	-.----	-.----			
75.000	123.217	126.911	23.504	23.504	-.----	-.----	-.----	-.----	-.----			
80.000	121.386	126.516	26.424	26.424	-.----	-.----	-.----	-.----	-.----			
85.000	-.----	-.----	28.617	28.617	-.----	-.----	-.----	-.----	-.----			
90.000	117.297	125.253	30.268	30.268	-.----	-.----	-.----	-.----	-.----			
95.000	-.----	-.----	31.511	31.511	-.----	-.----	-.----	-.----	-.----			
100.000	113.113	123.677	32.443	32.443	-.----	-.----	-.----	-.----	-.----			
105.000	-.----	-.----	33.136	33.136	-.----	-.----	-.----	-.----	-.----			
107.480	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----			
108.000	-.----	-.----	-.----	-.----	0.149	0.149	-.----	-.----	-.----			
109.000	-.----	-.----	-.----	-.----	0.434	0.434	-.----	-.----	-.----			
110.000	109.106	122.002	33.644	33.653	0.709	0.709	-.----	-.----	-.----			
115.000	-.----	-.----	34.009	34.082	1.958	1.958	-.----	-.----	-.----			
120.000	105.378	120.337	34.261	34.445	3.022	3.022	-.----	-.----	-.----			
125.000	-.----	-.----	-.----	-.----	3.934	3.934	-.----	-.----	-.----			
130.000	101.957	118.739	34.517	35.020	4.719	4.719	-.----	-.----	-.----			
131.550	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----			
132.000	-.----	-.----	-.----	-.----	-.----	-.----	0.069	0.069	-.----			
133.000	-.----	-.----	-.----	-.----	-.----	-.----	0.222	0.222	-.----			
134.000	-.----	-.----	-.----	-.----	-.----	-.----	0.370	0.370	-.----			
135.000	-.----	-.----	-.----	-.----	5.400	5.400	0.515	0.515	-.----			

B, Boron

A=10.811

Z=5

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	6.030		12.060		24.120		30.150			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
136.000	----	----	----	----	----	----	0.656	0.656		
137.000	----	----	----	----	----	----	0.794	0.794		
138.000	----	----	----	----	----	----	0.928	0.928		
139.000	----	----	----	----	----	----	1.059	1.059		
140.000	98.838	117.234	34.551	35.444	5.991	5.991	1.186	1.186		
145.000	----	----	----	----	6.509	6.509	1.777	1.777		
150.000	96.002	115.834	34.446	35.763	6.962	6.962	2.299	2.299		
155.000	----	----	----	----	7.362	7.362	2.764	2.764		
160.000	93.422	114.542	34.256	36.008	7.716	7.716	3.178	3.178		
165.000	----	----	----	----	----	----	3.549	3.549		
170.000	91.075	113.355	34.016	36.199	8.308	8.308	3.882	3.882		
175.000	----	----	----	----	----	----	4.183	4.183		
180.000	88.935	112.268	33.747	36.353	8.781	8.781	4.455	4.455		
185.000	----	----	----	----	----	----	4.701	4.701		
190.000	86.979	111.277	33.464	36.480	9.163	9.163	4.926	4.926		
195.000	----	----	----	----	----	----	5.131	5.131		
200.000	85.189	110.373	33.178	36.588	9.474	9.475	5.319	5.319		
210.000	83.546	109.552	32.894	36.683	9.732	9.745	5.649	5.649		
220.000	82.035	108.806	32.616	36.769	9.946	9.991	5.931	5.931		
230.000	80.641	108.130	32.348	36.849	10.127	10.216	6.173	6.173		
240.000	79.354	107.518	32.090	36.925	10.280	10.424	6.383	6.383		
250.000	78.162	106.965	31.843	37.000	10.412	10.617	6.567	6.572		
260.000	77.055	106.467	31.608	37.074	10.526	10.797	6.729	6.748		
270.000	76.026	106.019	31.384	37.149	10.626	10.968	6.873	6.913		
280.000	75.068	105.617	31.172	37.225	10.714	11.128	7.002	7.069		
290.000	74.173	105.257	30.971	37.303	10.791	11.282	7.119	7.216		
300.000	73.337	104.937	30.781	37.382	10.861	11.428	7.225	7.357		
310.000	----	----	30.601	37.464	10.924	11.568	7.321	7.491		
320.000	----	----	30.431	37.548	10.981	11.703	7.410	7.620		
330.000	----	----	30.269	37.635	11.033	11.834	7.492	7.743		
340.000	----	----	30.117	37.724	11.081	11.960	7.568	7.863		
350.000	69.868	103.832	29.972	37.816	11.125	12.083	7.638	7.978		
360.000	----	----	29.836	37.910	11.166	12.203	7.705	8.090		
370.000	----	----	29.706	38.006	11.205	12.320	7.767	8.198		
380.000	----	----	29.583	38.104	11.241	12.434	7.826	8.304		

B, Boron**A = 10.811****Z=5**

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		6.030		12.060		24.120		30.150			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
390.000	-.----	-.----	29.467	38.205	11.276	12.546	7.881	8.407			
400.000	67.281	103.357	29.357	38.308	11.308	12.655	7.934	8.508			
410.000	-.----	-.----	-.----	-.----	-.----	-.----	7.984	8.606			
420.000	-.----	-.----	-.----	-.----	-.----	-.----	8.032	8.702			
430.000	-.----	-.----	-.----	-.----	-.----	-.----	8.078	8.797			
440.000	-.----	-.----	-.----	-.----	-.----	-.----	8.122	8.890			
450.000	65.294	103.323	28.885	38.852	11.451	13.177	8.164	8.981			
460.000	-.----	-.----	-.----	-.----	-.----	-.----	8.204	9.070			
470.000	-.----	-.----	-.----	-.----	-.----	-.----	8.243	9.159			
480.000	-.----	-.----	-.----	-.----	-.----	-.----	8.281	9.246			
490.000	-.----	-.----	-.----	-.----	-.----	-.----	8.318	9.331			
500.000	63.730	103.603	28.517	39.434	11.571	13.666	8.353	9.416			
550.000	62.476	104.111	28.228	40.044	11.676	14.131	8.515	9.823			
600.000	61.452	104.785	27.998	40.674	11.771	14.578	8.657	10.210			
650.000	60.605	105.582	27.813	41.317	11.858	15.009	8.783	10.579			
700.000	59.896	106.469	27.663	41.967	11.938	15.426	8.897	10.934			
750.000	59.295	107.422	27.541	42.620	12.013	15.832	9.000	11.277			
800.000	58.782	108.424	27.440	43.272	12.082	16.227	9.094	11.608			
850.000	58.340	109.461	27.356	43.923	12.147	16.612	9.181	11.929			
900.000	57.956	110.522	27.286	44.569	12.207	16.987	9.260	12.241			
950.000	57.621	111.598	27.228	45.209	12.264	17.353	9.334	12.545			
1000.000	57.325	112.684	27.178	45.842	12.317	17.711	9.403	12.840			
1050.000	57.064	113.775	27.137	46.468	12.367	18.060	9.466	13.128			
1100.000	56.833	114.866	27.101	47.086	12.414	18.402	9.525	13.409			
1150.000	56.626	115.955	27.071	47.695	12.458	18.736	9.581	13.683			
1200.000	56.440	117.038	27.045	48.296	12.500	19.063	9.632	13.951			
1250.000	56.273	118.115	27.024	48.888	12.539	19.384	9.681	14.212			
1300.000	56.122	119.183	27.005	49.470	12.576	19.697	9.726	14.468			
1350.000	55.985	120.241	26.989	50.044	12.611	20.004	9.769	14.718			
1400.000	55.860	121.289	26.975	50.609	12.644	20.305	9.809	14.963			
1450.000	55.747	122.326	26.963	51.164	12.675	20.600	9.846	15.203			
1500.000	55.643	123.351	26.952	51.711	12.704	20.889	9.882	15.438			

C, Carbon

A = 12.010

Z = 6

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	7.430		14.860		29.720		37.150		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
39.150	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
40.000	7.665	7.665	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
41.000	15.929	15.929	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
42.000	23.433	23.433	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
43.000	30.255	30.255	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
44.000	36.465	36.465	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
45.000	42.124	42.124	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
46.000	47.286	47.286	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
47.000	51.999	51.999	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
48.000	56.306	56.306	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
49.000	60.243	60.243	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
50.000	63.846	63.846	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
55.000	77.797	77.797	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	86.823	86.823	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	92.638	92.638	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	96.307	96.307	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	98.517	98.517	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.690	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
76.000	-.----	-.----	0.377	0.377	-.----	-.----	-.----	-.----	-.----	-.----
77.000	-.----	-.----	1.585	1.585	-.----	-.----	-.----	-.----	-.----	-.----
78.000	-.----	-.----	2.735	2.735	-.----	-.----	-.----	-.----	-.----	-.----
79.000	-.----	-.----	3.830	3.830	-.----	-.----	-.----	-.----	-.----	-.----
80.000	99.722	99.867	4.874	4.874	-.----	-.----	-.----	-.----	-.----	-.----
85.000	100.227	100.820	9.416	9.416	-.----	-.----	-.----	-.----	-.----	-.----
90.000	100.243	101.476	13.028	13.028	-.----	-.----	-.----	-.----	-.----	-.----
95.000	99.916	101.908	15.927	15.927	-.----	-.----	-.----	-.----	-.----	-.----
100.000	99.350	102.169	18.269	18.269	-.----	-.----	-.----	-.----	-.----	-.----
105.000	-.----	-.----	20.175	20.175	-.----	-.----	-.----	-.----	-.----	-.----
110.000	97.779	102.329	21.734	21.734	-.----	-.----	-.----	-.----	-.----	-.----
115.000	-.----	-.----	23.015	23.015	-.----	-.----	-.----	-.----	-.----	-.----
120.000	95.910	102.179	24.072	24.072	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	24.947	24.947	-.----	-.----	-.----	-.----	-.----	-.----
130.000	93.944	101.851	25.673	25.673	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	26.277	26.277	-.----	-.----	-.----	-.----	-.----	-.----
140.000	91.987	101.427	26.780	26.780	-.----	-.----	-.----	-.----	-.----	-.----

C, Carbon

A = 12.010

Z = 6

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->						
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		7.430		14.860		29.720		37.150		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
142.680	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	
143.000	-.----	-.----	-.----	-.----	0.054	0.054	-.----	-.----	-.----	-.----	
143.880	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	
144.000	-.----	-.----	-.----	-.----	0.226	0.226	-.----	-.----	0.020	0.020	
145.000	-.----	-.----	-.----	-.----	0.394	0.394	-.----	-.----	0.188	0.188	
146.000	-.----	-.----	-.----	-.----	0.557	0.557	-.----	-.----	0.352	0.352	
147.000	-.----	-.----	-.----	-.----	0.717	0.717	-.----	-.----	0.512	0.512	
148.000	-.----	-.----	-.----	-.----	0.873	0.873	-.----	-.----	0.668	0.668	
149.000	-.----	-.----	-.----	-.----	1.025	1.025	-.----	-.----	0.821	0.821	
150.000	90.097	100.958	27.547	27.580	1.174	1.174	-.----	-.----	0.970	0.970	
155.000	-.----	-.----	-.----	-.----	1.869	1.869	-.----	-.----	1.667	1.667	
160.000	88.301	100.475	28.078	28.239	2.491	2.491	-.----	-.----	2.291	2.291	
165.000	-.----	-.----	-.----	-.----	3.048	3.048	-.----	-.----	2.851	2.851	
170.000	86.610	99.999	28.441	28.796	3.551	3.551	-.----	-.----	3.355	3.355	
173.720	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	
174.000	-.----	-.----	-.----	-.----	-.----	-.----	0.025	0.025	-.----	-.----	
175.000	-.----	-.----	-.----	-.----	4.005	4.005	0.118	0.118	3.811	3.811	
176.000	-.----	-.----	-.----	-.----	-.----	-.----	0.209	0.209	-.----	-.----	
177.000	-.----	-.----	-.----	-.----	-.----	-.----	0.298	0.298	-.----	-.----	
178.000	-.----	-.----	-.----	-.----	-.----	-.----	0.385	0.385	-.----	-.----	
179.000	-.----	-.----	-.----	-.----	-.----	-.----	0.471	0.471	-.----	-.----	
180.000	85.028	99.543	28.685	29.273	4.418	4.418	0.555	0.555	4.225	4.225	
185.000	-.----	-.----	-.----	-.----	4.793	4.793	0.954	0.954	4.601	4.601	
190.000	83.552	99.112	28.843	29.688	5.135	5.135	1.319	1.319	4.945	4.945	
195.000	-.----	-.----	-.----	-.----	5.448	5.448	1.655	1.655	5.260	5.260	
200.000	82.177	98.712	28.939	30.055	5.735	5.735	1.963	1.963	5.548	5.548	
205.000	-.----	-.----	-.----	-.----	-.----	-.----	2.248	2.248	-.----	-.----	
210.000	80.898	98.345	28.990	30.384	6.244	6.244	2.511	2.511	6.060	6.060	
215.000	-.----	-.----	-.----	-.----	-.----	-.----	2.756	2.756	-.----	-.----	
220.000	79.708	98.012	29.007	30.683	6.679	6.679	2.983	2.983	6.497	6.497	
225.000	-.----	-.----	-.----	-.----	-.----	-.----	3.195	3.195	-.----	-.----	
230.000	78.600	97.712	29.001	30.957	7.055	7.055	3.393	3.393	6.875	6.875	
235.000	-.----	-.----	-.----	-.----	-.----	-.----	3.579	3.579	-.----	-.----	
240.000	77.567	97.444	28.978	31.211	7.383	7.383	3.753	3.753	7.205	7.205	
250.000	76.605	97.208	28.943	31.450	7.671	7.671	4.070	4.070	7.495	7.495	

C, Carbon

A=12.010

Z=6

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	7.430		14.860		29.720		37.150		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
260.000	75.706	97.002	28.900	31.675	7.927	7.927	4.353	4.353	7.752	7.752
270.000	74.866	96.825	28.851	31.890	8.155	8.161	4.606	4.606	7.982	7.986
280.000	74.080	96.674	28.799	32.096	8.360	8.382	4.835	4.835	8.188	8.206
290.000	73.344	96.549	28.744	32.295	8.545	8.591	5.043	5.043	8.375	8.414
300.000	72.653	96.448	28.689	32.489	8.714	8.789	5.233	5.233	8.545	8.612
310.000	72.005	96.370	28.635	32.677	8.869	8.979	5.408	5.408	8.701	8.801
320.000	71.395	96.313	28.580	32.861	9.011	9.160	5.569	5.571	8.845	8.982
330.000	70.821	96.275	28.528	33.042	9.143	9.334	5.718	5.727	8.978	9.155
340.000	70.280	96.257	28.476	33.220	9.265	9.502	5.858	5.877	9.101	9.322
350.000	69.770	96.255	28.427	33.396	9.380	9.664	5.988	6.021	9.216	9.483
360.000	69.288	96.270	28.379	33.569	9.487	9.821	6.110	6.161	9.324	9.639
370.000	68.833	96.301	28.333	33.741	9.587	9.973	6.225	6.296	9.425	9.791
380.000	68.402	96.346	28.290	33.912	9.682	10.120	6.333	6.427	9.521	9.938
390.000	67.993	96.404	28.249	34.081	9.772	10.264	6.436	6.553	9.612	10.081
400.000	67.606	96.475	28.209	34.249	9.857	10.404	6.534	6.677	9.698	10.220
410.000	-----	-----	-----	-----	9.938	10.541	6.627	6.797	9.779	10.357
420.000	-----	-----	-----	-----	10.016	10.675	6.716	6.915	9.858	10.490
430.000	-----	-----	-----	-----	10.090	10.806	6.801	7.029	9.932	10.620
440.000	-----	-----	-----	-----	10.160	10.935	6.882	7.141	10.004	10.748
450.000	65.940	96.991	28.042	35.079	10.228	11.061	6.960	7.251	10.072	10.873
460.000	-----	-----	-----	-----	10.294	11.185	7.035	7.359	10.138	10.997
470.000	-----	-----	-----	-----	10.357	11.307	7.107	7.464	10.202	11.118
480.000	-----	-----	-----	-----	10.418	11.427	7.176	7.568	10.263	11.237
490.000	-----	-----	-----	-----	10.476	11.545	7.244	7.670	10.322	11.354
500.000	64.631	97.722	27.918	35.896	10.533	11.661	7.309	7.770	10.379	11.470
550.000	63.584	98.608	27.828	36.704	10.792	12.220	7.604	8.249	10.640	12.025
600.000	62.732	99.607	27.765	37.503	11.017	12.747	7.860	8.697	10.867	12.549
650.000	62.030	100.687	27.723	38.293	11.216	13.249	8.085	9.121	11.068	13.048
700.000	61.445	101.824	27.695	39.073	11.394	13.730	8.286	9.524	11.247	13.525
750.000	60.952	103.002	27.679	39.843	11.555	14.192	8.466	9.910	11.409	13.984
800.000	60.533	104.207	27.672	40.602	11.702	14.638	8.630	10.281	11.557	14.427
850.000	60.174	105.429	27.672	41.348	11.835	15.070	8.779	10.639	11.691	14.855
900.000	59.864	106.660	27.677	42.083	11.958	15.489	8.915	10.984	11.815	15.271
950.000	59.594	107.895	27.685	42.805	12.071	15.895	9.040	11.319	11.928	15.674
1000.000	59.358	109.128	27.696	43.515	12.175	16.290	9.155	11.644	12.033	16.066

C, Carbon

A=12.010

Z=6

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
	T _s		2T _s		4T _s		5T _s		T _d	
	7.430		14.860		29.720		37.150		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1050.000	59.150	110.356	27.709	44.212	12.272	16.675	9.262	11.959	12.131	16.447
1100.000	58.967	111.577	27.724	44.897	12.362	17.050	9.361	12.266	12.221	16.819
1150.000	58.804	112.788	27.739	45.569	12.446	17.416	9.453	12.565	12.305	17.182
1200.000	58.658	113.987	27.755	46.230	12.524	17.772	9.538	12.856	12.384	17.535
1250.000	58.528	115.173	27.771	46.878	12.597	18.121	9.618	13.140	12.457	17.881
1300.000	58.410	116.346	27.788	47.515	12.665	18.461	9.692	13.417	12.525	18.218
1350.000	58.304	117.505	27.804	48.140	12.729	18.794	9.762	13.687	12.590	18.548
1400.000	58.208	118.648	27.821	48.754	12.789	19.120	9.828	13.952	12.650	18.871
1450.000	58.121	119.777	27.837	49.358	12.845	19.438	9.889	14.210	12.707	19.187
1500.000	58.042	120.890	27.853	49.950	12.898	19.750	9.947	14.463	12.760	19.496

Na, Sodium

A = 22.990

Z = 11

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.120		2.240		4.480		5.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
11.590	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
12.000	475.534	475.534	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
13.000	1417.463	1417.463	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
14.000	2098.351	2098.351	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
15.000	2594.236	2594.236	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
16.000	2956.516	2956.516	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
17.000	3220.768	3220.768	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
18.000	3412.125	3412.125	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
19.000	3548.666	3548.666	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
20.000	3643.597	3643.597	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
22.940	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
23.000	-.----	-.----	8.763	8.763	-.----	-.----	-.----	-.----	-.----	-.----
24.000	-.----	-.----	156.157	156.157	-.----	-.----	-.----	-.----	-.----	-.----
25.000	3763.522	3775.998	280.909	280.909	-.----	-.----	-.----	-.----	-.----	-.----
26.000	-.----	-.----	386.856	386.856	-.----	-.----	-.----	-.----	-.----	-.----
27.000	-.----	-.----	477.086	477.086	-.----	-.----	-.----	-.----	-.----	-.----
28.000	-.----	-.----	554.111	554.111	-.----	-.----	-.----	-.----	-.----	-.----
29.000	-.----	-.----	619.983	619.983	-.----	-.----	-.----	-.----	-.----	-.----
30.000	3632.601	3729.133	676.390	676.390	-.----	-.----	-.----	-.----	-.----	-.----
35.000	3436.483	3633.645	858.110	858.110	-.----	-.----	-.----	-.----	-.----	-.----
40.000	3233.659	3523.023	939.787	939.787	-.----	-.----	-.----	-.----	-.----	-.----
44.940	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
45.000	3043.113	3411.011	971.228	971.229	1.157	1.157	-.----	-.----	-.----	-.----
46.000	-.----	-.----	-.----	-.----	21.222	21.222	-.----	-.----	-.----	-.----
47.000	-.----	-.----	-.----	-.----	39.667	39.667	-.----	-.----	-.----	-.----
48.000	-.----	-.----	-.----	-.----	56.640	56.640	-.----	-.----	-.----	-.----
49.000	-.----	-.----	-.----	-.----	72.276	72.276	-.----	-.----	-.----	-.----
50.000	2870.172	3303.342	976.343	981.235	86.694	86.694	-.----	-.----	-.----	-.----
55.000	2715.228	3202.258	967.395	982.983	143.900	143.900	-.----	-.----	-.----	-.----
55.620	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
56.000	-.----	-.----	-.----	-.----	-.----	-.----	4.070	4.070	-.----	-.----
57.000	-.----	-.----	-.----	-.----	-.----	-.----	14.409	14.409	-.----	-.----
58.000	-.----	-.----	-.----	-.----	-.----	-.----	24.077	24.077	-.----	-.----
59.000	-.----	-.----	-.----	-.----	-.----	-.----	33.122	33.122	-.----	-.----
60.000	2576.945	3108.415	950.992	979.675	182.882	182.882	41.592	41.592	-.----	-.----

Na, Sodium

A = 22.990

Z = 11

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.120		2.240		4.480		5.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
65.000	2453.492	3021.749	930.819	973.269	209.763	209.763	76.666	76.666		
70.000	2343.021	2941.871	908.982	964.996	228.400	228.400	102.372	102.372		
75.000	2243.842	2868.268	886.695	955.648	241.300	241.300	121.437	121.437		
80.000	2154.473	2800.398	864.662	945.739	250.138	250.138	135.700	135.700		
85.000	-----	-----	-----	-----	256.061	256.061	146.432	146.432		
90.000	2000.247	2679.783	822.763	925.479	259.866	260.062	154.531	154.531		
95.000	-----	-----	-----	-----	262.121	263.151	160.644	160.644		
100.000	1872.224	2576.277	784.674	905.760	263.234	265.559	165.241	165.241		
105.000	-----	-----	-----	-----	-----	-----	168.672	168.672		
110.000	1764.506	2486.813	750.568	887.226	263.145	268.870	171.199	171.299		
115.000	-----	-----	-----	-----	-----	-----	173.020	173.515		
120.000	1672.771	2408.945	720.178	870.109	261.167	270.801	174.287	175.403		
130.000	1593.807	2340.729	693.110	854.446	258.180	271.847	175.607	178.410		
140.000	1525.188	2280.617	668.954	840.184	254.689	272.326	175.822	180.655		
150.000	1465.056	2227.363	647.331	827.230	250.992	272.441	175.347	182.363		
160.000	1411.966	2179.961	627.907	815.477	247.263	272.331	174.443	183.689		
170.000	1364.777	2137.588	610.395	804.818	243.602	272.086	173.281	184.741		
180.000	1322.582	2099.565	594.549	795.150	240.068	271.767	171.972	185.596		
190.000	1284.646	2065.330	580.158	786.379	236.691	271.418	170.589	186.309		
200.000	1250.370	2034.411	567.045	778.419	233.487	271.066	169.180	186.920		
210.000	1219.263	2006.413	555.056	771.192	230.458	270.732	167.777	187.460		
220.000	1190.916	1980.997	544.061	764.630	227.603	270.427	166.401	187.950		
230.000	1164.986	1957.875	533.948	758.670	224.916	270.161	165.066	188.406		
240.000	1141.185	1936.801	524.622	753.256	222.390	269.939	163.778	188.841		
250.000	1119.268	1917.561	515.997	748.340	220.015	269.762	162.543	189.263		
260.000	1099.027	1899.970	508.003	743.878	217.783	269.634	161.362	189.679		
270.000	1080.282	1883.866	500.576	739.829	215.684	269.553	160.236	190.095		
280.000	1062.878	1869.108	493.660	736.160	213.709	269.519	159.165	190.513		
290.000	1046.681	1855.571	487.207	732.837	211.850	269.531	158.147	190.937		
300.000	1031.573	1843.145	481.175	729.832	210.099	269.589	157.180	191.368		
310.000	-----	-----	-----	-----	208.448	269.688	156.262	191.808		
320.000	-----	-----	-----	-----	206.890	269.829	155.390	192.258		
330.000	-----	-----	-----	-----	205.419	270.009	154.563	192.719		
340.000	-----	-----	-----	-----	204.028	270.226	153.778	193.189		
350.000	969.177	1794.618	456.139	718.770	202.712	270.479	153.033	193.671		

Na, Sodium

A = 22.990

Z = 11

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->											
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		1.120	2.240		4.480	5.600					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
360.000	-.----	-.----	-.----	-.----	201.467	270.764	152.325	194.163			
370.000	-.----	-.----	-.----	-.----	200.286	271.081	151.653	194.665			
380.000	-.----	-.----	-.----	-.----	199.166	271.428	151.014	195.178			
390.000	-.----	-.----	-.----	-.----	198.103	271.803	150.407	195.701			
400.000	922.755	1762.914	437.405	712.693	197.093	272.204	149.829	196.233			
450.000	887.029	1742.655	422.942	710.066	192.726	274.551	147.327	199.020			
500.000	858.792	1730.456	411.494	709.886	189.266	277.355	145.347	201.983			
550.000	835.990	1724.086	402.245	711.479	186.479	280.488	143.760	205.072			
600.000	817.248	1722.023	394.645	714.374	184.199	283.858	142.470	208.248			
650.000	801.616	1723.194	388.309	718.235	182.310	287.393	141.410	211.477			
700.000	788.412	1726.823	382.960	722.818	180.726	291.042	140.530	214.736			
750.000	777.137	1732.340	378.396	727.940	179.383	294.764	139.791	218.004			
800.000	767.419	1739.315	374.464	733.465	178.235	298.528	139.166	221.267			
850.000	758.971	1747.420	371.047	739.288	177.245	302.312	138.632	224.514			
900.000	751.574	1756.404	368.056	745.330	176.384	306.099	138.173	227.735			
950.000	745.053	1766.068	365.420	751.528	175.631	309.875	137.775	230.926			
1000.000	739.270	1776.257	363.083	757.834	174.968	313.629	137.428	234.080			
1050.000	734.113	1786.847	361.000	764.209	174.380	317.354	137.123	237.195			
1100.000	729.491	1797.740	359.133	770.623	173.857	321.043	136.854	240.268			
1150.000	725.329	1808.855	357.453	777.052	173.388	324.692	136.616	243.297			
1200.000	721.566	1820.128	355.935	783.477	172.967	328.298	136.403	246.281			
1250.000	718.149	1831.507	354.558	789.883	172.586	331.858	136.213	249.219			
1300.000	715.037	1842.949	353.304	796.256	172.240	335.371	136.041	252.112			
1350.000	712.191	1854.419	352.159	802.589	171.925	338.834	135.886	254.959			
1400.000	709.581	1865.889	351.109	808.872	171.637	342.249	135.745	257.760			
1450.000	707.180	1877.336	350.144	815.100	171.373	345.613	135.616	260.515			
1500.000	704.966	1888.741	349.255	821.268	171.131	348.928	135.498	263.227			

Mg, Magnesium

A = 24.312

Z = 12

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	1.520		3.040		6.080		7.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
16.560	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
17.000	212.712	212.712	-.----	-.----	-.----	-.----	-.----	-.----		
18.000	628.715	628.715	-.----	-.----	-.----	-.----	-.----	-.----		
19.000	959.753	959.753	-.----	-.----	-.----	-.----	-.----	-.----		
20.000	1224.514	1224.514	-.----	-.----	-.----	-.----	-.----	-.----		
25.000	1945.215	1945.215	-.----	-.----	-.----	-.----	-.----	-.----		
30.000	2176.143	2176.143	-.----	-.----	-.----	-.----	-.----	-.----		
32.620	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
33.000	-.----	-.----	24.135	24.135	-.----	-.----	-.----	-.----		
34.000	-.----	-.----	84.125	84.125	-.----	-.----	-.----	-.----		
35.000	2219.846	2224.874	137.533	137.533	-.----	-.----	-.----	-.----		
36.000	-.----	-.----	185.169	185.169	-.----	-.----	-.----	-.----		
37.000	-.----	-.----	227.727	227.727	-.----	-.----	-.----	-.----		
38.000	-.----	-.----	265.806	265.806	-.----	-.----	-.----	-.----		
39.000	-.----	-.----	299.921	299.921	-.----	-.----	-.----	-.----		
40.000	2186.811	2222.591	330.521	330.521	-.----	-.----	-.----	-.----		
45.000	2122.405	2199.326	442.836	442.836	-.----	-.----	-.----	-.----		
50.000	2046.676	2165.760	509.117	509.117	-.----	-.----	-.----	-.----		
55.000	1968.839	2127.530	547.912	547.912	-.----	-.----	-.----	-.----		
60.000	1893.151	2087.706	569.732	569.732	-.----	-.----	-.----	-.----		
63.400	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
64.000	-.----	-.----	-.----	-.----	5.110	5.110	-.----	-.----		
65.000	1821.488	2047.982	580.806	580.981	13.332	13.332	-.----	-.----		
66.000	-.----	-.----	-.----	-.----	21.087	21.087	-.----	-.----		
67.000	-.----	-.----	-.----	-.----	28.407	28.407	-.----	-.----		
68.000	-.----	-.----	-.----	-.----	35.320	35.320	-.----	-.----		
69.000	-.----	-.----	-.----	-.----	41.853	41.853	-.----	-.----		
70.000	1754.555	2009.287	584.959	587.509	48.030	48.030	-.----	-.----		
75.000	1692.475	1972.116	584.614	591.370	74.306	74.306	-.----	-.----		
78.190	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
79.000	-.----	-.----	-.----	-.----	-.----	-.----	3.644	3.644		
80.000	1635.086	1936.707	581.339	593.321	94.441	94.441	7.973	7.973		
85.000	-.----	-.----	576.169	593.898	110.021	110.021	26.869	26.869		
90.000	1533.163	1871.448	569.799	593.481	122.171	122.171	41.992	41.992		
95.000	-.----	-.----	562.701	592.348	131.703	131.703	54.206	54.206		

Mg, Magnesium

A=24.312

Z=12

<-----Surface Sputtering Regime-----><-----Bulk Displacement Regime----->										T _d
Displacement Energy(eV)=	T _s 1.520		2T _s 3.040		4T _s 6.080		5T _s 7.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade Cs (barns)
100.000	1446.088	1813.393	555.195	590.703	139.216	139.216	64.149	64.149		
105.000	-----	-----	-----	-----	145.153	145.153	72.301	72.301		
110.000	1371.280	1761.901	539.781	586.441	149.853	149.853	79.025	79.025		
115.000	-----	-----	-----	-----	153.570	153.570	84.602	84.602		
120.000	1306.563	1716.216	524.614	581.501	156.504	156.504	89.249	89.249		
125.000	-----	-----	-----	-----	-----	-----	93.137	93.137		
130.000	1250.168	1675.604	510.178	576.339	160.605	161.031	96.403	96.403		
135.000	-----	-----	-----	-----	-----	-----	99.153	99.153		
140.000	1200.681	1639.410	496.669	571.216	163.040	164.568	101.476	101.476		
150.000	1156.968	1607.064	484.142	566.278	164.368	167.389	105.107	105.126		
160.000	1118.120	1578.074	472.576	561.606	164.954	169.683	107.721	108.061		
170.000	1083.400	1552.023	461.920	557.238	165.040	171.586	109.607	110.556		
180.000	1052.208	1528.554	452.107	553.191	164.790	173.195	110.963	112.709		
190.000	1024.053	1507.364	443.066	549.464	164.314	174.581	111.932	114.593		
200.000	998.526	1488.190	434.728	546.051	163.692	175.798	112.614	116.264		
210.000	975.290	1470.810	427.028	542.938	162.976	176.885	113.082	117.766		
220.000	954.060	1455.029	419.905	540.109	162.206	177.872	113.391	119.130		
230.000	934.596	1440.680	413.306	537.548	161.408	178.782	113.581	120.383		
240.000	916.693	1427.617	407.180	535.239	160.600	179.633	113.681	121.546		
250.000	900.179	1415.713	401.485	533.164	159.796	180.439	113.713	122.633		
260.000	884.902	1404.856	396.181	531.308	159.006	181.211	113.696	123.659		
270.000	870.735	1394.949	391.232	529.655	158.234	181.956	113.641	124.633		
280.000	857.564	1385.903	386.607	528.191	157.486	182.682	113.560	125.564		
290.000	845.293	1377.643	382.278	526.903	156.764	183.393	113.459	126.460		
300.000	833.834	1370.100	378.220	525.779	156.070	184.093	113.344	127.325		
310.000	-----	-----	374.409	524.807	155.403	184.786	113.221	128.164		
320.000	-----	-----	370.826	523.975	154.765	185.474	113.092	128.981		
330.000	-----	-----	367.453	523.276	154.154	186.160	112.960	129.779		
340.000	-----	-----	364.272	522.698	153.571	186.843	112.828	130.561		
350.000	786.394	1341.214	361.269	522.234	153.015	187.527	112.696	131.329		
360.000	-----	-----	358.431	521.876	152.484	188.211	112.566	132.085		
370.000	-----	-----	355.744	521.617	151.977	188.896	112.439	132.830		
380.000	-----	-----	353.199	521.451	151.495	189.583	112.316	133.567		
390.000	-----	-----	350.785	521.370	151.035	190.272	112.197	134.295		
400.000	750.988	1323.327	348.493	521.370	150.596	190.963	112.082	135.015		

Mg, Magnesium**A = 24.312****Z = 12**

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	1.520		3.040		6.080		7.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade Cs (barns)
450.000	723.682	1312.977	338.592	522.400	148.689	194.457	111.575	138.534		
500.000	702.074	1307.953	330.741	524.789	147.177	198.008	111.180	141.949		
550.000	684.609	1306.784	324.392	528.160	145.969	201.601	110.880	145.288		
600.000	670.244	1308.455	319.174	532.248	144.993	205.215	110.657	148.564		
650.000	658.254	1312.248	314.825	536.859	144.197	208.834	110.494	151.781		
700.000	648.119	1317.640	311.155	541.852	143.541	212.443	110.377	154.941		
750.000	639.459	1324.250	308.025	547.120	142.997	216.029	110.296	158.044		
800.000	631.988	1331.788	305.332	552.584	142.541	219.585	110.243	161.091		
850.000	625.490	1340.033	302.993	558.184	142.155	223.102	110.210	164.081		
900.000	619.795	1348.818	300.948	563.871	141.827	226.575	110.193	167.016		
950.000	614.772	1358.010	299.146	569.609	141.546	230.001	110.188	169.895		
1000.000	610.315	1367.505	297.550	575.370	141.303	233.377	110.192	172.719		
1050.000	606.339	1377.221	296.127	581.133	141.091	236.701	110.202	175.488		
1100.000	602.773	1387.092	294.851	586.879	140.906	239.972	110.217	178.204		
1150.000	599.562	1397.065	293.703	592.595	140.744	243.190	110.235	180.868		
1200.000	596.658	1407.099	292.665	598.271	140.600	246.355	110.256	183.480		
1250.000	594.021	1417.158	291.723	603.900	140.472	249.466	110.278	186.043		
1300.000	591.618	1427.215	290.864	609.474	140.357	252.524	110.301	188.557		
1350.000	589.421	1437.248	290.079	614.989	140.254	255.529	110.324	191.023		
1400.000	587.405	1447.239	289.359	620.441	140.161	258.484	110.347	193.444		
1450.000	585.551	1457.173	288.697	625.828	140.076	261.388	110.370	195.820		
1500.000	583.840	1467.038	288.086	631.149	139.999	264.242	110.393	198.152		

Al, Aluminum

A = 26.980

Z = 13

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.420		6.840		13.680		17.100		15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
40.430	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
41.000	22.380	22.380	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
42.000	59.264	59.264	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
43.000	92.871	92.871	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
44.000	123.530	123.530	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
45.000	151.533	151.533	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
46.000	177.140	177.140	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
47.000	200.578	200.578	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
48.000	222.052	222.052	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
49.000	241.743	241.743	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
50.000	259.813	259.813	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
55.000	330.434	330.434	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	377.058	377.058	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	407.918	407.918	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	428.164	428.164	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	441.128	441.128	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
78.100	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
79.000	-.----	-.----	4.775	4.775	-.----	-.----	-.----	-.----	-.----	-.----
80.000	449.016	449.143	9.868	9.868	-.----	-.----	-.----	-.----	-.----	-.----
85.000	453.328	454.798	32.102	32.102	-.----	-.----	-.----	-.----	-.----	-.----
90.000	455.099	458.956	49.902	49.902	-.----	-.----	-.----	-.----	-.----	-.----
95.000	455.058	461.966	64.284	64.284	-.----	-.----	-.----	-.----	-.----	-.----
100.000	453.724	464.089	75.997	75.997	-.----	-.----	-.----	-.----	-.----	-.----
105.000	-.----	-.----	85.604	85.604	-.----	-.----	-.----	-.----	-.----	-.----
110.000	448.570	466.425	93.533	93.533	-.----	-.----	-.----	-.----	-.----	-.----
115.000	-.----	-.----	100.112	100.112	-.----	-.----	-.----	-.----	-.----	-.----
120.000	441.574	467.070	105.598	105.598	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	110.190	110.190	-.----	-.----	-.----	-.----	-.----	-.----
130.000	433.788	466.693	114.049	114.049	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	117.301	117.301	-.----	-.----	-.----	-.----	-.----	-.----
140.000	425.790	465.713	120.050	120.050	-.----	-.----	-.----	-.----	-.----	-.----
147.000	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
147.000	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
148.000	-.----	-.----	-.----	-.----	0.750	0.750	-.----	-.----	-.----	-.----
149.000	-.----	-.----	-.----	-.----	1.484	1.484	-.----	-.----	-.----	-.----

Al, Aluminum

A = 26.980

Z = 13

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
	3.420		6.840		13.680		17.100		15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
150.000	417.901	464.395	124.352	124.377	2.201	2.201	-.----	-.----	-.----	-.----
155.000	-.----	-.----	-.----	-.----	5.557	5.557	-.----	-.----	-.----	-.----
159.481	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
160.000	410.290	462.909	127.453	127.865	8.570	8.570	-.----	-.----	0.303	0.303
161.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.877	0.877
162.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.440	1.440
163.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.992	1.992
164.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.530	2.530
165.000	-.----	-.----	-.----	-.----	11.285	11.285	-.----	-.----	3.061	3.061
166.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.580	3.580
167.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.090	4.090
168.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.589	4.589
169.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	5.080	5.080
170.000	403.045	461.366	129.695	130.831	13.740	13.740	-.----	-.----	5.559	5.559
175.000	-.----	-.----	-.----	-.----	15.969	15.969	-.----	-.----	7.829	7.829
178.870	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
179.000	-.----	-.----	-.----	-.----	-.----	-.----	0.052	0.052	-.----	-.----
180.000	396.203	459.837	131.311	133.392	17.998	17.998	0.455	0.455	9.899	9.899
185.000	-.----	-.----	-.----	-.----	19.852	19.852	2.366	2.366	11.791	11.791
190.000	389.773	458.368	132.468	135.634	21.550	21.550	4.122	4.122	13.528	13.528
195.000	-.----	-.----	-.----	-.----	23.110	23.110	5.739	5.739	15.125	15.125
200.000	383.746	456.988	133.286	137.624	24.548	24.548	7.233	7.233	16.599	16.599
205.000	-.----	-.----	-.----	-.----	-.----	-.----	8.616	8.616	17.962	17.962
210.000	378.107	455.714	133.850	139.412	27.106	27.106	9.901	9.901	19.227	19.227
215.000	-.----	-.----	-.----	-.----	-.----	-.----	11.096	11.096	20.402	20.402
220.000	372.833	454.556	134.225	141.037	29.310	29.310	12.212	12.212	21.497	21.497
225.000	-.----	-.----	-.----	-.----	-.----	-.----	13.255	13.255	-.----	-.----
230.000	367.901	453.517	134.457	142.529	31.228	31.228	14.233	14.233	23.467	23.467
235.000	-.----	-.----	-.----	-.----	-.----	-.----	15.151	15.151	-.----	-.----
240.000	363.288	452.599	134.583	143.913	32.911	32.911	16.015	16.015	25.220	25.220
250.000	358.970	451.799	134.628	145.209	34.399	34.399	17.599	17.599	26.765	26.765
260.000	354.926	451.114	134.613	146.430	35.726	35.726	19.017	19.017	28.144	28.144
270.000	351.133	450.541	134.554	147.590	36.916	36.916	20.296	20.296	29.384	29.384
280.000	347.573	450.074	134.461	148.698	37.991	38.032	21.455	21.455	30.508	30.508
290.000	344.228	449.708	134.345	149.763	38.967	39.085	22.513	22.513	31.533	31.533

Al, Aluminum

A = 26.980

Z = 13

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	3.420	6.840	13.680	17.100	15.000					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
300.000	341.082	449.438	134.213	150.792	39.859	40.086	23.483	23.483	32.466	32.492
310.000	338.120	449.259	134.069	151.790	40.677	41.041	24.377	24.377	33.329	33.406
320.000	335.327	449.165	133.918	152.761	41.433	41.954	25.204	25.204	34.122	34.282
330.000	332.692	449.152	133.763	153.710	42.133	42.830	25.974	25.985	34.860	35.120
340.000	330.202	449.215	133.607	154.639	42.784	43.673	26.692	26.734	35.548	35.927
350.000	327.847	449.350	133.451	155.551	43.392	44.486	27.364	27.455	36.190	36.703
360.000	325.618	449.551	133.297	156.449	43.962	45.272	27.996	28.151	36.795	37.453
370.000	323.505	449.815	133.146	157.334	44.498	46.033	28.591	28.824	37.361	38.179
380.000	321.501	450.138	133.000	158.208	45.004	46.772	29.154	29.476	37.894	38.885
390.000	319.598	450.517	132.857	159.071	45.482	47.491	29.687	30.108	38.405	39.567
400.000	317.790	450.947	132.720	159.926	45.935	48.190	30.194	30.723	38.886	40.232
410.000	----	----	----	----	46.365	48.872	30.676	31.321	39.344	40.880
420.000	----	----	----	----	46.775	49.539	31.135	31.904	39.778	41.512
430.000	----	----	----	----	47.167	50.190	31.575	32.473	40.197	42.131
440.000	----	----	----	----	47.541	50.828	31.995	33.029	40.595	42.734
450.000	309.961	453.772	132.110	164.096	47.899	51.453	32.399	33.572	40.977	43.326
460.000	----	----	----	----	48.243	52.066	32.786	34.105	41.343	43.906
470.000	----	----	----	----	48.574	52.669	33.158	34.626	41.697	44.476
480.000	----	----	----	----	48.891	53.260	33.517	35.138	42.034	45.034
490.000	----	----	----	----	49.198	53.842	33.862	35.641	42.361	45.582
500.000	303.738	457.487	131.627	168.139	49.493	54.414	34.196	36.134	42.676	46.122
550.000	298.703	461.847	131.255	172.089	50.829	57.155	35.706	38.485	44.101	48.700
600.000	294.563	466.672	130.972	175.961	51.974	59.726	37.003	40.675	45.328	51.114
650.000	291.114	471.828	130.760	179.762	52.974	62.161	38.135	42.735	46.389	53.386
700.000	288.205	477.219	130.603	183.494	53.856	64.482	39.134	44.688	47.332	55.554
750.000	285.726	482.769	130.488	187.157	54.642	66.706	40.024	46.551	48.167	57.619
800.000	283.592	488.422	130.406	190.753	55.348	68.845	40.823	48.335	48.919	59.605
850.000	281.742	494.137	130.348	194.282	55.985	70.908	41.545	50.050	49.597	61.518
900.000	280.124	499.880	130.310	197.744	56.564	72.902	42.199	51.703	50.213	63.365
950.000	278.700	505.626	130.286	201.139	57.091	74.834	42.795	53.299	50.774	65.152
1000.000	277.438	511.356	130.273	204.469	57.574	76.708	43.340	54.844	51.286	66.889
1050.000	276.314	517.054	130.268	207.734	58.016	78.529	43.841	56.343	51.761	68.569
1100.000	275.307	522.709	130.270	210.935	58.423	80.300	44.301	57.797	52.188	70.196
1150.000	274.401	528.313	130.276	214.075	58.799	82.024	44.726	59.210	52.587	71.786
1200.000	273.580	533.857	130.285	217.154	59.146	83.703	45.118	60.585	52.957	73.333

Al, Aluminum

A = 26.980

Z = 13

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.420		6.840		13.680		17.100		15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1250.000	272.836	539.338	130.297	220.174	59.467	85.341	45.482	61.924	53.299	74.840
1300.000	272.156	544.751	130.310	223.136	59.766	86.940	45.820	63.230	53.616	76.312
1350.000	271.534	550.095	130.324	226.042	60.043	88.501	46.134	64.503	53.906	77.756
1400.000	270.963	555.366	130.338	228.893	60.301	90.026	46.427	65.746	54.186	79.148
1450.000	270.437	560.565	130.353	231.692	60.542	91.518	46.700	66.960	54.441	80.519
1500.000	269.951	565.691	130.367	234.439	60.767	92.977	46.956	68.147	54.681	81.859

Si, Silicon

A = 28.090

Z = 14

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.680		9.360		14.040		23.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
56.740	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
57.000	4.359	4.359	-.----	-.----	-.----	-.----	-.----	-.----		
58.000	20.411	20.411	-.----	-.----	-.----	-.----	-.----	-.----		
59.000	35.442	35.442	-.----	-.----	-.----	-.----	-.----	-.----		
60.000	49.528	49.528	-.----	-.----	-.----	-.----	-.----	-.----		
65.000	108.000	108.000	-.----	-.----	-.----	-.----	-.----	-.----		
70.000	151.060	151.060	-.----	-.----	-.----	-.----	-.----	-.----		
75.000	183.170	183.170	-.----	-.----	-.----	-.----	-.----	-.----		
80.000	207.345	207.345	-.----	-.----	-.----	-.----	-.----	-.----		
85.000	225.672	225.672	-.----	-.----	-.----	-.----	-.----	-.----		
90.000	239.627	239.627	-.----	-.----	-.----	-.----	-.----	-.----		
95.000	250.272	250.272	-.----	-.----	-.----	-.----	-.----	-.----		
100.000	258.385	258.385	-.----	-.----	-.----	-.----	-.----	-.----		
105.000	264.541	264.541	-.----	-.----	-.----	-.----	-.----	-.----		
108.300	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
109.000	-.----	-.----	1.586	1.586	-.----	-.----	-.----	-.----		
110.000	269.173	269.206	3.797	3.797	-.----	-.----	-.----	-.----		
115.000	272.613	273.071	13.851	13.851	-.----	-.----	-.----	-.----		
120.000	275.111	276.387	22.458	22.458	-.----	-.----	-.----	-.----		
125.000	-.----	-.----	29.871	29.871	-.----	-.----	-.----	-.----		
130.000	278.024	281.723	36.289	36.289	-.----	-.----	-.----	-.----		
135.000	-.----	-.----	41.876	41.876	-.----	-.----	-.----	-.----		
140.000	279.025	285.769	46.761	46.761	-.----	-.----	-.----	-.----		
145.000	-.----	-.----	51.054	51.054	-.----	-.----	-.----	-.----		
150.000	278.807	288.899	54.840	54.840	-.----	-.----	-.----	-.----		
155.000	-.----	-.----	58.194	58.194	-.----	-.----	-.----	-.----		
155.890	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
156.000	-.----	-.----	-.----	-.----	0.081	0.081	-.----	-.----		
157.000	-.----	-.----	-.----	-.----	0.805	0.805	-.----	-.----		
158.000	-.----	-.----	-.----	-.----	1.514	1.514	-.----	-.----		
159.000	-.----	-.----	-.----	-.----	2.208	2.208	-.----	-.----		
160.000	277.816	291.369	61.177	61.177	2.888	2.888	-.----	-.----		
165.000	-.----	-.----	-.----	-.----	6.088	6.088	-.----	-.----		
170.000	276.341	293.360	66.220	66.220	8.986	8.986	-.----	-.----		
175.000	-.----	-.----	-.----	-.----	11.621	11.621	-.----	-.----		

Si, Silicon

A = 28.090

Z = 14

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	4.680		9.360		14.040		23.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
180.000	274.573	295.003	70.290	70.290	14.022	14.022	-.----	-.----		
185.000	-.----	-.----	-.----	-.----	16.220	16.220	-.----	-.----		
190.000	272.639	296.391	73.613	73.613	18.235	18.235	-.----	-.----		
195.000	-.----	-.----	-.----	-.----	20.090	20.090	-.----	-.----		
200.000	270.626	297.593	76.359	76.359	21.801	21.801	-.----	-.----		
205.000	-.----	-.----	-.----	-.----	23.385	23.385	-.----	-.----		
210.000	268.590	298.658	78.651	78.733	24.853	24.853	-.----	-.----		
215.000	-.----	-.----	-.----	-.----	26.218	26.218	-.----	-.----		
220.000	266.570	299.625	80.584	80.893	27.490	27.490	-.----	-.----		
230.000	264.591	300.522	82.229	82.875	29.791	29.791	-.----	-.----		
240.000	262.669	301.371	83.642	84.705	31.815	31.815	-.----	-.----		
242.090	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
243.000	-.----	-.----	-.----	-.----	-.----	-.----	0.161	0.161		
244.000	-.----	-.----	-.----	-.----	-.----	-.----	0.337	0.337		
245.000	-.----	-.----	-.----	-.----	-.----	-.----	0.511	0.511		
246.000	-.----	-.----	-.----	-.----	-.----	-.----	0.683	0.683		
247.000	-.----	-.----	-.----	-.----	-.----	-.----	0.853	0.853		
248.000	-.----	-.----	-.----	-.----	-.----	-.----	1.021	1.021		
249.000	-.----	-.----	-.----	-.----	-.----	-.----	1.188	1.188		
250.000	260.814	302.187	84.866	86.408	33.610	33.610	1.353	1.353		
255.000	-.----	-.----	-.----	-.----	-.----	-.----	2.151	2.151		
260.000	259.032	302.983	85.934	88.001	35.213	35.213	2.909	2.909		
265.000	-.----	-.----	-.----	-.----	-.----	-.----	3.631	3.631		
270.000	257.325	303.768	86.874	89.501	36.654	36.654	4.318	4.318		
275.000	-.----	-.----	-.----	-.----	-.----	-.----	4.973	4.973		
280.000	255.694	304.549	87.706	90.920	37.959	37.959	5.600	5.600		
285.000	-.----	-.----	-.----	-.----	-.----	-.----	6.200	6.200		
290.000	254.139	305.331	88.449	92.268	39.146	39.161	6.774	6.774		
295.000	-.----	-.----	-.----	-.----	-.----	-.----	7.326	7.326		
300.000	252.656	306.117	89.116	93.555	40.232	40.303	7.856	7.856		
310.000	251.245	306.912	89.719	94.788	41.232	41.391	8.856	8.856		
320.000	249.902	307.716	90.267	95.973	42.155	42.431	9.786	9.786		
330.000	248.624	308.531	90.768	97.116	43.011	43.428	10.654	10.654		
340.000	247.408	309.358	91.228	98.221	43.809	44.387	11.467	11.467		
350.000	246.251	310.198	91.653	99.293	44.555	45.311	12.231	12.231		

Si, Silicon

A=28.090

Z=14

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->					T _d		
Displacement	T _s	2T _s		4T _s	5T _s		5T _s	5T _s				
Energy(eV)=	4.680	9.360			14.040							
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)		
360.000	245.150	311.051	92.048	100.334	45.254	46.203	12.952	12.952				
370.000	244.101	311.916	92.415	101.348	45.913	47.067	13.634	13.634				
380.000	243.103	312.795	92.759	102.338	46.534	47.904	14.280	14.280				
390.000	242.152	313.686	93.082	103.305	47.121	48.718	14.895	14.895				
400.000	241.245	314.589	93.386	104.252	47.679	49.510	15.481	15.481				
410.000	-.----	-.----	-.----	-.----	48.209	50.282	16.040	16.040				
420.000	-.----	-.----	-.----	-.----	48.714	51.034	16.575	16.575				
430.000	-.----	-.----	-.----	-.----	49.195	51.770	17.088	17.089				
440.000	-.----	-.----	-.----	-.----	49.656	52.490	17.580	17.591				
450.000	237.299	319.272	94.691	108.732	50.097	53.194	18.053	18.080				
460.000	-.----	-.----	-.----	-.----	50.521	53.885	18.508	18.559				
470.000	-.----	-.----	-.----	-.----	50.927	54.563	18.947	19.027				
480.000	-.----	-.----	-.----	-.----	51.319	55.228	19.370	19.485				
490.000	-.----	-.----	-.----	-.----	51.695	55.882	19.779	19.935				
500.000	234.149	324.186	95.741	112.889	52.059	56.525	20.175	20.376				
510.000	-.----	-.----	-.----	-.----	-.----	-.----	20.558	20.808				
520.000	-.----	-.----	-.----	-.----	-.----	-.----	20.929	21.233				
530.000	-.----	-.----	-.----	-.----	-.----	-.----	21.289	21.651				
540.000	-.----	-.----	-.----	-.----	-.----	-.----	21.638	22.062				
550.000	231.601	329.267	96.624	116.810	53.701	59.597	21.977	22.466				
560.000	-.----	-.----	-.----	-.----	-.----	-.----	22.306	22.864				
570.000	-.----	-.----	-.----	-.----	-.----	-.----	22.626	23.256				
580.000	-.----	-.----	-.----	-.----	-.----	-.----	22.938	23.642				
590.000	-.----	-.----	-.----	-.----	-.----	-.----	23.241	24.023				
600.000	229.514	334.458	97.387	120.548	55.107	62.469	23.536	24.399				
650.000	227.783	339.715	98.060	124.135	56.330	65.182	24.905	26.205				
700.000	226.333	345.002	98.661	127.594	57.408	67.763	26.120	27.908				
750.000	225.104	350.292	99.203	130.939	58.367	70.230	27.208	29.524				
800.000	224.055	355.563	99.694	134.182	59.226	72.599	28.187	31.065				
850.000	223.150	360.799	100.142	137.331	60.000	74.881	29.074	32.539				
900.000	222.363	365.987	100.551	140.393	60.701	77.083	29.880	33.955				
950.000	221.674	371.120	100.926	143.375	61.339	79.215	30.617	35.319				
1000.000	221.066	376.189	101.271	146.280	61.921	81.280	31.293	36.635				
1050.000	220.528	381.191	101.589	149.113	62.455	83.285	31.913	37.907				
1100.000	220.047	386.122	101.883	151.878	62.945	85.233	32.486	39.140				

Si, Silicon

A = 28.090

Z = 14

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	4.680		9.360		14.040		23.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1150.000	219.615	390.979	102.154	154.578	63.396	87.128	33.014	40.335		
1200.000	219.226	395.762	102.406	157.216	63.813	88.973	33.504	41.496		
1250.000	218.874	400.470	102.639	159.794	64.198	90.771	33.959	42.624		
1300.000	218.553	405.102	102.855	162.315	64.556	92.526	34.381	43.722		
1350.000	218.259	409.659	103.056	164.783	64.888	94.238	34.775	44.792		
1400.000	217.990	414.141	103.242	167.197	65.196	95.910	35.143	45.834		
1450.000	217.741	418.549	103.416	169.562	65.484	97.544	35.486	46.851		
1500.000	217.511	422.885	103.578	171.879	65.752	99.142	35.808	47.844		

P, Phosphorus**A=30.974****Z=15**

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d
Energy(eV)=		3.440	6.880		13.760	17.200				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
46.430	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
47.000	19.925	19.925	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
48.000	52.818	52.818	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
49.000	83.162	83.162	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
50.000	111.187	111.187	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
55.000	222.914	222.914	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	299.799	299.799	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	353.462	353.462	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	391.238	391.238	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	417.904	417.904	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
80.000	436.661	436.661	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
85.000	449.702	449.702	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
89.280	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
90.000	458.563	458.577	3.411	3.411	-.----	-.----	-.----	-.----	-.----	-.----
91.000	-.----	-.----	8.003	8.003	-.----	-.----	-.----	-.----	-.----	-.----
92.000	-.----	-.----	12.414	12.414	-.----	-.----	-.----	-.----	-.----	-.----
93.000	-.----	-.----	16.653	16.653	-.----	-.----	-.----	-.----	-.----	-.----
94.000	-.----	-.----	20.729	20.729	-.----	-.----	-.----	-.----	-.----	-.----
95.000	464.336	465.169	24.648	24.648	-.----	-.----	-.----	-.----	-.----	-.----
96.000	-.----	-.----	28.419	28.419	-.----	-.----	-.----	-.----	-.----	-.----
97.000	-.----	-.----	32.048	32.048	-.----	-.----	-.----	-.----	-.----	-.----
98.000	-.----	-.----	35.541	35.541	-.----	-.----	-.----	-.----	-.----	-.----
99.000	-.----	-.----	38.905	38.905	-.----	-.----	-.----	-.----	-.----	-.----
100.000	467.812	470.428	42.146	42.146	-.----	-.----	-.----	-.----	-.----	-.----
105.000	-.----	-.----	56.678	56.678	-.----	-.----	-.----	-.----	-.----	-.----
110.000	470.037	477.981	68.832	68.832	-.----	-.----	-.----	-.----	-.----	-.----
115.000	-.----	-.----	79.065	79.065	-.----	-.----	-.----	-.----	-.----	-.----
120.000	468.305	482.777	87.730	87.730	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	95.107	95.107	-.----	-.----	-.----	-.----	-.----	-.----
130.000	464.357	485.771	101.418	101.418	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	106.842	106.842	-.----	-.----	-.----	-.----	-.----	-.----
140.000	459.211	487.580	111.523	111.523	-.----	-.----	-.----	-.----	-.----	-.----
145.000	-.----	-.----	115.578	115.578	-.----	-.----	-.----	-.----	-.----	-.----
150.000	453.472	488.605	119.104	119.104	-.----	-.----	-.----	-.----	-.----	-.----
155.000	-.----	-.----	122.179	122.179	-.----	-.----	-.----	-.----	-.----	-.----

P, Phosphorus

A=30.974

Z=15

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	3.440		6.880		13.760		17.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
160.000	447.504	489.118	124.870	124.870	-.----	-.----	-.----	-.----		
166.900	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
167.000	-.----	-.----	-.----	-.----	0.064	0.064	-.----	-.----		
168.000	-.----	-.----	-.----	-.----	0.737	0.737	-.----	-.----		
169.000	-.----	-.----	-.----	-.----	1.396	1.396	-.----	-.----		
170.000	441.527	489.301	129.308	129.330	2.044	2.044	-.----	-.----		
175.000	-.----	-.----	-.----	-.----	5.105	5.105	-.----	-.----		
180.000	435.674	489.281	132.761	133.102	7.900	7.900	-.----	-.----		
185.000	-.----	-.----	-.----	-.----	10.460	10.460	-.----	-.----		
190.000	430.021	489.145	135.472	136.424	12.812	12.812	-.----	-.----		
195.000	-.----	-.----	-.----	-.----	14.979	14.979	-.----	-.----		
200.000	424.608	488.955	137.617	139.384	16.981	16.981	-.----	-.----		
202.550	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
203.000	-.----	-.----	-.----	-.----	-.----	-.----	0.162	0.162		
204.000	-.----	-.----	-.----	-.----	-.----	-.----	0.523	0.523		
205.000	-.----	-.----	-.----	-.----	18.835	18.835	0.879	0.879		
206.000	-.----	-.----	-.----	-.----	-.----	-.----	1.230	1.230		
207.000	-.----	-.----	-.----	-.----	-.----	-.----	1.576	1.576		
208.000	-.----	-.----	-.----	-.----	-.----	-.----	1.917	1.917		
209.000	-.----	-.----	-.----	-.----	-.----	-.----	2.254	2.254		
210.000	419.457	488.752	139.328	142.049	20.557	20.557	2.585	2.585		
215.000	-.----	-.----	-.----	-.----	22.161	22.161	4.176	4.176		
220.000	414.572	488.566	140.702	144.472	23.657	23.657	5.663	5.663		
225.000	-.----	-.----	-.----	-.----	-.----	-.----	7.055	7.055		
230.000	409.952	488.417	141.812	146.696	26.368	26.368	8.362	8.362		
235.000	-.----	-.----	-.----	-.----	-.----	-.----	9.592	9.592		
240.000	405.589	488.317	142.714	148.755	28.758	28.758	10.750	10.750		
245.000	-.----	-.----	-.----	-.----	-.----	-.----	11.845	11.845		
250.000	401.471	488.277	143.450	150.674	30.883	30.883	12.880	12.880		
255.000	-.----	-.----	-.----	-.----	-.----	-.----	13.861	13.861		
260.000	397.587	488.301	144.055	152.476	32.785	32.785	14.793	14.793		
270.000	393.923	488.392	144.554	154.179	34.500	34.500	16.522	16.522		
280.000	390.465	488.551	144.968	155.796	36.055	36.055	18.095	18.095		
290.000	387.202	488.778	145.313	157.341	37.472	37.472	19.534	19.534		
300.000	384.120	489.072	145.602	158.823	38.772	38.772	20.857	20.857		

P, Phosphorus

A=30.974

Z=15

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s		$2T_s$		$4T_s$		$5T_s$			
	3.440		6.880		13.760		17.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
310.000	381.207	489.430	145.845	160.251	39.969	39.988	22.080	22.080		
320.000	378.453	489.851	146.052	161.631	41.077	41.150	23.214	23.214		
330.000	375.846	490.333	146.228	162.969	42.106	42.263	24.271	24.271		
340.000	373.376	490.872	146.379	164.271	43.066	43.333	25.260	25.260		
350.000	371.035	491.466	146.509	165.540	43.964	44.363	26.187	26.187		
360.000	368.815	492.113	146.623	166.781	44.807	45.357	27.060	27.060		
370.000	366.706	492.809	146.723	167.995	45.602	46.319	27.884	27.895		
380.000	364.702	493.552	146.812	169.187	46.352	47.251	28.664	28.703		
390.000	362.797	494.340	146.891	170.358	47.062	48.155	29.405	29.487		
400.000	360.983	495.169	146.962	171.510	47.736	49.035	30.108	30.247		
410.000	-----	-----	-----	-----	48.377	49.891	30.779	30.987		
420.000	-----	-----	-----	-----	48.988	50.726	31.419	31.707		
430.000	-----	-----	-----	-----	49.571	51.541	32.032	32.408		
440.000	-----	-----	-----	-----	50.129	52.337	32.619	33.093		
450.000	353.105	499.865	147.244	177.040	50.664	53.116	33.182	33.763		
460.000	-----	-----	-----	-----	51.177	53.880	33.723	34.418		
470.000	-----	-----	-----	-----	51.669	54.628	34.243	35.059		
480.000	-----	-----	-----	-----	52.143	55.362	34.744	35.687		
490.000	-----	-----	-----	-----	52.600	56.083	35.228	36.302		
500.000	346.813	505.293	147.462	182.281	53.040	56.792	35.695	36.907		
550.000	341.705	511.251	147.658	187.310	55.029	60.170	37.810	39.778		
600.000	337.494	517.585	147.847	192.170	56.730	63.319	39.628	42.440		
650.000	333.979	524.180	148.033	196.888	58.209	66.284	41.213	44.934		
700.000	331.008	530.949	148.216	201.479	59.510	69.098	42.612	47.291		
750.000	328.472	537.825	148.396	205.953	60.665	71.783	43.857	49.531		
800.000	326.285	544.759	148.571	210.318	61.698	74.356	44.973	51.670		
850.000	324.384	551.713	148.740	214.579	62.628	76.830	45.979	53.721		
900.000	322.718	558.657	148.902	218.742	63.469	79.215	46.891	55.693		
950.000	321.249	565.569	149.056	222.810	64.234	81.520	47.721	57.594		
1000.000	319.944	572.432	149.202	226.788	64.930	83.752	48.478	59.431		
1050.000	318.780	579.234	149.340	230.678	65.568	85.915	49.173	61.208		
1100.000	317.734	585.965	149.470	234.483	66.153	88.015	49.811	62.931		
1150.000	316.790	592.616	149.592	238.207	66.691	90.057	50.399	64.604		
1200.000	315.934	599.184	149.706	241.852	67.188	92.044	50.942	66.229		
1250.000	315.154	605.663	149.813	245.422	67.646	93.979	51.444	67.810		

P, Phosphorus

A=30.974

Z=15

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		3.440	6.880		13.760	17.200				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1300.000	314.441	612.052	149.912	248.918	68.071	95.865	51.910	69.350		
1350.000	313.786	618.349	150.004	252.344	68.465	97.705	52.343	70.850		
1400.000	313.183	624.553	150.090	255.701	68.831	99.501	52.746	72.313		
1450.000	312.625	630.664	150.170	258.992	69.172	101.255	53.122	73.741		
1500.000	312.107	636.682	150.244	262.219	69.490	102.970	53.473	75.136		

S, Sulfur**A = 32.060****Z = 16**

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 2.870		2T _s 5.740		4T _s 11.480		5T _s 14.350			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
40.320	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
41.000	41.083	41.083	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
42.000	97.482	97.482	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
43.000	148.871	148.871	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
44.000	195.756	195.756	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
45.000	238.584	238.584	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
46.000	277.749	277.749	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
47.000	313.601	313.601	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
48.000	346.452	346.452	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
49.000	376.579	376.579	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
50.000	404.229	404.229	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
55.000	512.341	512.341	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	583.784	583.784	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	631.129	631.129	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	662.244	662.244	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	682.211	682.211	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
77.890	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
78.000	-.----	-.----	0.853	0.853	-.----	-.----	-.----	-.----	-.----	-.----
79.000	-.----	-.----	9.014	9.014	-.----	-.----	-.----	-.----	-.----	-.----
80.000	694.405	694.645	16.802	16.802	-.----	-.----	-.----	-.----	-.----	-.----
85.000	701.115	703.515	50.820	50.820	-.----	-.----	-.----	-.----	-.----	-.----
90.000	703.925	710.071	78.086	78.086	-.----	-.----	-.----	-.----	-.----	-.----
95.000	703.949	714.849	100.141	100.141	-.----	-.----	-.----	-.----	-.----	-.----
100.000	701.982	718.253	118.127	118.127	-.----	-.----	-.----	-.----	-.----	-.----
105.000	-.----	-.----	132.900	132.900	-.----	-.----	-.----	-.----	-.----	-.----
110.000	694.208	722.095	145.109	145.109	-.----	-.----	-.----	-.----	-.----	-.----
115.000	-.----	-.----	155.255	155.255	-.----	-.----	-.----	-.----	-.----	-.----
120.000	683.575	723.302	163.728	163.728	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	170.834	170.834	-.----	-.----	-.----	-.----	-.----	-.----
130.000	671.699	722.909	176.816	176.816	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	181.867	181.867	-.----	-.----	-.----	-.----	-.----	-.----
140.000	659.471	721.563	186.145	186.145	-.----	-.----	-.----	-.----	-.----	-.----
146.630	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
147.000	-.----	-.----	-.----	-.----	0.428	0.428	-.----	-.----	-.----	-.----
148.000	-.----	-.----	-.----	-.----	1.576	1.576	-.----	-.----	-.----	-.----

S, Sulfur

A=32.060

Z=16

	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.870		5.740		11.480		14.350			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
149.000	----	----	----	----	2.698	2.698	----	----		
150.000	647.387	719.676	192.861	192.909	3.795	3.795	----	----		
155.000	----	----	----	----	8.936	8.936	----	----		
160.000	635.712	717.514	197.727	198.397	13.557	13.557	----	----		
165.000	----	----	----	----	17.727	17.727	----	----		
170.000	624.582	715.249	201.263	203.071	21.503	21.503	----	----		
175.000	----	----	----	----	24.935	24.935	----	----		
178.430	----	----	----	----	----	----	0.000	0.000		
179.000	----	----	----	----	----	----	0.353	0.353		
180.000	614.059	712.993	203.830	207.111	28.063	28.063	0.970	0.970		
185.000	----	----	----	----	30.925	30.925	3.898	3.898		
190.000	604.156	710.818	205.683	210.653	33.550	33.550	6.591	6.591		
195.000	----	----	----	----	35.964	35.964	9.074	9.074		
200.000	594.866	708.770	207.006	213.798	38.192	38.192	11.371	11.371		
205.000	----	----	----	----	----	----	13.502	13.502		
210.000	586.162	706.877	207.931	216.626	42.162	42.162	15.482	15.482		
215.000	----	----	----	----	----	----	17.328	17.328		
220.000	578.014	705.154	208.557	219.198	45.592	45.592	19.053	19.053		
225.000	----	----	----	----	----	----	20.667	20.667		
230.000	570.387	703.609	208.958	221.559	48.582	48.582	22.182	22.182		
235.000	----	----	----	----	----	----	23.606	23.606		
240.000	563.245	702.243	209.188	223.749	51.210	51.210	24.947	24.947		
250.000	556.553	701.055	209.289	225.798	53.539	53.539	27.410	27.410		
260.000	550.278	700.039	209.292	227.728	55.618	55.618	29.620	29.620		
270.000	544.388	699.190	209.222	229.561	57.485	57.491	31.615	31.615		
280.000	538.855	698.502	209.098	231.311	59.174	59.243	33.427	33.427		
290.000	533.651	697.965	208.933	232.991	60.709	60.901	35.083	35.083		
300.000	528.752	697.573	208.739	234.613	62.112	62.477	36.603	36.603		
310.000	524.133	697.318	208.525	236.184	63.401	63.979	38.005	38.005		
320.000	519.776	697.193	208.297	237.711	64.591	65.416	39.305	39.305		
330.000	515.660	697.189	208.060	239.202	65.694	66.794	40.514	40.533		
340.000	511.767	697.299	207.820	240.661	66.720	68.120	41.642	41.713		
350.000	508.082	697.518	207.578	242.092	67.678	69.398	42.700	42.848		
360.000	504.590	697.838	207.337	243.499	68.576	70.633	43.694	43.943		
370.000	501.278	698.253	207.100	244.885	69.420	71.829	44.631	45.001		

S, Sulfur

A=32.060

Z=16

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->				T _d					
	T _s 2.870	2T _s 5.740	4T _s 11.480	5T _s 14.350						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
380.000	498.133	698.758	206.866	246.251	70.216	72.990	45.516	46.026		
390.000	495.144	699.346	206.639	247.601	70.967	74.118	46.355	47.020		
400.000	492.301	700.013	206.417	248.936	71.680	75.216	47.152	47.986		
410.000	----	----	----	----	72.356	76.286	47.910	48.926		
420.000	----	----	----	----	73.000	77.331	48.633	49.842		
430.000	----	----	----	----	73.613	78.353	49.323	50.735		
440.000	----	----	----	----	74.200	79.352	49.984	51.608		
450.000	479.957	704.367	205.415	255.434	74.760	80.331	50.617	52.461		
460.000	----	----	----	----	75.298	81.291	51.225	53.296		
470.000	----	----	----	----	75.814	82.233	51.809	54.115		
480.000	----	----	----	----	76.310	83.159	52.371	54.917		
490.000	----	----	----	----	76.787	84.069	52.912	55.704		
500.000	470.099	710.069	204.592	261.714	77.246	84.964	53.434	56.477		
550.000	462.083	716.748	203.930	267.835	79.318	89.243	55.792	60.156		
600.000	455.461	724.132	203.401	273.823	81.084	93.250	57.809	63.576		
650.000	449.916	732.019	202.979	279.691	82.614	97.038	59.562	66.790		
700.000	445.217	740.259	202.641	285.445	83.958	100.644	61.102	69.832		
750.000	441.191	748.740	202.369	291.087	85.149	104.095	62.469	72.729		
800.000	437.710	757.376	202.149	296.621	86.212	107.409	63.690	75.500		
850.000	434.676	766.104	201.970	302.046	87.166	110.603	64.788	78.161		
900.000	432.010	774.874	201.823	307.365	88.029	113.688	65.780	80.723		
950.000	429.653	783.647	201.701	312.579	88.810	116.673	66.681	83.196		
1000.000	427.554	792.394	201.598	317.690	89.522	119.567	67.502	85.587		
1050.000	425.675	801.091	201.512	322.699	90.172	122.377	68.252	87.904		
1100.000	423.984	809.722	201.437	327.609	90.767	125.107	68.939	90.151		
1150.000	422.455	818.272	201.372	332.421	91.313	127.764	69.571	92.333		
1200.000	421.065	826.732	201.314	337.139	91.816	130.351	70.154	94.455		
1250.000	419.796	835.093	201.263	341.766	92.279	132.873	70.692	96.521		
1300.000	418.634	843.350	201.216	346.302	92.708	135.333	71.190	98.533		
1350.000	417.566	851.500	201.174	350.751	93.104	137.735	71.651	100.495		
1400.000	416.580	859.540	201.134	355.116	93.472	140.080	72.080	102.410		
1450.000	415.669	867.468	201.097	359.399	93.813	142.373	72.478	104.279		
1500.000	414.823	875.285	201.061	363.602	94.130	144.614	72.850	106.105		

K, Potassium

A = 39.100

Z = 19

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	0.929		1.858		3.716		4.645			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
16.280	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
17.000	920.383	920.383	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
18.000	1977.488	1977.488	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
19.000	2816.208	2816.208	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
20.000	3484.972	3484.972	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
25.000	5288.433	5288.433	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
30.000	5847.855	5847.855	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
32.080	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
33.000	-.----	-.----	155.896	155.896	-.----	-.----	-.----	-.----	-.----	-.----
34.000	-.----	-.----	308.573	308.573	-.----	-.----	-.----	-.----	-.----	-.----
35.000	5935.786	5955.935	444.394	444.394	-.----	-.----	-.----	-.----	-.----	-.----
36.000	-.----	-.----	565.443	565.443	-.----	-.----	-.----	-.----	-.----	-.----
37.000	-.----	-.----	673.507	673.507	-.----	-.----	-.----	-.----	-.----	-.----
38.000	-.----	-.----	770.124	770.124	-.----	-.----	-.----	-.----	-.----	-.----
39.000	-.----	-.----	856.619	856.619	-.----	-.----	-.----	-.----	-.----	-.----
40.000	5832.564	5942.143	934.141	934.141	-.----	-.----	-.----	-.----	-.----	-.----
45.000	5652.651	5875.467	1218.020	1218.020	-.----	-.----	-.----	-.----	-.----	-.----
50.000	5446.313	5783.132	1384.692	1384.692	-.----	-.----	-.----	-.----	-.----	-.----
55.000	5236.460	5679.480	1481.507	1481.507	-.----	-.----	-.----	-.----	-.----	-.----
60.000	5033.537	5572.287	1535.244	1535.244	-.----	-.----	-.----	-.----	-.----	-.----
62.380	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
63.000	-.----	-.----	-.----	-.----	14.368	14.368	-.----	-.----	-.----	-.----
64.000	-.----	-.----	-.----	-.----	36.604	36.604	-.----	-.----	-.----	-.----
65.000	4842.038	5465.823	1561.749	1563.007	57.568	57.568	-.----	-.----	-.----	-.----
66.000	-.----	-.----	-.----	-.----	77.345	77.345	-.----	-.----	-.----	-.----
67.000	-.----	-.----	-.----	-.----	96.016	96.016	-.----	-.----	-.----	-.----
68.000	-.----	-.----	-.----	-.----	113.651	113.651	-.----	-.----	-.----	-.----
69.000	-.----	-.----	-.----	-.----	130.319	130.319	-.----	-.----	-.----	-.----
70.000	4663.546	5362.410	1570.749	1579.783	146.081	146.081	-.----	-.----	-.----	-.----
75.000	4498.212	5263.260	1568.391	1589.652	213.163	213.163	-.----	-.----	-.----	-.----
76.940	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
77.000	-.----	-.----	-.----	-.----	-.----	-.----	0.663	0.663	-.----	-.----
78.000	-.----	-.----	-.----	-.----	-.----	-.----	12.805	12.805	-.----	-.----
79.000	-.----	-.----	-.----	-.----	-.----	-.----	24.387	24.387	-.----	-.----
80.000	4345.498	5168.943	1558.655	1594.574	264.621	264.621	35.439	35.439	-.----	-.----

K, Potassium

A = 39.100

Z = 19

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s		4T _s		5T _s				
Energy(eV)=	0.929	1.858		3.716		4.645				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
85.000	----	----	1544.169	1595.929	304.483	304.483	83.720	83.720		
90.000	4074.454	4995.368	1526.692	1594.710	335.607	335.607	122.420	122.420		
95.000	----	----	1507.417	1591.634	360.060	360.060	153.730	153.730		
100.000	3842.961	4841.142	1487.159	1587.231	379.358	379.358	179.266	179.266		
105.000	----	----	----	----	394.633	394.633	200.242	200.242		
110.000	3644.053	4704.455	1445.755	1575.908	406.740	406.740	217.582	217.582		
115.000	----	----	----	----	416.331	416.331	231.993	231.993		
120.000	3471.904	4583.232	1405.146	1562.833	423.913	423.941	244.029	244.029		
125.000	----	----	----	----	----	----	254.124	254.124		
130.000	3321.810	4475.496	1366.540	1549.191	434.534	436.149	262.621	262.621		
135.000	----	----	----	----	----	----	269.796	269.796		
140.000	3190.014	4379.486	1330.421	1535.658	440.857	445.735	275.870	275.870		
150.000	3073.513	4293.676	1296.912	1522.617	444.315	453.414	285.403	285.564		
160.000	2969.898	4216.760	1265.954	1510.273	445.842	459.686	292.302	293.548		
170.000	2877.219	4147.626	1237.402	1498.731	446.060	464.906	297.306	300.353		
180.000	2793.892	4085.328	1211.079	1488.029	445.391	469.334	300.927	306.238		
190.000	2718.612	4029.056	1186.797	1478.169	444.125	473.158	303.528	311.400		
200.000	2650.306	3978.120	1164.372	1469.130	442.463	476.520	305.370	315.986		
210.000	2588.074	3931.924	1143.633	1460.878	440.547	479.525	306.644	320.110		
220.000	2531.167	3889.958	1124.423	1453.372	438.477	482.255	307.490	323.859		
230.000	2478.949	3851.777	1106.597	1446.570	436.324	484.771	308.012	327.303		
240.000	2430.881	3816.996	1090.027	1440.426	434.136	487.121	308.289	330.497		
250.000	2386.501	3785.277	1074.598	1434.897	431.951	489.342	308.379	333.484		
260.000	2345.413	3756.327	1060.205	1429.942	429.793	491.463	308.330	336.298		
270.000	2307.276	3729.884	1046.755	1425.520	427.679	493.508	308.174	338.969		
280.000	2271.791	3705.720	1034.166	1421.594	425.620	495.493	307.940	341.518		
290.000	2238.700	3683.630	1022.364	1418.129	423.624	497.433	307.648	343.965		
300.000	2207.776	3663.436	1011.282	1415.094	421.695	499.339	307.313	346.326		
310.000	----	----	1000.861	1412.456	419.837	501.219	306.949	348.612		
320.000	----	----	991.046	1410.190	418.049	503.082	306.565	350.835		
330.000	----	----	981.789	1408.268	416.331	504.932	306.169	353.004		
340.000	----	----	973.048	1406.667	414.683	506.774	305.767	355.124		
350.000	2079.426	3585.792	964.782	1405.364	413.103	508.611	305.363	357.204		
360.000	----	----	956.956	1404.340	411.588	510.445	304.961	359.248		
370.000	----	----	949.538	1403.575	410.136	512.279	304.563	361.260		

K, Potassium

A=39.100

Z=19

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 0.929		2T _s 1.858		4T _s 3.716		5T _s 4.645			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
380.000	-.----	-.----	942.498	1403.052	408.746	514.114	304.172	363.243		
390.000	-.----	-.----	935.810	1402.755	407.413	515.952	303.789	365.202		
400.000	1983.219	3537.215	929.449	1402.669	406.137	517.793	303.415	367.139		
450.000	1908.712	3508.563	901.842	1404.951	400.504	527.059	301.702	376.557		
500.000	1849.499	3494.002	879.767	1410.801	395.918	536.427	300.256	385.648		
550.000	1801.440	3489.642	861.770	1419.235	392.144	545.868	299.054	394.498		
600.000	1761.744	3492.803	846.854	1429.552	389.005	555.340	298.054	403.150		
650.000	1728.469	3501.585	834.317	1441.247	386.363	564.801	297.221	411.622		
700.000	1700.221	3514.614	823.652	1453.949	384.116	574.220	296.520	419.925		
750.000	1675.981	3530.877	814.482	1467.380	382.185	583.567	295.925	428.064		
800.000	1654.982	3549.611	806.525	1481.332	380.511	592.821	295.415	436.041		
850.000	1636.642	3570.238	799.561	1495.643	379.047	601.967	294.975	443.859		
900.000	1620.505	3592.311	793.421	1510.190	377.754	610.991	294.589	451.522		
950.000	1606.215	3615.481	787.970	1524.876	376.605	619.885	294.249	459.031		
1000.000	1593.484	3639.474	783.100	1539.627	375.576	628.643	293.945	466.389		
1050.000	1582.083	3664.070	778.724	1554.385	374.649	637.260	293.671	473.599		
1100.000	1571.822	3689.097	774.773	1569.104	373.809	645.736	293.421	480.665		
1150.000	1562.545	3714.415	771.189	1583.751	373.043	654.070	293.192	487.589		
1200.000	1554.124	3739.910	767.923	1598.297	372.342	662.261	292.980	494.376		
1250.000	1546.449	3765.492	764.937	1612.721	371.696	670.311	292.782	501.029		
1300.000	1539.428	3791.087	762.196	1627.007	371.100	678.221	292.597	507.553		
1350.000	1532.985	3816.634	759.672	1641.144	370.547	685.993	292.422	513.950		
1400.000	1527.053	3842.086	757.342	1655.121	370.032	693.629	292.257	520.225		
1450.000	1521.575	3867.402	755.183	1668.932	369.550	701.132	292.100	526.381		
1500.000	1516.502	3892.552	753.179	1682.572	369.097	708.504	291.949	532.421		

Ca, Calcium

A=40.080

Z=20

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	1.850		3.700		7.400		9.250			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
32.730	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
33.000	50.123	50.123	-.----	-.----	-.----	-.----	-.----	-.----		
34.000	223.331	223.331	-.----	-.----	-.----	-.----	-.----	-.----		
35.000	377.573	377.573	-.----	-.----	-.----	-.----	-.----	-.----		
36.000	515.192	515.192	-.----	-.----	-.----	-.----	-.----	-.----		
37.000	638.195	638.195	-.----	-.----	-.----	-.----	-.----	-.----		
38.000	748.308	748.308	-.----	-.----	-.----	-.----	-.----	-.----		
39.000	847.019	847.019	-.----	-.----	-.----	-.----	-.----	-.----		
40.000	935.619	935.619	-.----	-.----	-.----	-.----	-.----	-.----		
45.000	1261.623	1261.623	-.----	-.----	-.----	-.----	-.----	-.----		
50.000	1455.203	1455.203	-.----	-.----	-.----	-.----	-.----	-.----		
55.000	1569.612	1569.612	-.----	-.----	-.----	-.----	-.----	-.----		
60.000	1635.007	1635.007	-.----	-.----	-.----	-.----	-.----	-.----		
63.600	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
64.000	-.----	-.----	9.838	9.838	-.----	-.----	-.----	-.----		
65.000	1669.265	1669.652	33.512	33.512	-.----	-.----	-.----	-.----		
66.000	-.----	-.----	55.856	55.856	-.----	-.----	-.----	-.----		
67.000	-.----	-.----	76.959	76.959	-.----	-.----	-.----	-.----		
68.000	-.----	-.----	96.901	96.901	-.----	-.----	-.----	-.----		
69.000	-.----	-.----	115.759	115.759	-.----	-.----	-.----	-.----		
70.000	1683.382	1690.247	133.601	133.601	-.----	-.----	-.----	-.----		
75.000	1684.327	1703.015	209.653	209.653	-.----	-.----	-.----	-.----		
80.000	1676.626	1710.144	268.164	268.164	-.----	-.----	-.----	-.----		
85.000	1663.275	1713.183	313.643	313.643	-.----	-.----	-.----	-.----		
90.000	1646.292	1713.244	349.291	349.291	-.----	-.----	-.----	-.----		
95.000	1627.050	1711.137	377.420	377.420	-.----	-.----	-.----	-.----		
100.000	1606.494	1707.459	399.733	399.733	-.----	-.----	-.----	-.----		
105.000	-.----	-.----	417.497	417.497	-.----	-.----	-.----	-.----		
110.000	1563.848	1697.055	431.673	431.673	-.----	-.----	-.----	-.----		
115.000	-.----	-.----	442.995	442.995	-.----	-.----	-.----	-.----		
120.000	1521.507	1684.418	452.029	452.029	-.----	-.----	-.----	-.----		
120.830	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
121.000	-.----	-.----	-.----	-.----	0.574	0.574	-.----	-.----		
122.000	-.----	-.----	-.----	-.----	3.930	3.930	-.----	-.----		
123.000	-.----	-.----	-.----	-.----	7.193	7.193	-.----	-.----		

Ca, Calcium

A = 40.080

Z = 20

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		1.850		3.700		7.400		9.250			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
124.000	-.----	-.----	-.----	-.----	10.366	10.366	-.----	-.----			
125.000	-.----	-.----	-.----	-.----	13.452	13.452	-.----	-.----			
126.000	-.----	-.----	-.----	-.----	16.455	16.455	-.----	-.----			
127.000	-.----	-.----	-.----	-.----	19.377	19.377	-.----	-.----			
128.000	-.----	-.----	-.----	-.----	22.222	22.222	-.----	-.----			
129.000	-.----	-.----	-.----	-.----	24.991	24.991	-.----	-.----			
130.000	1480.947	1670.913	464.917	466.044	27.687	27.687	-.----	-.----			
135.000	-.----	-.----	-.----	-.----	40.161	40.161	-.----	-.----			
140.000	1442.802	1657.330	472.878	477.093	51.148	51.148	-.----	-.----			
145.000	-.----	-.----	-.----	-.----	60.869	60.869	-.----	-.----			
147.580	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
148.000	-.----	-.----	-.----	-.----	-.----	-.----	0.754	0.754			
149.000	-.----	-.----	-.----	-.----	-.----	-.----	2.542	2.542			
150.000	1407.277	1644.124	477.531	485.987	69.509	69.509	4.290	4.290			
155.000	-.----	-.----	-.----	-.----	77.220	77.220	12.490	12.490			
160.000	1374.360	1631.551	479.938	493.284	84.129	84.129	19.875	19.875			
165.000	-.----	-.----	-.----	-.----	90.342	90.342	26.550	26.550			
170.000	1343.932	1619.744	480.806	499.382	95.949	95.949	32.606	32.606			
175.000	-.----	-.----	-.----	-.----	101.026	101.026	38.119	38.119			
180.000	1315.825	1608.765	480.618	504.571	105.638	105.638	43.154	43.154			
185.000	-.----	-.----	-.----	-.----	-.----	-.----	47.767	47.767			
190.000	1289.856	1598.629	479.705	509.065	113.680	113.680	52.006	52.006			
195.000	-.----	-.----	-.----	-.----	-.----	-.----	55.913	55.913			
200.000	1265.842	1589.324	478.301	513.022	120.433	120.433	59.523	59.523			
210.000	1243.607	1580.823	476.571	516.563	126.162	126.162	65.973	65.973			
220.000	1222.989	1573.089	474.630	519.779	131.071	131.071	71.562	71.562			
230.000	1203.841	1566.080	472.563	522.741	135.315	135.394	76.448	76.448			
240.000	1186.027	1559.754	470.429	525.504	139.015	139.382	80.756	80.756			
250.000	1169.427	1554.066	468.272	528.111	142.265	143.090	84.581	84.581			
260.000	1153.931	1548.976	466.122	530.594	145.142	146.557	88.002	88.002			
270.000	1139.442	1544.442	463.999	532.980	147.704	149.814	91.082	91.085			
280.000	1125.873	1540.427	461.920	535.289	150.002	152.889	93.871	93.956			
290.000	1113.145	1536.896	459.895	537.540	152.075	155.805	96.410	96.673			
300.000	1101.187	1533.814	457.930	539.743	153.955	158.581	98.733	99.253			
310.000	1089.937	1531.150	456.030	541.911	155.668	161.233	100.869	101.713			

Ca, Calcium

A=40.080

Z=20

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 1.850		2T _s 3.700		4T _s 7.400		5T _s 9.250			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
320.000	1079.337	1528.876	454.196	544.052	157.238	163.774	102.842	104.065		
330.000	1069.337	1526.965	452.430	546.172	158.682	166.217	104.671	106.321		
340.000	1059.888	1525.391	450.731	548.276	160.017	168.572	106.373	108.489		
350.000	1050.950	1524.132	449.097	550.369	161.254	170.848	107.962	110.578		
360.000	1042.485	1523.166	447.529	552.454	162.406	173.052	109.450	112.596		
370.000	1034.458	1522.474	446.024	554.533	163.483	175.191	110.848	114.549		
380.000	1026.838	1522.037	444.579	556.610	164.491	177.271	112.166	116.442		
390.000	1019.596	1521.839	443.192	558.685	165.439	179.297	113.410	118.281		
400.000	1012.707	1521.863	441.862	560.759	166.332	181.273	114.587	120.071		
410.000	-----	-----	-----	-----	-----	-----	115.704	121.814		
420.000	-----	-----	-----	-----	-----	-----	116.766	123.514		
430.000	-----	-----	-----	-----	-----	-----	117.778	125.175		
440.000	-----	-----	-----	-----	-----	-----	118.742	126.799		
450.000	982.777	1524.849	435.972	571.149	170.140	190.537	119.664	128.389		
460.000	-----	-----	-----	-----	-----	-----	120.546	129.946		
470.000	-----	-----	-----	-----	-----	-----	121.391	131.474		
480.000	-----	-----	-----	-----	-----	-----	122.203	132.974		
490.000	-----	-----	-----	-----	-----	-----	122.982	134.448		
500.000	958.812	1531.607	431.151	581.586	173.150	199.007	123.731	135.896		
550.000	939.248	1541.096	427.167	592.056	175.617	206.894	127.093	142.809		
600.000	923.013	1552.576	423.839	602.524	177.691	214.332	129.935	149.263		
650.000	909.351	1565.510	421.029	612.954	179.468	221.404	132.377	155.349		
700.000	897.714	1579.503	418.630	623.316	181.011	228.170	134.502	161.129		
750.000	887.698	1594.263	416.561	633.584	182.364	234.671	136.370	166.649		
800.000	878.997	1609.566	414.762	643.738	183.561	240.937	138.024	171.941		
850.000	871.373	1625.241	413.182	653.761	184.626	246.993	139.498	177.033		
900.000	864.645	1641.158	411.783	663.643	185.577	252.858	140.818	181.943		
950.000	858.664	1657.215	410.535	673.376	186.432	258.546	142.007	186.690		
1000.000	853.316	1673.331	409.413	682.953	187.202	264.070	143.080	191.285		
1050.000	848.506	1689.446	408.399	692.373	187.898	269.442	144.054	195.742		
1100.000	844.158	1705.511	407.477	701.633	188.528	274.670	144.938	200.070		
1150.000	840.210	1721.490	406.634	710.734	189.100	279.764	145.745	204.276		
1200.000	836.609	1737.353	405.860	719.676	189.621	284.730	146.482	208.370		
1250.000	833.312	1753.079	405.146	728.461	190.095	289.576	147.156	212.357		
1300.000	830.284	1768.650	404.483	737.092	190.528	294.307	147.775	216.244		

Ca, Calcium

A=40.080

Z=20

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	1.850		3.700		7.400		9.250			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1350.000	827.492	1784.054	403.867	745.569	190.923	298.928	148.344	220.035		
1400.000	824.912	1799.281	403.292	753.897	191.285	303.445	148.867	223.736		
1450.000	822.520	1814.325	402.752	762.078	191.616	307.862	149.350	227.351		
1500.000	820.297	1829.180	402.245	770.115	191.919	312.184	149.795	230.885		

Sc, Scandium

A = 44.956

Z = 21

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.920		4.840		9.680		19.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
74.800	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	3.210	3.210	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
76.000	19.443	19.443	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
77.000	34.906	34.906	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
78.000	49.644	49.644	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
79.000	63.698	63.698	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
80.000	77.105	77.105	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
85.000	135.611	135.611	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
90.000	182.421	182.421	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
91.010	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
92.000	-.----	-.----	8.809	8.809	-.----	-.----	-.----	-.----	-.----	-.----
93.000	-.----	-.----	17.452	17.452	-.----	-.----	-.----	-.----	-.----	-.----
94.000	-.----	-.----	25.767	25.767	-.----	-.----	-.----	-.----	-.----	-.----
95.000	220.217	220.217	33.769	33.769	-.----	-.----	-.----	-.----	-.----	-.----
96.000	-.----	-.----	41.472	41.472	-.----	-.----	-.----	-.----	-.----	-.----
97.000	-.----	-.----	48.890	48.890	-.----	-.----	-.----	-.----	-.----	-.----
98.000	-.----	-.----	56.036	56.036	-.----	-.----	-.----	-.----	-.----	-.----
99.000	-.----	-.----	62.922	62.922	-.----	-.----	-.----	-.----	-.----	-.----
100.000	250.978	250.978	69.560	69.560	-.----	-.----	-.----	-.----	-.----	-.----
105.000	276.187	276.187	99.391	99.391	-.----	-.----	-.----	-.----	-.----	-.----
110.000	296.972	296.972	124.438	124.438	-.----	-.----	-.----	-.----	-.----	-.----
115.000	314.199	314.199	145.610	145.610	-.----	-.----	-.----	-.----	-.----	-.----
120.000	328.541	328.541	163.615	163.615	-.----	-.----	-.----	-.----	-.----	-.----
125.000	340.528	340.528	179.013	179.013	-.----	-.----	-.----	-.----	-.----	-.----
130.000	350.579	350.579	192.249	192.249	-.----	-.----	-.----	-.----	-.----	-.----
135.000	359.029	359.029	203.680	203.680	-.----	-.----	-.----	-.----	-.----	-.----
140.000	366.149	366.149	213.595	213.595	-.----	-.----	-.----	-.----	-.----	-.----
145.000	-.----	-.----	222.230	222.230	-.----	-.----	-.----	-.----	-.----	-.----
150.000	377.230	377.877	229.779	229.779	-.----	-.----	-.----	-.----	-.----	-.----
155.000	-.----	-.----	236.402	236.402	-.----	-.----	-.----	-.----	-.----	-.----
160.000	385.138	387.693	242.230	242.230	-.----	-.----	-.----	-.----	-.----	-.----
169.980	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
170.000	390.770	396.049	251.932	251.932	0.026	0.026	-.----	-.----	-.----	-.----
171.000	-.----	-.----	-.----	-.----	1.306	1.306	-.----	-.----	-.----	-.----
172.000	-.----	-.----	-.----	-.----	2.562	2.562	-.----	-.----	-.----	-.----

Sc, Scandium

A = 44.956

Z = 21

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s		$2T_s$		$4T_s$		$5T_s$			
	3.920		4.840		9.680		19.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
173.000	-,-,-	-,-,-	-,-,-	-,-,-	3.797	3.797	-,-,-	-,-,-		
174.000	-,-,-	-,-,-	-,-,-	-,-,-	5.009	5.009	-,-,-	-,-,-		
175.000	-,-,-	-,-,-	-,-,-	-,-,-	6.200	6.200	-,-,-	-,-,-		
176.000	-,-,-	-,-,-	-,-,-	-,-,-	7.370	7.370	-,-,-	-,-,-		
177.000	-,-,-	-,-,-	-,-,-	-,-,-	8.520	8.520	-,-,-	-,-,-		
178.000	-,-,-	-,-,-	-,-,-	-,-,-	9.649	9.649	-,-,-	-,-,-		
179.000	-,-,-	-,-,-	-,-,-	-,-,-	10.760	10.760	-,-,-	-,-,-		
180.000	394.746	403.268	259.577	259.966	11.852	11.852	-,-,-	-,-,-		
185.000	-,-,-	-,-,-	-,-,-	-,-,-	17.043	17.043	-,-,-	-,-,-		
190.000	397.508	409.596	265.662	267.056	21.825	21.825	-,-,-	-,-,-		
195.000	-,-,-	-,-,-	-,-,-	-,-,-	26.243	26.243	-,-,-	-,-,-		
200.000	399.370	415.214	270.549	273.383	30.335	30.335	-,-,-	-,-,-		
205.000	-,-,-	-,-,-	-,-,-	-,-,-	34.136	34.136	-,-,-	-,-,-		
210.000	400.561	420.264	274.506	279.086	37.675	37.675	-,-,-	-,-,-		
215.000	-,-,-	-,-,-	-,-,-	-,-,-	40.978	40.978	-,-,-	-,-,-		
220.000	401.252	424.855	277.734	284.277	44.068	44.068	-,-,-	-,-,-		
225.000	-,-,-	-,-,-	-,-,-	-,-,-	46.965	46.965	-,-,-	-,-,-		
230.000	401.566	429.073	280.386	289.040	49.686	49.686	-,-,-	-,-,-		
235.000	-,-,-	-,-,-	-,-,-	-,-,-	52.247	52.247	-,-,-	-,-,-		
240.000	401.598	432.985	282.577	293.447	54.662	54.662	-,-,-	-,-,-		
250.000	401.420	436.645	284.400	297.553	59.104	59.104	-,-,-	-,-,-		
260.000	401.085	440.096	285.923	301.404	63.095	63.095	-,-,-	-,-,-		
270.000	400.634	443.373	287.205	305.037	66.705	66.705	-,-,-	-,-,-		
280.000	400.099	446.503	288.287	308.483	69.988	69.988	-,-,-	-,-,-		
290.000	399.504	449.511	289.207	311.769	72.989	72.989	-,-,-	-,-,-		
300.000	398.869	452.415	289.991	314.914	75.747	75.747	-,-,-	-,-,-		
308.370	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	0.000	0.000		
309.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	0.118	0.118		
310.000	398.208	455.230	290.664	317.936	78.293	78.301	0.303	0.303		
315.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	1.214	1.214		
320.000	397.531	457.970	291.244	320.852	80.652	80.729	2.097	2.097		
325.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	2.954	2.954		
330.000	396.848	460.644	291.746	323.674	82.846	83.055	3.787	3.787		
335.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	4.598	4.598		
340.000	396.165	463.263	292.182	326.411	84.894	85.288	5.386	5.386		

Sc, Scandium

A = 44.956

Z = 21

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	3.920		4.840		9.680		19.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
345.000	-.----	-.----	-.----	-.----	-.----	-.----	6.154	6.154		
350.000	395.488	465.833	292.564	329.075	86.813	87.438	6.902	6.902		
355.000	-.----	-.----	-.----	-.----	-.----	-.----	7.632	7.632		
360.000	394.819	468.361	292.899	331.672	88.614	89.510	8.344	8.344		
370.000	394.163	470.852	293.194	334.209	90.312	91.514	9.720	9.720		
380.000	393.520	473.310	293.456	336.693	91.914	93.453	11.034	11.034		
390.000	392.893	475.739	293.689	339.127	93.431	95.334	12.294	12.294		
400.000	392.283	478.143	293.898	341.518	94.870	97.161	13.502	13.502		
410.000	-.----	-.----	-.----	-.----	96.237	98.939	14.664	14.664		
420.000	-.----	-.----	-.----	-.----	97.539	100.670	15.783	15.783		
430.000	-.----	-.----	-.----	-.----	98.781	102.359	16.862	16.862		
440.000	-.----	-.----	-.----	-.----	99.968	104.008	17.903	17.903		
450.000	389.493	489.855	294.680	352.927	101.103	105.619	18.909	18.909		
460.000	-.----	-.----	-.----	-.----	102.191	107.196	19.883	19.883		
470.000	-.----	-.----	-.----	-.----	103.235	108.741	20.826	20.826		
480.000	-.----	-.----	-.----	-.----	104.237	110.255	21.740	21.740		
490.000	-.----	-.----	-.----	-.----	105.201	111.740	22.626	22.626		
500.000	387.128	501.192	295.197	363.645	106.129	113.198	23.487	23.487		
510.000	-.----	-.----	-.----	-.----	-.----	-.----	24.323	24.323		
520.000	-.----	-.----	-.----	-.----	-.----	-.----	25.136	25.136		
530.000	-.----	-.----	-.----	-.----	-.----	-.----	25.927	25.927		
540.000	-.----	-.----	-.----	-.----	-.----	-.----	26.697	26.702		
550.000	385.136	512.255	295.578	373.856	110.300	120.130	27.447	27.463		
560.000	-.----	-.----	-.----	-.----	-.----	-.----	28.177	28.212		
570.000	-.----	-.----	-.----	-.----	-.----	-.----	28.889	28.949		
580.000	-.----	-.----	-.----	-.----	-.----	-.----	29.583	29.674		
590.000	-.----	-.----	-.----	-.----	-.----	-.----	30.261	30.389		
600.000	383.454	523.088	295.881	383.669	113.835	126.564	30.922	31.094		
650.000	382.024	533.710	296.137	393.148	116.878	132.599	34.002	34.473		
700.000	380.797	544.130	296.358	402.334	119.528	138.305	36.755	37.644		
750.000	379.735	554.353	296.552	411.257	121.859	143.731	39.231	40.640		
800.000	378.807	564.379	296.724	419.938	123.924	148.917	41.467	43.484		
850.000	377.988	574.212	296.875	428.393	125.765	153.889	43.497	46.196		
900.000	377.259	583.852	297.008	436.635	127.415	158.672	45.345	48.791		
950.000	376.604	593.303	297.124	444.675	128.900	163.284	47.035	51.281		

Sc, Scandium

A = 44.956

Z = 21

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 3.920		2T _s 4.840		4T _s 9.680		5T _s 19.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1000.000	376.011	602.566	297.224	452.523	130.243	167.740	48.582	53.676		
1050.000	375.469	611.646	297.309	460.188	131.460	172.053	50.005	55.984		
1100.000	374.971	620.545	297.380	467.677	132.568	176.233	51.314	58.214		
1150.000	374.509	629.267	297.437	474.997	133.578	180.291	52.523	60.370		
1200.000	374.080	637.818	297.483	482.156	134.501	184.234	53.641	62.459		
1250.000	373.679	646.202	297.517	489.159	135.348	188.070	54.677	64.486		
1300.000	373.301	654.422	297.541	496.012	136.125	191.804	55.639	66.453		
1350.000	372.945	662.485	297.555	502.721	136.840	195.443	56.533	68.366		
1400.000	372.608	670.394	297.560	509.292	137.499	198.992	57.365	70.226		
1450.000	372.288	678.154	297.558	515.729	138.107	202.456	58.142	72.038		
1500.000	371.982	685.768	297.548	522.038	138.669	205.838	58.867	73.805		

Ti, Titanium

A=47.900

Z=22

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=		4.860	9.720			19.440	24.300			15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
96.870	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
97.000	1.069	1.069	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
98.000	9.214	9.214	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
99.000	17.068	17.068	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
100.000	24.644	24.644	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
105.000	58.767	58.767	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
110.000	87.530	87.530	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
115.000	111.943	111.943	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
120.000	132.797	132.797	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
125.000	150.714	150.714	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
130.000	166.191	166.191	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	179.626	179.626	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	191.343	191.343	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	201.605	201.605	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	210.630	210.630	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	218.596	218.596	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	225.653	225.653	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	237.518	237.518	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	247.005	247.005	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.290	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
181.000	-.----	-.----	0.824	0.824	-.----	-.----	-.----	-.----	-.----	-.----	
182.000	-.----	-.----	1.982	1.982	-.----	-.----	-.----	-.----	-.----	-.----	
183.000	-.----	-.----	3.121	3.121	-.----	-.----	-.----	-.----	-.----	-.----	
184.000	-.----	-.----	4.241	4.241	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	-.----	-.----	5.344	5.344	-.----	-.----	-.----	-.----	-.----	-.----	
186.000	-.----	-.----	6.428	6.428	-.----	-.----	-.----	-.----	-.----	-.----	
187.000	-.----	-.----	7.496	7.496	-.----	-.----	-.----	-.----	-.----	-.----	
188.000	-.----	-.----	8.546	8.546	-.----	-.----	-.----	-.----	-.----	-.----	
189.000	-.----	-.----	9.580	9.580	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	254.676	254.996	10.597	10.597	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	-.----	-.----	15.456	15.456	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	260.942	262.135	19.961	19.961	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	-.----	-.----	24.149	24.149	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	266.110	268.577	28.053	28.053	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	-.----	-.----	31.700	31.700	-.----	-.----	-.----	-.----	-.----	-.----	

Ti, Titanium

A=47.900

Z=22

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	4.860		9.720		19.440		24.300		15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
220.000	270.408	274.440	35.115	35.115	-.----	-.----	-.----	-.----	-.----	-.----
225.000	-.----	-.----	38.320	38.320	-.----	-.----	-.----	-.----	-.----	-.----
230.000	274.012	279.821	41.334	41.334	-.----	-.----	-.----	-.----	-.----	-.----
235.000	-.----	-.----	44.174	44.174	-.----	-.----	-.----	-.----	-.----	-.----
240.000	277.058	284.797	46.855	46.855	-.----	-.----	-.----	-.----	-.----	-.----
250.000	279.651	289.429	51.792	51.792	-.----	-.----	-.----	-.----	-.----	-.----
260.000	281.872	293.769	56.237	56.237	-.----	-.----	-.----	-.----	-.----	-.----
260.780	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
261.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.078	0.078
262.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.435	0.435
263.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.788	0.788
264.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.137	1.137
265.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.484	1.484
266.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.828	1.828
267.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.168	2.168
268.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.506	2.506
269.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.840	2.840
270.000	283.789	297.858	60.264	60.264	-.----	-.----	-.----	-.----	3.172	3.172
275.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.789	4.789
280.000	285.453	301.730	63.934	63.934	-.----	-.----	-.----	-.----	6.341	6.341
285.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	7.831	7.831
290.000	286.906	305.414	67.295	67.295	-.----	-.----	-.----	-.----	9.264	9.264
295.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	10.644	10.644
300.000	288.183	308.934	70.388	70.388	-.----	-.----	-.----	-.----	11.974	11.974
305.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	13.258	13.258
310.000	289.311	312.311	73.247	73.247	-.----	-.----	-.----	-.----	14.499	14.499
315.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	15.698	15.698
320.000	290.313	315.561	75.900	75.900	-.----	-.----	-.----	-.----	16.859	16.859
322.460	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
323.000	-.----	-.----	-.----	-.----	0.095	0.095	-.----	-.----	-.----	-.----
324.000	-.----	-.----	-.----	-.----	0.272	0.272	-.----	-.----	-.----	-.----
325.000	-.----	-.----	-.----	-.----	0.447	0.447	-.----	-.----	-.----	-.----
326.000	-.----	-.----	-.----	-.----	0.622	0.622	-.----	-.----	-.----	-.----
327.000	-.----	-.----	-.----	-.----	0.796	0.796	-.----	-.----	-.----	-.----
328.000	-.----	-.----	-.----	-.----	0.969	0.969	-.----	-.----	-.----	-.----

Ti, Titanium

A=47.900

Z=22

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.860		9.720		19.440		24.300		15.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
329.000	----	----	----	----	1.141	1.141	----	----	----	----
330.000	291.207	318.699	78.372	78.391	1.312	1.312	----	----	19.075	19.075
335.000	----	----	----	----	2.154	2.154	----	----	----	----
340.000	292.010	321.738	80.682	80.779	2.974	2.974	----	----	21.161	21.161
345.000	----	----	----	----	3.774	3.774	----	----	----	----
350.000	292.734	324.687	82.848	83.076	4.555	4.555	----	----	23.132	23.132
355.000	----	----	----	----	5.317	5.317	----	----	----	----
360.000	293.390	327.557	84.885	85.291	6.062	6.062	----	----	24.998	24.998
365.000	----	----	----	----	6.790	6.790	----	----	----	----
370.000	293.987	330.355	86.806	87.431	7.503	7.503	----	----	26.771	26.771
375.000	----	----	----	----	8.200	8.200	----	----	----	----
380.000	294.533	333.088	88.621	89.501	8.883	8.883	----	----	28.458	28.458
385.130	----	----	----	----	----	----	0.000	0.000	----	----
386.000	----	----	----	----	----	----	0.085	0.085	----	----
387.000	----	----	----	----	----	----	0.182	0.182	----	----
388.000	----	----	----	----	----	----	0.280	0.280	----	----
389.000	----	----	----	----	----	----	0.376	0.376	----	----
390.000	295.034	335.761	90.340	91.508	10.208	10.208	0.473	0.473	30.066	30.066
395.000	----	----	----	----	----	----	0.952	0.952	----	----
400.000	295.495	338.381	91.972	93.456	11.483	11.483	1.424	1.424	31.604	31.604
405.000	----	----	----	----	----	----	1.890	1.890	----	----
410.000	----	----	93.524	95.350	12.710	12.710	2.349	2.349	33.076	33.076
415.000	----	----	----	----	----	----	2.803	2.803	----	----
420.000	----	----	95.004	97.194	13.895	13.895	3.251	3.251	34.487	34.487
425.000	----	----	----	----	----	----	3.693	3.693	----	----
430.000	----	----	96.415	98.992	15.038	15.038	4.129	4.129	35.842	35.842
435.000	----	----	----	----	----	----	4.560	4.560	----	----
440.000	----	----	97.765	100.746	16.144	16.144	4.986	4.986	37.144	37.144
450.000	297.358	350.812	99.057	102.460	17.215	17.215	5.824	5.824	38.398	38.398
460.000	----	----	100.295	104.136	18.253	18.253	6.641	6.641	39.607	39.611
470.000	----	----	101.483	105.776	19.259	19.259	7.441	7.441	40.773	40.795
480.000	----	----	102.625	107.383	20.236	20.236	8.223	8.223	41.900	41.953
490.000	----	----	103.724	108.959	21.185	21.185	8.988	8.988	42.989	43.088
500.000	298.722	362.393	104.782	110.505	22.107	22.107	9.737	9.737	44.042	44.200
510.000	----	----	----	----	23.004	23.004	10.470	10.470	45.062	45.290

Ti, Titanium

A=47.900

Z=22

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 15.000	
	T _s 4.860		2T _s 9.720		4T _s 19.440		5T _s 24.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
520.000	----	----	----	----	23.877	23.877	11.188	11.188	46.051	46.360
530.000	----	----	----	----	24.728	24.728	11.892	11.892	47.009	47.410
540.000	----	----	----	----	25.556	25.556	12.581	12.581	47.939	48.443
550.000	299.783	373.351	109.540	117.843	26.364	26.364	13.257	13.257	48.842	49.457
560.000	----	----	----	----	27.151	27.154	13.920	13.920	49.720	50.455
570.000	----	----	----	----	27.920	27.932	14.570	14.570	50.572	51.437
580.000	----	----	----	----	28.669	28.697	15.207	15.207	51.402	52.404
590.000	----	----	----	----	29.401	29.451	15.832	15.832	52.208	53.356
600.000	300.646	383.821	113.574	124.638	30.116	30.195	16.445	16.445	52.994	54.294
610.000	----	----	----	----	----	----	17.047	17.047	----	----
620.000	----	----	----	----	----	----	17.637	17.637	----	----
630.000	----	----	----	----	----	----	18.217	18.217	----	----
640.000	----	----	----	----	----	----	18.786	18.786	----	----
650.000	301.366	393.888	117.048	130.997	33.455	33.760	19.344	19.344	56.629	58.794
660.000	----	----	----	----	----	----	19.893	19.895	----	----
670.000	----	----	----	----	----	----	20.431	20.439	----	----
680.000	----	----	----	----	----	----	20.960	20.976	----	----
690.000	----	----	----	----	----	----	21.479	21.508	----	----
700.000	301.981	403.607	120.074	136.997	36.447	37.104	21.989	22.033	59.841	63.016
750.000	302.510	413.018	122.733	142.694	39.143	40.262	24.408	24.576	62.702	67.003
800.000	302.970	422.150	125.089	148.128	41.583	43.260	26.626	26.994	65.264	70.789
850.000	303.372	431.023	127.189	153.333	43.801	46.116	28.663	29.300	67.572	74.400
900.000	303.722	439.656	129.069	158.333	45.822	48.848	30.539	31.507	69.660	77.855
950.000	304.029	448.064	130.761	163.148	47.672	51.469	32.269	33.626	71.555	81.171
1000.000	304.296	456.260	132.290	167.796	49.367	53.988	33.867	35.664	73.282	84.361
1050.000	304.530	464.253	133.676	172.291	50.926	56.416	35.345	37.628	74.860	87.438
1100.000	304.732	472.055	134.936	176.644	52.362	58.760	36.716	39.525	76.305	90.409
1150.000	304.907	479.674	136.084	180.867	53.688	61.027	37.989	41.360	77.633	93.284
1200.000	305.057	487.118	137.134	184.967	54.915	63.221	39.172	43.136	78.856	96.070
1250.000	305.185	494.395	138.096	188.953	56.052	65.349	40.274	44.858	79.983	98.772
1300.000	305.292	501.510	138.978	192.832	57.108	67.415	41.302	46.531	81.026	101.397
1350.000	305.382	508.472	139.790	196.610	58.089	69.422	42.261	48.155	81.991	103.949
1400.000	305.454	515.286	140.537	200.292	59.003	71.374	43.158	49.736	82.887	106.433
1450.000	305.512	521.959	141.227	203.884	59.856	73.275	43.997	51.274	83.719	108.852
1500.000	305.557	528.495	141.864	207.391	60.652	75.127	44.784	52.773	84.493	111.210

V, Vanadium

A = 50.942

Z = 23

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	5.330		10.660		21.320		26.650		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
111.520	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
112.000	2.782	2.782	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
113.000	8.518	8.518	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
114.000	14.080	14.080	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	19.476	19.476	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
116.000	24.711	24.711	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
117.000	29.793	29.793	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
118.000	34.725	34.725	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
119.000	39.515	39.515	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	44.167	44.167	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	65.532	65.532	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	84.124	84.124	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	100.388	100.388	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	114.687	114.687	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
145.000	127.316	127.316	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
150.000	138.518	138.518	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	148.495	148.495	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	157.416	157.416	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
165.000	165.421	165.421	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
170.000	172.628	172.628	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
175.000	179.140	179.140	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
180.000	185.040	185.040	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
190.000	195.291	195.291	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
200.000	203.852	203.852	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
205.900	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
206.000	-.----	-.----	0.079	0.079	-.----	-.----	-.----	-.----	-.----	-.----
207.000	-.----	-.----	0.921	0.921	-.----	-.----	-.----	-.----	-.----	-.----
208.000	-.----	-.----	1.751	1.751	-.----	-.----	-.----	-.----	-.----	-.----
209.000	-.----	-.----	2.571	2.571	-.----	-.----	-.----	-.----	-.----	-.----
210.000	211.076	211.115	3.379	3.379	-.----	-.----	-.----	-.----	-.----	-.----
215.000	-.----	-.----	7.265	7.265	-.----	-.----	-.----	-.----	-.----	-.----
220.000	217.229	217.650	10.909	10.909	-.----	-.----	-.----	-.----	-.----	-.----
225.000	-.----	-.----	14.334	14.334	-.----	-.----	-.----	-.----	-.----	-.----
230.000	222.515	223.648	17.560	17.560	-.----	-.----	-.----	-.----	-.----	-.----
235.000	-.----	-.----	20.605	20.605	-.----	-.----	-.----	-.----	-.----	-.----

V, Vanadium

A = 50.942

Z = 23

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 5.330		$2T_s$ 10.660		$4T_s$ 21.320		$5T_s$ 26.650		T_d 30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
240.000	227.095	229.192	23.483	23.483	-.----	-.----	-.----	-.----	-.----	-.----
245.000	-.----	-.----	26.210	26.210	-.----	-.----	-.----	-.----	-.----	-.----
250.000	231.093	234.347	28.798	28.798	-.----	-.----	-.----	-.----	-.----	-.----
255.000	-.----	-.----	31.258	31.258	-.----	-.----	-.----	-.----	-.----	-.----
260.000	234.607	239.168	33.600	33.600	-.----	-.----	-.----	-.----	-.----	-.----
270.000	237.718	243.701	37.964	37.964	-.----	-.----	-.----	-.----	-.----	-.----
280.000	240.488	247.984	41.954	41.954	-.----	-.----	-.----	-.----	-.----	-.----
290.000	242.969	252.047	45.621	45.621	-.----	-.----	-.----	-.----	-.----	-.----
300.000	245.204	255.919	49.006	49.006	-.----	-.----	-.----	-.----	-.----	-.----
310.000	247.228	259.620	52.144	52.144	-.----	-.----	-.----	-.----	-.----	-.----
320.000	249.069	263.170	55.066	55.066	-.----	-.----	-.----	-.----	-.----	-.----
330.000	250.752	266.586	57.795	57.795	-.----	-.----	-.----	-.----	-.----	-.----
340.000	252.296	269.882	60.353	60.353	-.----	-.----	-.----	-.----	-.----	-.----
350.000	253.720	273.070	62.758	62.758	-.----	-.----	-.----	-.----	-.----	-.----
360.000	255.036	276.160	65.025	65.025	-.----	-.----	-.----	-.----	-.----	-.----
364.660	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
365.000	-.----	-.----	-.----	-.----	0.043	0.043	-.----	-.----	-.----	-.----
366.000	-.----	-.----	-.----	-.----	0.172	0.172	-.----	-.----	-.----	-.----
367.000	-.----	-.----	-.----	-.----	0.301	0.301	-.----	-.----	-.----	-.----
368.000	-.----	-.----	-.----	-.----	0.429	0.429	-.----	-.----	-.----	-.----
369.000	-.----	-.----	-.----	-.----	0.557	0.557	-.----	-.----	-.----	-.----
370.000	256.258	279.162	67.168	67.174	0.684	0.684	-.----	-.----	-.----	-.----
375.000	-.----	-.----	-.----	-.----	1.313	1.313	-.----	-.----	-.----	-.----
380.000	257.397	282.083	69.197	69.247	1.931	1.931	-.----	-.----	-.----	-.----
385.000	-.----	-.----	-.----	-.----	2.539	2.539	-.----	-.----	-.----	-.----
390.000	258.460	284.932	71.125	71.255	3.137	3.137	-.----	-.----	-.----	-.----
395.000	-.----	-.----	-.----	-.----	3.726	3.726	-.----	-.----	-.----	-.----
400.000	259.457	287.713	72.958	73.204	4.305	4.305	-.----	-.----	-.----	-.----
405.000	-.----	-.----	-.----	-.----	4.876	4.876	-.----	-.----	-.----	-.----
410.000	-.----	-.----	74.705	75.096	5.438	5.438	-.----	-.----	-.----	-.----
415.000	-.----	-.----	-.----	-.----	5.993	5.993	-.----	-.----	-.----	-.----
420.000	-.----	-.----	76.373	76.937	6.539	6.539	-.----	-.----	-.----	-.----
430.000	-.----	-.----	77.968	78.731	7.608	7.608	-.----	-.----	-.----	-.----
434.090	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
435.000	-.----	-.----	-.----	-.----	-.----	-.----	0.065	0.065	-.----	-.----

V, Vanadium

A=50.942

Z=23

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	5.330		10.660		21.320		26.650		30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
436.000	-.---	-.---	-.---	-.---	-.---	-.---	0.136	0.136	-.---	-.---
437.000	-.---	-.---	-.---	-.---	-.---	-.---	0.207	0.207	-.---	-.---
438.000	-.---	-.---	-.---	-.---	-.---	-.---	0.278	0.278	-.---	-.---
439.000	-.---	-.---	-.---	-.---	-.---	-.---	0.350	0.350	-.---	-.---
440.000	-.---	-.---	79.495	80.479	8.648	8.648	0.421	0.421	-.---	-.---
445.000	-.---	-.---	-.---	-.---	-.---	-.---	0.774	0.774	-.---	-.---
450.000	263.640	300.783	80.959	82.186	9.661	9.661	1.126	1.126	-.---	-.---
455.000	-.---	-.---	-.---	-.---	-.---	-.---	1.476	1.476	-.---	-.---
460.000	-.---	-.---	82.364	83.853	10.648	10.648	1.823	1.823	-.---	-.---
465.000	-.---	-.---	-.---	-.---	-.---	-.---	2.169	2.169	-.---	-.---
470.000	-.---	-.---	83.715	85.484	11.610	11.610	2.512	2.512	-.---	-.---
475.000	-.---	-.---	-.---	-.---	-.---	-.---	2.854	2.854	-.---	-.---
475.230	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	0.000	0.000
476.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	0.040	0.040
477.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	0.092	0.092
478.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	0.145	0.145
479.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	0.197	0.197
480.000	-.---	-.---	85.016	87.081	12.548	12.548	3.193	3.193	0.249	0.249
485.000	-.---	-.---	-.---	-.---	-.---	-.---	3.531	3.531	0.510	0.510
490.000	-.---	-.---	86.268	88.645	13.465	13.465	3.866	3.866	0.772	0.772
495.000	-.---	-.---	-.---	-.---	-.---	-.---	4.199	4.199	1.033	1.033
500.000	266.867	312.778	87.475	90.178	14.359	14.359	4.530	4.530	1.294	1.294
505.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	1.555	1.555
510.000	-.---	-.---	-.---	-.---	15.233	15.233	5.186	5.186	1.815	1.815
515.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	2.075	2.075
520.000	-.---	-.---	-.---	-.---	16.087	16.087	5.833	5.833	2.335	2.335
525.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	2.594	2.594
530.000	-.---	-.---	-.---	-.---	16.922	16.922	6.472	6.472	2.852	2.852
535.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---	3.110	3.110
540.000	-.---	-.---	-.---	-.---	17.738	17.738	7.103	7.103	3.367	3.367
550.000	269.457	323.987	92.923	97.438	18.537	18.537	7.725	7.725	3.879	3.879
560.000	-.---	-.---	-.---	-.---	19.318	19.318	8.338	8.338	4.389	4.389
570.000	-.---	-.---	-.---	-.---	20.083	20.083	8.944	8.944	4.894	4.894
580.000	-.---	-.---	-.---	-.---	20.832	20.832	9.541	9.541	5.396	5.396
590.000	-.---	-.---	-.---	-.---	21.565	21.565	10.129	10.129	5.894	5.894

V, Vanadium

A = 50.942

Z = 23

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T _s 5.330		2T _s 10.660		4T _s 21.320		5T _s 26.650		T _d 30.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
600.000	271.595	334.584	97.565	104.133	22.283	22.283	10.710	10.710	6.388	6.388
610.000	-----	-----	-----	-----	22.987	22.987	11.282	11.282	6.878	6.878
620.000	-----	-----	-----	-----	23.676	23.676	11.846	11.846	7.363	7.363
630.000	-----	-----	-----	-----	24.352	24.356	12.402	12.402	7.843	7.843
640.000	-----	-----	-----	-----	25.014	25.026	12.950	12.950	8.319	8.319
650.000	273.397	344.685	101.576	110.377	25.663	25.688	13.490	13.490	8.790	8.790
660.000	-----	-----	-----	-----	26.300	26.342	14.022	14.022	9.255	9.255
670.000	-----	-----	-----	-----	26.924	26.987	14.547	14.547	9.716	9.716
680.000	-----	-----	-----	-----	27.536	27.625	15.063	15.063	10.172	10.172
690.000	-----	-----	-----	-----	28.136	28.256	15.572	15.572	10.623	10.623
700.000	274.936	354.366	105.080	116.248	28.726	28.879	16.074	16.074	11.068	11.068
710.000	-----	-----	-----	-----	-----	-----	16.568	16.568	11.508	11.508
720.000	-----	-----	-----	-----	-----	-----	17.055	17.055	11.944	11.944
730.000	-----	-----	-----	-----	-----	-----	17.535	17.535	12.373	12.373
740.000	-----	-----	-----	-----	-----	-----	18.007	18.010	12.798	12.798
750.000	276.267	363.683	108.169	121.807	31.510	31.893	18.473	18.480	13.218	13.218
760.000	-----	-----	-----	-----	-----	-----	18.931	18.946	13.632	13.632
770.000	-----	-----	-----	-----	-----	-----	19.383	19.407	14.041	14.041
780.000	-----	-----	-----	-----	-----	-----	19.828	19.864	14.445	14.445
790.000	-----	-----	-----	-----	-----	-----	20.266	20.317	14.844	14.844
800.000	277.426	372.676	110.910	127.095	34.050	34.755	20.698	20.765	15.238	15.239
850.000	278.441	381.376	113.357	132.148	36.373	37.483	22.763	22.948	17.133	17.165
900.000	279.336	389.809	115.554	136.992	38.503	40.091	24.680	25.040	18.906	19.014
950.000	280.126	397.995	117.533	141.648	40.460	42.593	26.460	27.048	20.566	20.791
1000.000	280.826	405.951	119.324	146.134	42.262	44.998	28.114	28.982	22.119	22.505
1050.000	281.448	413.692	120.949	150.466	43.925	47.315	29.653	30.846	23.572	24.158
1100.000	282.000	421.230	122.429	154.656	45.463	49.551	31.087	32.647	24.931	25.757
1150.000	282.493	428.577	123.780	158.714	46.886	51.713	32.423	34.389	26.204	27.304
1200.000	282.931	435.743	125.016	162.650	48.207	53.805	33.670	36.076	27.396	28.804
1250.000	283.322	442.737	126.149	166.472	49.433	55.834	34.835	37.712	28.514	30.259
1300.000	283.670	449.567	127.191	170.188	50.575	57.802	35.924	39.300	29.562	31.672
1350.000	283.980	456.241	128.151	173.804	51.638	59.714	36.944	40.843	30.547	33.046
1400.000	284.255	462.765	129.036	177.325	52.631	61.573	37.900	42.344	31.472	34.382
1450.000	284.499	469.147	129.854	180.758	53.558	63.383	38.796	43.805	32.343	35.684
1500.000	284.716	475.392	130.610	184.106	54.425	65.146	39.638	45.229	33.162	36.952

Cr, Chromium

A=51.996

Z=24

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.110		8.220		16.440		20.550		21.300	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
89.510	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
90.000	6.153	6.153	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
91.000	18.493	18.493	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
92.000	30.355	30.355	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
93.000	41.762	41.762	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
94.000	52.735	52.735	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
95.000	63.294	63.294	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
96.000	73.459	73.459	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
97.000	83.248	83.248	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
98.000	92.677	92.677	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
99.000	101.764	101.764	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	110.522	110.522	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	149.879	149.879	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	182.922	182.922	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	210.849	210.849	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	234.598	234.598	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	254.906	254.906	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	272.359	272.359	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	287.431	287.431	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	300.501	300.501	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
145.000	311.882	311.882	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
150.000	321.827	321.827	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	330.549	330.549	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	338.221	338.221	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
167.310	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
168.000	-.----	-.----	1.221	1.221	-.----	-.----	-.----	-.----	-.----	-.----
169.000	-.----	-.----	2.988	2.988	-.----	-.----	-.----	-.----	-.----	-.----
170.000	350.980	351.023	4.723	4.723	-.----	-.----	-.----	-.----	-.----	-.----
175.000	-.----	-.----	12.947	12.947	-.----	-.----	-.----	-.----	-.----	-.----
180.000	361.019	361.874	20.483	20.483	-.----	-.----	-.----	-.----	-.----	-.----
185.000	-.----	-.----	27.412	27.412	-.----	-.----	-.----	-.----	-.----	-.----
190.000	368.992	371.452	33.800	33.800	-.----	-.----	-.----	-.----	-.----	-.----
195.000	-.----	-.----	39.708	39.708	-.----	-.----	-.----	-.----	-.----	-.----
200.000	375.379	380.000	45.185	45.185	-.----	-.----	-.----	-.----	-.----	-.----
205.000	-.----	-.----	50.277	50.277	-.----	-.----	-.----	-.----	-.----	-.----

Cr, Chromium

A = 51.996

Z = 24

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.110		8.220		16.440		20.550		21.300	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
210.000	380.532	387.706	55.022	55.022	-.----	-.----	-.----	-.----	-.----	-.----
215.000	-.----	-.----	59.455	59.455	-.----	-.----	-.----	-.----	-.----	-.----
220.000	384.719	394.718	63.604	63.604	-.----	-.----	-.----	-.----	-.----	-.----
230.000	388.140	401.153	71.157	71.157	-.----	-.----	-.----	-.----	-.----	-.----
240.000	390.951	407.106	77.856	77.856	-.----	-.----	-.----	-.----	-.----	-.----
250.000	393.272	412.652	83.843	83.843	-.----	-.----	-.----	-.----	-.----	-.----
260.000	395.195	417.852	89.228	89.228	-.----	-.----	-.----	-.----	-.----	-.----
270.000	396.797	422.758	94.102	94.102	-.----	-.----	-.----	-.----	-.----	-.----
280.000	398.134	427.410	98.538	98.538	-.----	-.----	-.----	-.----	-.----	-.----
290.000	399.255	431.844	102.596	102.596	-.----	-.----	-.----	-.----	-.----	-.----
300.000	400.196	436.088	106.325	106.325	-.----	-.----	-.----	-.----	-.----	-.----
300.850	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
301.000	-.----	-.----	-.----	-.----	0.039	0.039	-.----	-.----	-.----	-.----
302.000	-.----	-.----	-.----	-.----	0.307	0.307	-.----	-.----	-.----	-.----
303.000	-.----	-.----	-.----	-.----	0.574	0.574	-.----	-.----	-.----	-.----
304.000	-.----	-.----	-.----	-.----	0.839	0.839	-.----	-.----	-.----	-.----
305.000	-.----	-.----	-.----	-.----	1.102	1.102	-.----	-.----	-.----	-.----
306.000	-.----	-.----	-.----	-.----	1.364	1.364	-.----	-.----	-.----	-.----
307.000	-.----	-.----	-.----	-.----	1.624	1.624	-.----	-.----	-.----	-.----
308.000	-.----	-.----	-.----	-.----	1.882	1.882	-.----	-.----	-.----	-.----
309.000	-.----	-.----	-.----	-.----	2.139	2.139	-.----	-.----	-.----	-.----
310.000	400.989	440.166	109.768	109.811	2.394	2.394	-.----	-.----	-.----	-.----
315.000	-.----	-.----	-.----	-.----	3.647	3.647	-.----	-.----	-.----	-.----
320.000	401.658	444.098	112.958	113.141	4.863	4.863	-.----	-.----	-.----	-.----
325.000	-.----	-.----	-.----	-.----	6.045	6.045	-.----	-.----	-.----	-.----
330.000	402.224	447.903	115.926	116.328	7.194	7.194	-.----	-.----	-.----	-.----
335.000	-.----	-.----	-.----	-.----	8.312	8.312	-.----	-.----	-.----	-.----
340.000	402.703	451.593	118.695	119.389	9.401	9.401	-.----	-.----	-.----	-.----
345.000	-.----	-.----	-.----	-.----	10.462	10.462	-.----	-.----	-.----	-.----
350.000	403.110	455.183	121.288	122.333	11.497	11.497	-.----	-.----	-.----	-.----
355.000	-.----	-.----	-.----	-.----	12.506	12.506	-.----	-.----	-.----	-.----
359.980	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
360.000	403.455	458.683	123.723	125.173	13.493	13.493	0.003	0.003	-.----	-.----
361.000	-.----	-.----	-.----	-.----	-.----	-.----	0.150	0.150	-.----	-.----
362.000	-.----	-.----	-.----	-.----	-.----	-.----	0.298	0.298	-.----	-.----

Cr, Chromium

A = 51.996

Z = 24

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.110		8.220		16.440		20.550		21.300	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
363.000	-.----	-.----	-.----	-.----	-.----	-.----	0.444	0.444	-.----	-.----
364.000	-.----	-.----	-.----	-.----	-.----	-.----	0.590	0.590	-.----	-.----
365.000	-.----	-.----	-.----	-.----	-.----	-.----	0.736	0.736	-.----	-.----
366.000	-.----	-.----	-.----	-.----	-.----	-.----	0.881	0.881	-.----	-.----
367.000	-.----	-.----	-.----	-.----	-.----	-.----	1.025	1.025	-.----	-.----
368.000	-.----	-.----	-.----	-.----	-.----	-.----	1.169	1.169	-.----	-.----
369.000	-.----	-.----	-.----	-.----	-.----	-.----	1.313	1.313	-.----	-.----
370.000	403.749	462.101	126.014	127.916	15.397	15.397	1.456	1.456	-.----	-.----
370.340	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
371.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.088	0.088
372.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.222	0.222
373.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.356	0.356
374.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.489	0.489
375.000	-.----	-.----	-.----	-.----	-.----	-.----	2.163	2.163	0.621	0.621
376.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.754	0.754
377.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.886	0.886
378.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.017	1.017
379.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.148	1.148
380.000	403.998	465.446	128.177	130.571	17.219	17.219	2.859	2.859	1.278	1.278
385.000	-.----	-.----	-.----	-.----	-.----	-.----	3.543	3.543	1.925	1.925
390.000	404.210	468.725	130.223	133.146	18.966	18.966	4.215	4.215	2.562	2.562
395.000	-.----	-.----	-.----	-.----	-.----	-.----	4.877	4.877	3.190	3.190
400.000	404.390	471.944	132.161	135.646	20.642	20.642	5.529	5.529	3.808	3.808
405.000	-.----	-.----	-.----	-.----	-.----	-.----	6.171	6.171	4.417	4.417
410.000	-.----	-.----	134.002	138.077	22.253	22.253	6.803	6.803	5.018	5.018
415.000	-.----	-.----	-.----	-.----	-.----	-.----	7.426	7.426	5.611	5.611
420.000	-.----	-.----	135.754	140.444	23.805	23.805	8.040	8.040	6.195	6.195
425.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.772	6.772
430.000	-.----	-.----	137.423	142.753	25.301	25.301	9.241	9.241	7.342	7.342
435.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	7.903	7.903
440.000	-.----	-.----	139.016	145.006	26.745	26.745	10.410	10.410	8.458	8.458
450.000	404.955	487.297	140.539	147.208	28.140	28.140	11.548	11.548	9.547	9.547
460.000	-.----	-.----	141.996	149.361	29.490	29.490	12.656	12.656	10.608	10.608
470.000	-.----	-.----	143.393	151.470	30.796	30.796	13.736	13.736	11.645	11.645
480.000	-.----	-.----	144.733	153.536	32.062	32.062	14.789	14.789	12.657	12.657

Cr, Chromium

A=51.996

Z=24

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		4.110		8.220		16.440		20.550		21.300	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
490.000	----	----	146.020	155.562	33.289	33.289	15.816	15.816	13.646	13.646	
500.000	405.189	501.708	147.258	157.551	34.480	34.480	16.819	16.819	14.612	14.612	
510.000	----	----	----	----	35.637	35.637	17.798	17.798	15.557	15.557	
520.000	----	----	----	----	36.761	36.761	18.755	18.755	16.482	16.482	
530.000	----	----	----	----	37.853	37.862	19.690	19.690	17.386	17.386	
540.000	----	----	----	----	38.915	38.943	20.604	20.604	18.271	18.271	
550.000	405.265	515.429	152.802	166.997	39.949	40.006	21.498	21.498	19.137	19.137	
560.000	----	----	----	----	40.956	41.051	22.372	22.372	19.985	19.985	
570.000	----	----	----	----	41.936	42.079	23.227	23.227	20.815	20.815	
580.000	----	----	----	----	42.892	43.091	24.064	24.064	21.629	21.629	
590.000	----	----	----	----	43.823	44.088	24.883	24.883	22.425	22.425	
600.000	405.261	528.607	157.472	175.751	44.732	45.069	25.685	25.685	23.206	23.206	
610.000	----	----	----	----	----	----	26.471	26.471	23.971	23.971	
620.000	----	----	----	----	----	----	27.240	27.243	24.721	24.721	
630.000	----	----	----	----	----	----	27.993	28.004	25.457	25.457	
640.000	----	----	----	----	----	----	28.732	28.756	26.178	26.182	
650.000	405.216	541.329	161.467	183.952	48.956	49.774	29.455	29.498	26.885	26.898	
660.000	----	----	----	----	----	----	30.164	30.230	27.578	27.605	
670.000	----	----	----	----	----	----	30.860	30.954	28.258	28.304	
680.000	----	----	----	----	----	----	31.541	31.669	28.925	28.994	
690.000	----	----	----	----	----	----	32.210	32.375	29.580	29.676	
700.000	405.146	553.655	164.926	191.696	52.716	54.181	32.865	33.073	30.222	30.350	
750.000	405.061	565.623	167.949	199.053	56.084	58.338	35.960	36.448	33.260	33.609	
800.000	404.965	577.262	170.612	206.076	59.115	62.279	38.779	39.651	36.032	36.703	
850.000	404.859	588.594	172.972	212.804	61.856	66.032	41.353	42.702	38.569	39.650	
900.000	404.745	599.639	175.075	219.271	64.344	69.618	43.709	45.618	40.895	42.468	
950.000	404.623	610.410	176.957	225.502	66.608	73.055	45.871	48.413	43.033	45.169	
1000.000	404.495	620.922	178.648	231.519	68.677	76.358	47.860	51.099	45.001	47.765	
1050.000	404.359	631.186	180.173	237.338	70.571	79.538	49.692	53.685	46.817	50.265	
1100.000	404.218	641.212	181.552	242.976	72.309	82.607	51.384	56.181	48.496	52.678	
1150.000	404.069	651.011	182.803	248.446	73.909	85.573	52.949	58.592	50.050	55.009	
1200.000	403.916	660.592	183.940	253.758	75.383	88.444	54.399	60.926	51.491	57.265	
1250.000	403.757	669.963	184.976	258.923	76.745	91.226	55.744	63.187	52.829	59.451	
1300.000	403.593	679.132	185.922	263.950	78.006	93.926	56.995	65.381	54.074	61.572	
1350.000	403.425	688.107	186.786	268.846	79.174	96.549	58.159	67.512	55.234	63.632	

Cr, Chromium

A = 51.996

Z = 24

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d			
Energy(eV)=		4.110	8.220		16.440	20.550		21.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
1400.000	403.254	696.895	187.578	273.620	80.259	99.100	59.244	69.583	56.316	65.634	
1450.000	403.080	705.505	188.305	278.277	81.268	101.582	60.256	71.599	57.326	67.583	
1500.000	402.903	713.941	188.972	282.824	82.207	104.000	61.203	73.562	58.270	69.480	

Mn, Manganese**A = 54.938****Z = 25**

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 2.940		2T _s 5.880		4T _s 11.760		5T _s 14.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
68.930	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
69.000	2.104	2.104	-.----	-.----	-.----	-.----	-.----	-.----		
70.000	32.594	32.594	-.----	-.----	-.----	-.----	-.----	-.----		
75.000	163.249	163.249	-.----	-.----	-.----	-.----	-.----	-.----		
80.000	264.789	264.789	-.----	-.----	-.----	-.----	-.----	-.----		
85.000	344.630	344.630	-.----	-.----	-.----	-.----	-.----	-.----		
90.000	408.035	408.035	-.----	-.----	-.----	-.----	-.----	-.----		
95.000	458.816	458.816	-.----	-.----	-.----	-.----	-.----	-.----		
100.000	499.777	499.777	-.----	-.----	-.----	-.----	-.----	-.----		
105.000	533.015	533.015	-.----	-.----	-.----	-.----	-.----	-.----		
110.000	560.120	560.120	-.----	-.----	-.----	-.----	-.----	-.----		
115.000	582.311	582.311	-.----	-.----	-.----	-.----	-.----	-.----		
120.000	600.535	600.535	-.----	-.----	-.----	-.----	-.----	-.----		
130.000	627.890	627.890	-.----	-.----	-.----	-.----	-.----	-.----		
130.500	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
131.000	-.----	-.----	2.147	2.147	-.----	-.----	-.----	-.----		
132.000	-.----	-.----	6.365	6.365	-.----	-.----	-.----	-.----		
133.000	-.----	-.----	10.477	10.477	-.----	-.----	-.----	-.----		
134.000	-.----	-.----	14.489	14.489	-.----	-.----	-.----	-.----		
135.000	-.----	-.----	18.401	18.401	-.----	-.----	-.----	-.----		
136.000	-.----	-.----	22.219	22.219	-.----	-.----	-.----	-.----		
137.000	-.----	-.----	25.944	25.944	-.----	-.----	-.----	-.----		
138.000	-.----	-.----	29.581	29.581	-.----	-.----	-.----	-.----		
139.000	-.----	-.----	33.131	33.131	-.----	-.----	-.----	-.----		
140.000	646.461	647.900	36.597	36.597	-.----	-.----	-.----	-.----		
145.000	-.----	-.----	52.762	52.762	-.----	-.----	-.----	-.----		
150.000	659.001	664.258	67.187	67.187	-.----	-.----	-.----	-.----		
155.000	-.----	-.----	80.115	80.115	-.----	-.----	-.----	-.----		
160.000	667.328	677.874	91.748	91.748	-.----	-.----	-.----	-.----		
165.000	-.----	-.----	102.253	102.253	-.----	-.----	-.----	-.----		
170.000	672.674	689.397	111.776	111.776	-.----	-.----	-.----	-.----		
175.000	-.----	-.----	120.436	120.436	-.----	-.----	-.----	-.----		
180.000	675.889	699.307	128.338	128.338	-.----	-.----	-.----	-.----		
185.000	-.----	-.----	135.569	135.569	-.----	-.----	-.----	-.----		
190.000	677.569	707.957	142.206	142.206	-.----	-.----	-.----	-.----		

Mn, Manganese

A=54.938

Z=25

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.940		5.880		11.760		14.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
195.000	-.----	-.----	148.314	148.314	-.----	-.----	-.----	-.----		
200.000	678.140	715.615	153.951	153.951	-.----	-.----	-.----	-.----		
210.000	677.907	722.486	164.001	164.001	-.----	-.----	-.----	-.----		
220.000	677.095	728.728	172.683	172.683	-.----	-.----	-.----	-.----		
230.000	675.866	734.463	180.247	180.247	-.----	-.----	-.----	-.----		
238.610	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
239.000	-.----	-.----	-.----	-.----	0.242	0.242	-.----	-.----		
240.000	674.342	739.788	186.891	186.894	0.866	0.866	-.----	-.----		
245.000	-.----	-.----	-.----	-.----	3.892	3.892	-.----	-.----		
250.000	672.615	744.779	192.769	192.956	6.769	6.769	-.----	-.----		
255.000	-.----	-.----	-.----	-.----	9.510	9.510	-.----	-.----		
260.000	670.750	749.497	198.005	198.621	12.125	12.125	-.----	-.----		
265.000	-.----	-.----	-.----	-.----	14.623	14.623	-.----	-.----		
270.000	668.800	753.990	202.698	203.939	17.014	17.014	-.----	-.----		
275.000	-.----	-.----	-.----	-.----	19.304	19.304	-.----	-.----		
280.000	666.802	758.298	206.930	208.955	21.502	21.502	-.----	-.----		
285.000	-.----	-.----	-.----	-.----	23.614	23.614	-.----	-.----		
287.200	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
288.000	-.----	-.----	-.----	-.----	-.----	-.----	0.274	0.274		
289.000	-.----	-.----	-.----	-.----	-.----	-.----	0.614	0.614		
290.000	664.784	762.452	210.765	213.705	25.644	25.644	0.951	0.951		
295.000	-.----	-.----	-.----	-.----	27.600	27.600	2.605	2.605		
300.000	662.768	766.478	214.258	218.220	29.485	29.485	4.202	4.202		
305.000	-.----	-.----	-.----	-.----	-.----	-.----	5.748	5.748		
310.000	660.770	770.398	217.455	222.526	33.060	33.060	7.245	7.245		
315.000	-.----	-.----	-.----	-.----	-.----	-.----	8.696	8.696		
320.000	658.801	774.228	220.393	226.645	36.401	36.401	10.104	10.104		
325.000	-.----	-.----	-.----	-.----	-.----	-.----	11.472	11.472		
330.000	656.869	777.983	223.104	230.598	39.535	39.535	12.801	12.801		
335.000	-.----	-.----	-.----	-.----	-.----	-.----	14.093	14.093		
340.000	654.981	781.674	225.615	234.400	42.484	42.484	15.351	15.351		
350.000	653.141	785.312	227.948	238.067	45.266	45.266	17.770	17.770		
360.000	651.351	788.904	230.122	241.611	47.898	47.898	20.072	20.072		
370.000	649.613	792.456	232.155	245.044	50.394	50.394	22.265	22.265		
380.000	647.928	795.975	234.061	248.374	52.766	52.766	24.361	24.361		

Mn, Manganese

A=54.938

Z=25

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	2.940		5.880		11.760		14.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
390.000	646.295	799.465	235.853	251.611	55.025	55.025	26.367	26.367		
400.000	644.714	802.929	237.541	254.762	57.180	57.180	28.290	28.290		
410.000	-.----	-.----	239.134	257.834	59.239	59.239	30.136	30.136		
420.000	-.----	-.----	240.642	260.833	61.211	61.211	31.912	31.912		
430.000	-.----	-.----	242.071	263.764	63.100	63.122	33.622	33.622		
440.000	-.----	-.----	243.429	266.633	64.914	64.983	35.270	35.270		
450.000	637.552	819.961	244.720	269.442	66.657	66.800	36.861	36.861		
460.000	-.----	-.----	245.950	272.197	68.334	68.573	38.398	38.398		
470.000	-.----	-.----	247.124	274.901	69.949	70.306	39.884	39.884		
480.000	-.----	-.----	248.245	277.556	71.506	72.001	41.322	41.322		
490.000	-.----	-.----	249.318	280.166	73.008	73.661	42.714	42.714		
500.000	631.496	836.654	250.346	282.733	74.459	75.287	44.064	44.066		
510.000	-.----	-.----	-.----	-.----	75.862	76.881	45.373	45.388		
520.000	-.----	-.----	-.----	-.----	77.219	78.445	46.644	46.686		
530.000	-.----	-.----	-.----	-.----	78.532	79.980	47.878	47.959		
540.000	-.----	-.----	-.----	-.----	79.804	81.488	49.077	49.210		
550.000	626.354	853.097	254.900	295.005	81.037	82.970	50.243	50.439		
560.000	-.----	-.----	-.----	-.----	82.233	84.427	51.377	51.648		
570.000	-.----	-.----	-.----	-.----	83.393	85.861	52.480	52.837		
580.000	-.----	-.----	-.----	-.----	84.520	87.272	53.554	54.007		
590.000	-.----	-.----	-.----	-.----	85.614	88.661	54.600	55.158		
600.000	621.954	869.315	258.675	306.490	86.678	90.030	55.619	56.293		
650.000	618.154	885.307	261.860	317.340	91.576	96.591	60.347	61.727		
700.000	614.840	901.066	264.582	327.662	95.873	102.742	64.538	66.816		
750.000	611.925	916.580	266.933	337.532	99.671	108.546	68.278	71.612		
800.000	609.338	931.841	268.979	347.007	103.051	114.054	71.633	76.158		
850.000	607.023	946.842	270.772	356.131	106.075	119.303	74.658	80.485		
900.000	604.936	961.578	272.351	364.937	108.793	124.323	77.395	84.619		
950.000	603.041	976.046	273.749	373.455	111.247	129.138	79.880	88.579		
1000.000	601.309	990.247	274.989	381.707	113.469	133.769	82.144	92.384		
1050.000	599.717	1004.182	276.093	389.713	115.488	138.232	84.212	96.048		
1100.000	598.245	1017.854	277.078	397.490	117.328	142.542	86.106	99.582		
1150.000	596.879	1031.266	277.959	405.053	119.010	146.710	87.845	102.998		
1200.000	595.606	1044.425	278.749	412.415	120.550	150.747	89.445	106.303		
1250.000	594.415	1057.334	279.457	419.586	121.963	154.663	90.920	109.506		

Mn, Manganese**A=54.938****Z=25**

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.940		5.880		11.760		14.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1300.000	593.297	1070.001	280.094	426.579	123.263	158.465	92.282	112.614		
1350.000	592.244	1082.430	280.666	433.402	124.460	162.160	93.542	115.633		
1400.000	591.250	1094.628	281.180	440.063	125.566	165.755	94.709	118.568		
1450.000	590.307	1106.599	281.643	446.570	126.587	169.257	95.793	121.424		
1500.000	589.412	1118.351	282.060	452.930	127.533	172.669	96.800	124.206		

Fe, Iron

A = 55.847

Z = 26

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 16.700	
	T _s 4.310		2T _s 8.620		4T _s 17.240		5T _s 21.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
99.890	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	1.173	1.173	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
101.000	11.812	11.812	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
102.000	22.086	22.086	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
103.000	32.011	32.011	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
104.000	41.602	41.602	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	50.873	50.873	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
106.000	59.837	59.837	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
107.000	68.507	68.507	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
108.000	76.895	76.895	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
109.000	85.012	85.012	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	92.870	92.870	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	128.614	128.614	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	159.235	159.235	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	185.626	185.626	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	208.495	208.495	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	228.416	228.416	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	245.850	245.850	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
145.000	261.175	261.175	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
150.000	274.702	274.702	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	286.689	286.689	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	297.350	297.350	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
170.000	315.380	315.380	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
180.000	329.917	329.917	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
185.600	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
186.000	-.----	-.----	0.610	0.610	-.----	-.----	-.----	-.----	-.----	-.----
187.000	-.----	-.----	2.132	2.132	-.----	-.----	-.----	-.----	-.----	-.----
188.000	-.----	-.----	3.629	3.629	-.----	-.----	-.----	-.----	-.----	-.----
189.000	-.----	-.----	5.104	5.104	-.----	-.----	-.----	-.----	-.----	-.----
190.000	341.773	341.862	6.556	6.556	-.----	-.----	-.----	-.----	-.----	-.----
195.000	-.----	-.----	13.497	13.497	-.----	-.----	-.----	-.----	-.----	-.----
200.000	351.543	352.402	19.944	19.944	-.----	-.----	-.----	-.----	-.----	-.----
205.000	-.----	-.----	25.949	25.949	-.----	-.----	-.----	-.----	-.----	-.----
210.000	359.669	361.919	31.555	31.555	-.----	-.----	-.----	-.----	-.----	-.----
215.000	-.----	-.----	36.802	36.802	-.----	-.----	-.----	-.----	-.----	-.----

Fe, Iron

A = 55.847

Z = 26

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=	4.310	8.620			17.240	21.550			16.700	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
220.000	366.489	370.584	41.724	41.724	-.----	-.----	-.----	-.----	-.----	-.----
225.000	-.----	-.----	46.351	46.351	-.----	-.----	-.----	-.----	-.----	-.----
230.000	372.258	378.535	50.708	50.708	-.----	-.----	-.----	-.----	-.----	-.----
235.000	-.----	-.----	54.821	54.821	-.----	-.----	-.----	-.----	-.----	-.----
240.000	377.175	385.885	58.709	58.709	-.----	-.----	-.----	-.----	-.----	-.----
250.000	381.397	392.723	65.885	65.885	-.----	-.----	-.----	-.----	-.----	-.----
260.000	385.044	399.124	72.364	72.364	-.----	-.----	-.----	-.----	-.----	-.----
270.000	388.215	405.147	78.249	78.249	-.----	-.----	-.----	-.----	-.----	-.----
280.000	390.989	410.844	83.624	83.624	-.----	-.----	-.----	-.----	-.----	-.----
290.000	393.429	416.257	88.557	88.557	-.----	-.----	-.----	-.----	-.----	-.----
300.000	395.587	421.421	93.105	93.105	-.----	-.----	-.----	-.----	-.----	-.----
310.000	397.504	426.367	97.316	97.316	-.----	-.----	-.----	-.----	-.----	-.----
320.000	399.216	431.119	101.229	101.229	-.----	-.----	-.----	-.----	-.----	-.----
322.870	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
323.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.032	0.032
324.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.284	0.284
325.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.535	0.535
326.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.785	0.785
327.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.034	1.034
328.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.282	1.282
329.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.528	1.528
330.000	400.751	435.699	104.878	104.878	-.----	-.----	-.----	-.----	1.773	1.773
331.250	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
332.000	-.----	-.----	-.----	-.----	0.174	0.174	-.----	-.----	-.----	-.----
333.000	-.----	-.----	-.----	-.----	0.405	0.405	-.----	-.----	-.----	-.----
334.000	-.----	-.----	-.----	-.----	0.635	0.635	-.----	-.----	-.----	-.----
335.000	-.----	-.----	-.----	-.----	0.864	0.864	-.----	-.----	2.980	2.980
336.000	-.----	-.----	-.----	-.----	1.092	1.092	-.----	-.----	-.----	-.----
337.000	-.----	-.----	-.----	-.----	1.319	1.319	-.----	-.----	-.----	-.----
338.000	-.----	-.----	-.----	-.----	1.545	1.545	-.----	-.----	-.----	-.----
339.000	-.----	-.----	-.----	-.----	1.770	1.770	-.----	-.----	-.----	-.----
340.000	402.135	440.126	108.293	108.325	1.994	1.994	-.----	-.----	4.158	4.158
345.000	-.----	-.----	-.----	-.----	3.098	3.098	-.----	-.----	5.310	5.310
350.000	403.386	444.415	111.496	111.638	4.178	4.178	-.----	-.----	6.435	6.435
355.000	-.----	-.----	-.----	-.----	5.235	5.235	-.----	-.----	7.536	7.536

Fe, Iron

A=55.847

Z=26

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 4.310		$2T_s$ 8.620		$4T_s$ 17.240		$5T_s$ 21.550		T_d 16.700	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
360.000	404.523	448.582	114.511	114.830	6.270	6.270	-.----	-.----	8.613	8.613
365.000	-.----	-.----	-.----	-.----	7.285	7.285	-.----	-.----	9.667	9.667
370.000	405.559	452.636	117.354	117.912	8.279	8.279	-.----	-.----	10.700	10.700
375.000	-.----	-.----	-.----	-.----	9.255	9.255	-.----	-.----	11.712	11.712
380.000	406.507	456.589	120.043	120.892	10.211	10.211	-.----	-.----	12.705	12.705
385.000	-.----	-.----	-.----	-.----	11.151	11.151	-.----	-.----	-.----	-.----
390.000	407.377	460.450	122.589	123.779	12.073	12.073	-.----	-.----	14.634	14.634
395.000	-.----	-.----	-.----	-.----	12.978	12.978	-.----	-.----	-.----	-.----
395.340	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
396.000	-.----	-.----	-.----	-.----	-.----	-.----	0.084	0.084	-.----	-.----
397.000	-.----	-.----	-.----	-.----	-.----	-.----	0.212	0.212	-.----	-.----
398.000	-.----	-.----	-.----	-.----	-.----	-.----	0.340	0.340	-.----	-.----
399.000	-.----	-.----	-.----	-.----	-.----	-.----	0.467	0.467	-.----	-.----
400.000	408.178	464.227	125.007	126.580	13.869	13.869	0.594	0.594	16.492	16.492
405.000	-.----	-.----	-.----	-.----	-.----	-.----	1.225	1.225	-.----	-.----
410.000	-.----	-.----	127.307	129.301	15.603	15.603	1.849	1.849	18.286	18.286
415.000	-.----	-.----	-.----	-.----	-.----	-.----	2.467	2.467	-.----	-.----
420.000	-.----	-.----	129.497	131.948	17.281	17.281	3.079	3.079	20.018	20.018
425.000	-.----	-.----	-.----	-.----	-.----	-.----	3.684	3.684	-.----	-.----
430.000	-.----	-.----	131.587	134.526	18.906	18.906	4.284	4.284	21.693	21.693
435.000	-.----	-.----	-.----	-.----	-.----	-.----	4.878	4.878	-.----	-.----
440.000	-.----	-.----	133.584	137.040	20.481	20.481	5.466	5.466	23.315	23.315
445.000	-.----	-.----	-.----	-.----	-.----	-.----	6.048	6.048	-.----	-.----
450.000	411.387	482.066	135.495	139.494	22.008	22.008	6.625	6.625	24.887	24.887
455.000	-.----	-.----	-.----	-.----	-.----	-.----	7.196	7.196	-.----	-.----
460.000	-.----	-.----	137.325	141.893	23.491	23.491	7.762	7.762	26.411	26.411
470.000	-.----	-.----	139.081	144.238	24.931	24.931	8.878	8.878	27.890	27.890
480.000	-.----	-.----	140.767	146.535	26.331	26.331	9.972	9.972	29.327	29.327
490.000	-.----	-.----	142.388	148.784	27.693	27.693	11.046	11.046	30.723	30.723
500.000	413.680	498.567	143.947	150.990	29.018	29.018	12.101	12.101	32.080	32.080
510.000	-.----	-.----	-.----	-.----	30.309	30.309	13.136	13.136	33.401	33.401
520.000	-.----	-.----	-.----	-.----	31.566	31.566	14.152	14.152	34.686	34.686
530.000	-.----	-.----	-.----	-.----	32.791	32.791	15.149	15.149	35.938	35.938
540.000	-.----	-.----	-.----	-.----	33.985	33.985	16.128	16.128	37.157	37.157
550.000	415.399	514.088	150.942	161.438	35.150	35.150	17.089	17.089	38.346	38.346

Fe, Iron

A = 55.847

Z = 26

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement T_s $2T_s$ $4T_s$ $5T_s$ T_d Energy(eV)= 4.310 8.620 17.240 21.550 16.700 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
560.000	-.----	-.----	-.----	-.----	36.287	36.287	18.033	18.033	39.505	39.508
570.000	-.----	-.----	-.----	-.----	37.396	37.397	18.960	18.960	40.635	40.651
580.000	-.----	-.----	-.----	-.----	38.479	38.489	19.870	19.870	41.738	41.776
590.000	-.----	-.----	-.----	-.----	39.537	39.564	20.763	20.763	42.815	42.884
600.000	416.733	528.845	156.844	171.078	40.570	40.623	21.641	21.641	43.866	43.975
610.000	-.----	-.----	-.----	-.----	41.580	41.667	22.502	22.502	-.----	-.----
620.000	-.----	-.----	-.----	-.----	42.567	42.695	23.349	23.349	-.----	-.----
630.000	-.----	-.----	-.----	-.----	43.531	43.710	24.180	24.180	-.----	-.----
640.000	-.----	-.----	-.----	-.----	44.475	44.710	24.996	24.996	-.----	-.----
650.000	417.793	542.975	161.898	180.072	45.397	45.697	25.798	25.798	48.769	49.202
660.000	-.----	-.----	-.----	-.----	46.300	46.672	26.586	26.586	-.----	-.----
670.000	-.----	-.----	-.----	-.----	47.183	47.634	27.360	27.361	-.----	-.----
680.000	-.----	-.----	-.----	-.----	48.048	48.583	28.120	28.125	-.----	-.----
690.000	-.----	-.----	-.----	-.----	48.894	49.522	28.867	28.881	-.----	-.----
700.000	418.648	556.570	166.275	188.533	49.722	50.448	29.601	29.628	53.151	54.095
750.000	419.345	569.696	170.100	196.546	53.616	54.926	33.083	33.241	57.088	58.705
800.000	419.915	582.400	173.468	204.172	57.135	59.167	36.276	36.670	60.641	63.072
850.000	420.381	594.719	176.451	211.460	60.327	63.202	39.208	39.935	63.860	67.226
900.000	420.760	606.682	179.108	218.448	63.232	67.054	41.904	43.056	66.784	71.192
950.000	421.066	618.315	181.484	225.167	65.883	70.743	44.388	46.046	69.450	74.990
1000.000	421.309	629.637	183.618	231.643	68.308	74.285	46.680	48.919	71.887	78.636
1050.000	421.499	640.668	185.541	237.895	70.532	77.692	48.797	51.684	74.119	82.144
1100.000	421.642	651.421	187.279	243.944	72.576	80.977	50.756	54.350	76.169	85.527
1150.000	421.745	661.912	188.853	249.803	74.458	84.150	52.572	56.925	78.055	88.793
1200.000	421.812	672.153	190.284	255.487	76.195	87.218	54.256	59.416	79.795	91.953
1250.000	421.848	682.155	191.587	261.006	77.801	90.190	55.822	61.829	81.402	95.013
1300.000	421.856	691.929	192.775	266.373	79.288	93.072	57.279	64.168	82.888	97.981
1350.000	421.840	701.485	193.861	271.595	80.667	95.870	58.637	66.439	84.266	100.862
1400.000	421.803	710.833	194.854	276.681	81.947	98.589	59.903	68.646	85.545	103.662
1450.000	421.747	719.980	195.766	281.639	83.138	101.233	61.086	70.793	86.734	106.385
1500.000	421.675	728.936	196.602	286.475	84.248	103.808	62.192	72.882	87.841	109.037

Co, Cobalt

A = 58.933

Z = 27

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		4.440		8.880		17.760		22.200		23.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
107.820	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
108.000	1.593	1.593	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
109.000	10.702	10.702	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
110.000	19.526	19.526	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
115.000	59.743	59.743	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
120.000	94.319	94.319	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
125.000	124.232	124.232	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
130.000	150.258	150.258	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	173.023	173.023	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	193.034	193.034	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	210.705	210.705	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	226.376	226.376	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	240.331	240.331	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	252.804	252.804	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	274.063	274.063	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	291.392	291.392	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	305.687	305.687	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
199.470	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	317.607	317.608	0.695	0.695	-.----	-.----	-.----	-.----	-.----	-.----	
201.000	-.----	-.----	2.006	2.006	-.----	-.----	-.----	-.----	-.----	-.----	
202.000	-.----	-.----	3.299	3.299	-.----	-.----	-.----	-.----	-.----	-.----	
203.000	-.----	-.----	4.575	4.575	-.----	-.----	-.----	-.----	-.----	-.----	
204.000	-.----	-.----	5.833	5.833	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	-.----	-.----	7.074	7.074	-.----	-.----	-.----	-.----	-.----	-.----	
206.000	-.----	-.----	8.298	8.298	-.----	-.----	-.----	-.----	-.----	-.----	
207.000	-.----	-.----	9.506	9.506	-.----	-.----	-.----	-.----	-.----	-.----	
208.000	-.----	-.----	10.698	10.698	-.----	-.----	-.----	-.----	-.----	-.----	
209.000	-.----	-.----	11.874	11.874	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	327.645	328.034	13.035	13.035	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	-.----	-.----	18.620	18.620	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	336.176	337.533	23.865	23.865	-.----	-.----	-.----	-.----	-.----	-.----	
225.000	-.----	-.----	28.800	28.800	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	343.487	346.252	33.454	33.454	-.----	-.----	-.----	-.----	-.----	-.----	
235.000	-.----	-.----	37.851	37.851	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	349.801	354.308	42.012	42.012	-.----	-.----	-.----	-.----	-.----	-.----	
245.000	-.----	-.----	45.959	45.959	-.----	-.----	-.----	-.----	-.----	-.----	

Co, Cobalt

A = 58.933

Z = 27

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T _s	2T _s		4T _s	5T _s		T _d		
Energy(eV)=		4.440	8.880		17.760	22.200		23.000		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
250.000	355.294	361.799	49.707	49.707	-.----	-.----	-.----	-.----	-.----	-.----
255.000	-.----	-.----	53.273	53.273	-.----	-.----	-.----	-.----	-.----	-.----
260.000	360.105	368.805	56.670	56.670	-.----	-.----	-.----	-.----	-.----	-.----
270.000	364.345	375.391	63.009	63.009	-.----	-.----	-.----	-.----	-.----	-.----
280.000	368.105	381.612	68.811	68.811	-.----	-.----	-.----	-.----	-.----	-.----
290.000	371.456	387.514	74.148	74.148	-.----	-.----	-.----	-.----	-.----	-.----
300.000	374.460	393.135	79.078	79.078	-.----	-.----	-.----	-.----	-.----	-.----
310.000	377.165	398.509	83.653	83.653	-.----	-.----	-.----	-.----	-.----	-.----
320.000	379.612	403.663	87.912	87.912	-.----	-.----	-.----	-.----	-.----	-.----
330.000	381.835	408.622	91.891	91.891	-.----	-.----	-.----	-.----	-.----	-.----
340.000	383.863	413.405	95.621	95.621	-.----	-.----	-.----	-.----	-.----	-.----
350.000	385.721	418.030	99.127	99.127	-.----	-.----	-.----	-.----	-.----	-.----
354.110	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
355.000	-.----	-.----	-.----	-.----	0.178	0.178	-.----	-.----	-.----	-.----
356.000	-.----	-.----	-.----	-.----	0.379	0.379	-.----	-.----	-.----	-.----
357.000	-.----	-.----	-.----	-.----	0.579	0.579	-.----	-.----	-.----	-.----
358.000	-.----	-.----	-.----	-.----	0.779	0.779	-.----	-.----	-.----	-.----
359.000	-.----	-.----	-.----	-.----	0.977	0.977	-.----	-.----	-.----	-.----
360.000	387.428	422.513	102.431	102.443	1.175	1.175	-.----	-.----	-.----	-.----
365.000	-.----	-.----	-.----	-.----	2.155	2.155	-.----	-.----	-.----	-.----
370.000	389.002	426.868	105.552	105.637	3.118	3.118	-.----	-.----	-.----	-.----
375.000	-.----	-.----	-.----	-.----	4.065	4.065	-.----	-.----	-.----	-.----
380.000	390.458	431.105	108.507	108.724	4.997	4.997	-.----	-.----	-.----	-.----
385.000	-.----	-.----	-.----	-.----	5.913	5.913	-.----	-.----	-.----	-.----
390.000	391.809	435.236	111.310	111.714	6.816	6.816	-.----	-.----	-.----	-.----
395.000	-.----	-.----	-.----	-.----	7.704	7.704	-.----	-.----	-.----	-.----
400.000	393.067	439.268	113.975	114.613	8.579	8.579	-.----	-.----	-.----	-.----
405.000	-.----	-.----	-.----	-.----	9.441	9.441	-.----	-.----	-.----	-.----
410.000	-.----	-.----	116.512	117.429	10.290	10.290	-.----	-.----	-.----	-.----
415.000	-.----	-.----	-.----	-.----	11.127	11.127	-.----	-.----	-.----	-.----
420.000	-.----	-.----	118.932	120.166	11.952	11.952	-.----	-.----	-.----	-.----
421.870	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
422.000	-.----	-.----	-.----	-.----	-.----	-.----	0.014	0.014	-.----	-.----
423.000	-.----	-.----	-.----	-.----	-.----	-.----	0.125	0.125	-.----	-.----
424.000	-.----	-.----	-.----	-.----	-.----	-.----	0.237	0.237	-.----	-.----
425.000	-.----	-.----	-.----	-.----	-.----	-.----	0.348	0.348	-.----	-.----

Co, Cobalt

A = 58.933

Z = 27

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.440		8.880		17.760		22.200		23.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
426.000	-.----	-.----	-.----	-.----	-.----	-.----	0.459	0.459	-.----	-.----
427.000	-.----	-.----	-.----	-.----	-.----	-.----	0.570	0.570	-.----	-.----
428.000	-.----	-.----	-.----	-.----	-.----	-.----	0.680	0.680	-.----	-.----
429.000	-.----	-.----	-.----	-.----	-.----	-.----	0.791	0.791	-.----	-.----
430.000	-.----	-.----	121.243	122.831	13.567	13.567	0.901	0.901	-.----	-.----
433.560	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
434.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.044	0.044
435.000	-.----	-.----	-.----	-.----	-.----	-.----	1.452	1.452	0.145	0.145
436.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.247	0.247
437.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.348	0.348
438.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.449	0.449
439.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.550	0.550
440.000	-.----	-.----	123.454	125.429	15.139	15.139	1.999	1.999	0.651	0.651
445.000	-.----	-.----	-.----	-.----	-.----	-.----	2.544	2.544	1.155	1.155
450.000	398.238	458.210	125.572	127.963	16.669	16.669	3.085	3.085	1.657	1.657
455.000	-.----	-.----	-.----	-.----	-.----	-.----	3.622	3.622	2.157	2.157
460.000	-.----	-.----	127.602	130.439	18.159	18.159	4.157	4.157	2.654	2.654
465.000	-.----	-.----	-.----	-.----	-.----	-.----	4.688	4.688	3.150	3.150
470.000	-.----	-.----	129.551	132.858	19.612	19.612	5.217	5.217	3.643	3.643
475.000	-.----	-.----	-.----	-.----	-.----	-.----	5.741	5.741	4.134	4.134
480.000	-.----	-.----	131.424	135.226	21.028	21.028	6.263	6.263	4.623	4.623
485.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	5.109	5.109
490.000	-.----	-.----	133.226	137.544	22.409	22.409	7.295	7.295	5.592	5.592
495.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.073	6.073
500.000	402.087	475.584	134.961	139.816	23.757	23.757	8.315	8.315	6.552	6.552
510.000	-.----	-.----	-.----	-.----	25.073	25.073	9.320	9.320	7.501	7.501
520.000	-.----	-.----	-.----	-.----	26.358	26.358	10.312	10.312	8.439	8.439
530.000	-.----	-.----	-.----	-.----	27.613	27.613	11.289	11.289	9.367	9.367
540.000	-.----	-.----	-.----	-.----	28.840	28.840	12.253	12.253	10.283	10.283
550.000	405.066	491.810	142.758	150.562	30.039	30.039	13.204	13.204	11.188	11.188
560.000	-.----	-.----	-.----	-.----	31.211	31.211	14.140	14.140	12.081	12.081
570.000	-.----	-.----	-.----	-.----	32.356	32.356	15.062	15.062	12.962	12.962
580.000	-.----	-.----	-.----	-.----	33.477	33.477	15.971	15.971	13.832	13.832
590.000	-.----	-.----	-.----	-.----	34.574	34.574	16.866	16.866	14.690	14.690
600.000	407.441	507.144	149.354	160.451	35.646	35.646	17.748	17.748	15.537	15.537
610.000	-.----	-.----	-.----	-.----	36.696	36.699	18.616	18.616	16.371	16.371

Co, Cobalt

A=58.933

Z=27

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.440		8.880		17.760		22.200		23.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
620.000	-.----	-.----	-.----	-.----	37.724	37.738	19.471	19.471	17.194	17.194
630.000	-.----	-.----	-.----	-.----	38.730	38.761	20.313	20.313	18.005	18.005
640.000	-.----	-.----	-.----	-.----	39.715	39.771	21.141	21.141	18.804	18.804
650.000	409.372	521.752	155.013	169.657	40.680	40.768	21.957	21.957	19.592	19.592
660.000	-.----	-.----	-.----	-.----	41.625	41.751	22.760	22.760	20.368	20.368
670.000	-.----	-.----	-.----	-.----	42.550	42.722	23.550	23.550	21.133	21.133
680.000	-.----	-.----	-.----	-.----	43.457	43.681	24.328	24.328	21.887	21.887
690.000	-.----	-.----	-.----	-.----	44.346	44.628	25.093	25.093	22.629	22.629
700.000	410.965	535.748	159.921	178.300	45.217	45.564	25.847	25.847	23.360	23.360
710.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	24.080	24.080
720.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	24.789	24.789
730.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	25.488	25.489
740.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	26.176	26.180
750.000	412.292	549.213	164.215	186.470	49.322	50.084	29.438	29.474	26.853	26.865
760.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	27.520	27.543
770.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	28.177	28.214
780.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	28.824	28.878
790.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	29.461	29.536
800.000	413.407	562.205	168.000	194.232	53.047	54.365	32.752	32.918	30.088	30.187
850.000	414.346	574.771	171.355	201.638	56.438	58.436	35.812	36.201	33.083	33.354
900.000	415.139	586.948	174.345	208.730	59.532	62.323	38.638	39.338	35.857	36.383
950.000	415.808	598.764	177.022	215.540	62.362	66.043	41.251	42.345	38.426	39.286
1000.000	416.373	610.245	179.426	222.096	64.956	69.614	43.670	45.233	40.807	42.076
1050.000	416.847	621.414	181.594	228.420	67.340	73.048	45.910	48.013	43.017	44.762
1100.000	417.244	632.287	183.554	234.532	69.534	76.358	47.987	50.694	45.069	47.353
1150.000	417.573	642.883	185.331	240.447	71.557	79.553	49.917	53.283	46.977	49.855
1200.000	417.844	653.216	186.947	246.181	73.427	82.642	51.710	55.787	48.753	52.275
1250.000	418.063	663.298	188.418	251.745	75.156	85.633	53.379	58.212	50.408	54.619
1300.000	418.236	673.143	189.761	257.151	76.760	88.532	54.935	60.563	51.951	56.892
1350.000	418.368	682.760	190.989	262.408	78.248	91.346	56.386	62.845	53.392	59.098
1400.000	418.465	692.161	192.113	267.526	79.631	94.080	57.741	65.062	54.738	61.241
1450.000	418.531	701.354	193.145	272.511	80.918	96.738	59.008	67.218	55.998	63.326
1500.000	418.569	710.349	194.092	277.373	82.118	99.325	60.194	69.316	57.179	65.355

Ni, Nickel

A = 58.710

Z = 28

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 21.000	
	T _s		2T _s		4T _s		5T _s			
	4.460		8.920		17.840		22.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
107.890	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
108.000	1.029	1.029	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
109.000	10.906	10.906	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	20.474	20.474	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	64.088	64.088	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	101.593	101.593	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	134.048	134.048	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	162.294	162.294	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	187.009	187.009	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	208.740	208.740	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
145.000	227.936	227.936	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
150.000	244.966	244.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	260.136	260.136	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	273.699	273.699	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
170.000	296.828	296.828	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
180.000	315.694	315.694	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
190.000	331.266	331.266	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
199.590	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
200.000	344.259	344.260	0.580	0.580	-.----	-.----	-.----	-.----	-.----	-.----
201.000	-.----	-.----	2.000	2.000	-.----	-.----	-.----	-.----	-.----	-.----
202.000	-.----	-.----	3.401	3.401	-.----	-.----	-.----	-.----	-.----	-.----
203.000	-.----	-.----	4.783	4.783	-.----	-.----	-.----	-.----	-.----	-.----
204.000	-.----	-.----	6.146	6.146	-.----	-.----	-.----	-.----	-.----	-.----
205.000	-.----	-.----	7.491	7.491	-.----	-.----	-.----	-.----	-.----	-.----
206.000	-.----	-.----	8.818	8.818	-.----	-.----	-.----	-.----	-.----	-.----
207.000	-.----	-.----	10.127	10.127	-.----	-.----	-.----	-.----	-.----	-.----
208.000	-.----	-.----	11.419	11.419	-.----	-.----	-.----	-.----	-.----	-.----
209.000	-.----	-.----	12.694	12.694	-.----	-.----	-.----	-.----	-.----	-.----
210.000	355.206	355.618	13.953	13.953	-.----	-.----	-.----	-.----	-.----	-.----
215.000	-.----	-.----	20.009	20.009	-.----	-.----	-.----	-.----	-.----	-.----
220.000	364.514	365.966	25.698	25.698	-.----	-.----	-.----	-.----	-.----	-.----
225.000	-.----	-.----	31.054	31.054	-.----	-.----	-.----	-.----	-.----	-.----
230.000	372.493	375.464	36.105	36.105	-.----	-.----	-.----	-.----	-.----	-.----
235.000	-.----	-.----	40.880	40.880	-.----	-.----	-.----	-.----	-.----	-.----
240.000	379.386	384.239	45.400	45.400	-.----	-.----	-.----	-.----	-.----	-.----

Ni, Nickel

A = 58.710

Z = 28

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.460		8.920		17.840		22.300		21.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
245.000	-.----	-.----	49.688	49.688	-.----	-.----	-.----	-.----	-.----	-.----
250.000	385.384	392.399	53.762	53.762	-.----	-.----	-.----	-.----	-.----	-.----
255.000	-.----	-.----	57.638	57.638	-.----	-.----	-.----	-.----	-.----	-.----
260.000	390.638	400.028	61.333	61.333	-.----	-.----	-.----	-.----	-.----	-.----
270.000	395.269	407.200	68.228	68.228	-.----	-.----	-.----	-.----	-.----	-.----
280.000	399.374	413.972	74.543	74.543	-.----	-.----	-.----	-.----	-.----	-.----
290.000	403.032	420.396	80.353	80.353	-.----	-.----	-.----	-.----	-.----	-.----
300.000	406.310	426.514	85.723	85.723	-.----	-.----	-.----	-.----	-.----	-.----
310.000	409.261	432.361	90.705	90.705	-.----	-.----	-.----	-.----	-.----	-.----
320.000	411.929	437.967	95.346	95.346	-.----	-.----	-.----	-.----	-.----	-.----
330.000	414.351	443.360	99.683	99.683	-.----	-.----	-.----	-.----	-.----	-.----
340.000	416.560	448.560	103.749	103.749	-.----	-.----	-.----	-.----	-.----	-.----
350.000	418.581	453.588	107.570	107.570	-.----	-.----	-.----	-.----	-.----	-.----
354.310	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
355.000	-.----	-.----	-.----	-.----	0.149	0.149	-.----	-.----	-.----	-.----
356.000	-.----	-.----	-.----	-.----	0.367	0.367	-.----	-.----	-.----	-.----
357.000	-.----	-.----	-.----	-.----	0.583	0.583	-.----	-.----	-.----	-.----
358.000	-.----	-.----	-.----	-.----	0.799	0.799	-.----	-.----	-.----	-.----
359.000	-.----	-.----	-.----	-.----	1.014	1.014	-.----	-.----	-.----	-.----
360.000	420.437	458.461	111.171	111.184	1.229	1.229	-.----	-.----	-.----	-.----
365.000	-.----	-.----	-.----	-.----	2.290	2.290	-.----	-.----	-.----	-.----
370.000	422.146	463.192	114.574	114.664	3.334	3.334	-.----	-.----	-.----	-.----
375.000	-.----	-.----	-.----	-.----	4.360	4.360	-.----	-.----	-.----	-.----
380.000	423.726	467.795	117.795	118.027	5.370	5.370	-.----	-.----	-.----	-.----
385.000	-.----	-.----	-.----	-.----	6.365	6.365	-.----	-.----	-.----	-.----
390.000	425.190	472.280	120.851	121.283	7.344	7.344	-.----	-.----	-.----	-.----
395.000	-.----	-.----	-.----	-.----	8.308	8.308	-.----	-.----	-.----	-.----
400.000	426.551	476.659	123.755	124.441	9.258	9.258	-.----	-.----	-.----	-.----
402.860	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
403.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.019	0.019
404.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.160	0.160
405.000	-.----	-.----	-.----	-.----	10.195	10.195	-.----	-.----	0.301	0.301
406.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.442	0.442
407.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.582	0.582
408.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.723	0.723

Ni, Nickel

A=58.710

Z=28

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T _s		2T _s		4T _s		5T _s		T _d	
	4.460		8.920		17.840		22.300		21.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
409.000	-----	-----	-----	-----	-----	-----	-----	-----	0.863	0.863
410.000	-----	-----	126.521	127.506	11.117	11.117	-----	-----	1.002	1.002
415.000	-----	-----	-----	-----	12.027	12.027	-----	-----	1.698	1.698
420.000	-----	-----	129.158	130.487	12.924	12.924	-----	-----	2.388	2.388
422.100	-----	-----	-----	-----	-----	-----	0.000	0.000	-----	-----
423.000	-----	-----	-----	-----	-----	-----	0.108	0.108	-----	-----
424.000	-----	-----	-----	-----	-----	-----	0.228	0.228	-----	-----
425.000	-----	-----	-----	-----	-----	-----	0.348	0.348	3.072	3.072
426.000	-----	-----	-----	-----	-----	-----	0.469	0.469	-----	-----
427.000	-----	-----	-----	-----	-----	-----	0.588	0.588	-----	-----
428.000	-----	-----	-----	-----	-----	-----	0.708	0.708	-----	-----
429.000	-----	-----	-----	-----	-----	-----	0.828	0.828	-----	-----
430.000	-----	-----	131.676	133.388	14.681	14.681	0.948	0.948	3.751	3.751
435.000	-----	-----	-----	-----	-----	-----	1.544	1.544	4.424	4.424
440.000	-----	-----	134.084	136.215	16.391	16.391	2.137	2.137	5.092	5.092
445.000	-----	-----	-----	-----	-----	-----	2.727	2.727	5.754	5.754
450.000	432.128	497.212	136.390	138.973	18.057	18.057	3.313	3.313	6.411	6.411
455.000	-----	-----	-----	-----	-----	-----	3.897	3.897	7.063	7.063
460.000	-----	-----	138.601	141.667	19.679	19.679	4.477	4.477	7.709	7.709
465.000	-----	-----	-----	-----	-----	-----	5.054	5.054	-----	-----
470.000	-----	-----	140.723	144.299	21.261	21.261	5.627	5.627	8.985	8.985
475.000	-----	-----	-----	-----	-----	-----	6.197	6.197	-----	-----
480.000	-----	-----	142.762	146.875	22.804	22.804	6.764	6.764	10.241	10.241
490.000	-----	-----	144.723	149.396	24.309	24.309	7.887	7.887	11.476	11.476
500.000	436.246	516.046	146.610	151.867	25.778	25.778	8.995	8.995	12.690	12.690
510.000	-----	-----	-----	-----	27.212	27.212	10.089	10.089	13.884	13.884
520.000	-----	-----	-----	-----	28.612	28.612	11.168	11.168	15.058	15.058
530.000	-----	-----	-----	-----	29.981	29.981	12.233	12.233	16.212	16.212
540.000	-----	-----	-----	-----	31.318	31.318	13.283	13.283	17.347	17.347
550.000	439.408	533.620	155.086	163.546	32.624	32.624	14.318	14.318	18.462	18.462
560.000	-----	-----	-----	-----	33.902	33.902	15.338	15.338	19.559	19.559
570.000	-----	-----	-----	-----	35.151	35.151	16.343	16.343	20.636	20.636
580.000	-----	-----	-----	-----	36.372	36.372	17.334	17.334	21.695	21.695
590.000	-----	-----	-----	-----	37.568	37.568	18.309	18.309	22.736	22.736
600.000	441.905	550.217	162.247	174.288	38.737	38.737	19.270	19.270	23.759	23.759

Ni, Nickel

A = 58.710

Z = 28

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d			
Energy(eV)=		4.460	8.920		17.840	22.300		21.000			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
610.000	----	----	----	----	39.881	39.884	20.216	20.216	24.765	24.765	
620.000	----	----	----	----	41.001	41.015	21.148	21.148	25.753	25.753	
630.000	----	----	----	----	42.097	42.131	22.066	22.066	26.724	26.724	
640.000	----	----	----	----	43.171	43.231	22.969	22.969	27.678	27.678	
650.000	443.915	566.020	168.380	184.281	44.222	44.316	23.858	23.858	28.616	28.616	
660.000	----	----	----	----	45.251	45.387	24.733	24.733	29.538	29.538	
670.000	----	----	----	----	46.259	46.444	25.595	25.595	30.443	30.443	
680.000	----	----	----	----	47.247	47.488	26.442	26.442	31.333	31.334	
690.000	----	----	----	----	48.215	48.519	27.277	27.277	32.208	32.213	
700.000	445.557	581.152	173.691	193.658	49.164	49.537	28.098	28.098	33.068	33.081	
750.000	446.910	595.703	178.331	202.515	53.632	54.456	32.011	32.050	37.150	37.281	
800.000	448.032	609.739	182.413	210.927	57.684	59.111	35.621	35.800	40.896	41.262	
850.000	448.966	623.310	186.026	218.950	61.369	63.537	38.952	39.372	44.337	45.052	
900.000	449.742	636.456	189.241	226.629	64.729	67.759	42.027	42.785	47.502	48.670	
950.000	450.387	649.211	192.113	234.001	67.800	71.799	44.868	46.054	50.417	52.135	
1000.000	450.920	661.601	194.690	241.095	70.613	75.675	47.496	49.193	53.105	55.461	
1050.000	451.357	673.650	197.009	247.935	73.195	79.402	49.928	52.213	55.587	58.660	
1100.000	451.713	685.380	199.103	254.544	75.570	82.992	52.182	55.124	57.882	61.743	
1150.000	451.999	696.809	200.998	260.940	77.759	86.456	54.274	57.934	60.008	64.718	
1200.000	452.223	707.951	202.717	267.137	79.779	89.805	56.218	60.651	61.978	67.595	
1250.000	452.393	718.823	204.280	273.150	81.647	93.046	58.025	63.282	63.808	70.379	
1300.000	452.516	729.436	205.705	278.991	83.377	96.187	59.708	65.831	65.510	73.078	
1350.000	452.598	739.803	207.005	284.670	84.981	99.235	61.277	68.305	67.094	75.696	
1400.000	452.643	749.936	208.193	290.197	86.471	102.195	62.742	70.708	68.570	78.239	
1450.000	452.656	759.844	209.281	295.581	87.856	105.072	64.110	73.044	69.947	80.711	
1500.000	452.642	769.538	210.279	300.830	89.147	107.872	65.389	75.317	71.234	83.116	

Cu, Copper

A = 63.546

Z = 29

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 19.000	
	T _s 3.500		2T _s 7.000		4T _s 14.000		5T _s 17.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
92.880	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
93.000	2.045	2.045	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
94.000	19.006	19.006	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
95.000	35.337	35.337	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
96.000	51.066	51.066	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
97.000	66.221	66.221	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
98.000	80.828	80.828	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
99.000	94.911	94.911	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	108.495	108.495	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	169.646	169.646	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	221.160	221.160	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	264.862	264.862	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	302.173	302.173	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	334.215	334.215	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	361.878	361.878	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	385.880	385.880	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	406.798	406.798	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
145.000	425.107	425.107	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
150.000	441.194	441.194	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	455.379	455.379	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	467.931	467.931	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
170.000	488.992	488.992	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
173.270	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
174.000	-.----	-.----	1.775	1.775	-.----	-.----	-.----	-.----	-.----	-.----
175.000	-.----	-.----	4.170	4.170	-.----	-.----	-.----	-.----	-.----	-.----
176.000	-.----	-.----	6.525	6.525	-.----	-.----	-.----	-.----	-.----	-.----
177.000	-.----	-.----	8.841	8.841	-.----	-.----	-.----	-.----	-.----	-.----
178.000	-.----	-.----	11.118	11.118	-.----	-.----	-.----	-.----	-.----	-.----
179.000	-.----	-.----	13.357	13.357	-.----	-.----	-.----	-.----	-.----	-.----
180.000	505.773	506.113	15.560	15.560	-.----	-.----	-.----	-.----	-.----	-.----
185.000	-.----	-.----	26.053	26.053	-.----	-.----	-.----	-.----	-.----	-.----
190.000	519.283	521.172	35.748	35.748	-.----	-.----	-.----	-.----	-.----	-.----
195.000	-.----	-.----	44.733	44.733	-.----	-.----	-.----	-.----	-.----	-.----
200.000	530.258	534.626	53.081	53.081	-.----	-.----	-.----	-.----	-.----	-.----
205.000	-.----	-.----	60.858	60.858	-.----	-.----	-.----	-.----	-.----	-.----

Cu, Copper

A = 63.546

Z = 29

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T _s 3.500		2T _s 7.000		4T _s 14.000		5T _s 17.500		T _d 19.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
210.000	539.247	546.762	68.120	68.120	-.----	-.----	-.----	-.----	-.----	-.----
215.000	-.----	-.----	74.917	74.917	-.----	-.----	-.----	-.----	-.----	-.----
220.000	546.664	557.806	81.292	81.292	-.----	-.----	-.----	-.----	-.----	-.----
225.000	-.----	-.----	87.285	87.285	-.----	-.----	-.----	-.----	-.----	-.----
230.000	552.824	567.939	92.930	92.930	-.----	-.----	-.----	-.----	-.----	-.----
235.000	-.----	-.----	98.256	98.256	-.----	-.----	-.----	-.----	-.----	-.----
240.000	557.972	577.304	103.291	103.291	-.----	-.----	-.----	-.----	-.----	-.----
250.000	562.298	586.018	112.580	112.580	-.----	-.----	-.----	-.----	-.----	-.----
260.000	565.952	594.178	120.962	120.962	-.----	-.----	-.----	-.----	-.----	-.----
270.000	569.051	601.862	128.569	128.569	-.----	-.----	-.----	-.----	-.----	-.----
280.000	571.691	609.135	135.509	135.509	-.----	-.----	-.----	-.----	-.----	-.----
290.000	573.950	616.051	141.872	141.872	-.----	-.----	-.----	-.----	-.----	-.----
300.000	575.888	622.656	147.731	147.731	-.----	-.----	-.----	-.----	-.----	-.----
310.000	577.556	628.988	153.148	153.148	-.----	-.----	-.----	-.----	-.----	-.----
310.780	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
311.000	-.----	-.----	-.----	-.----	0.079	0.079	-.----	-.----	-.----	-.----
312.000	-.----	-.----	-.----	-.----	0.444	0.444	-.----	-.----	-.----	-.----
313.000	-.----	-.----	-.----	-.----	0.806	0.806	-.----	-.----	-.----	-.----
314.000	-.----	-.----	-.----	-.----	1.167	1.167	-.----	-.----	-.----	-.----
315.000	-.----	-.----	-.----	-.----	1.526	1.526	-.----	-.----	-.----	-.----
316.000	-.----	-.----	-.----	-.----	1.882	1.882	-.----	-.----	-.----	-.----
317.000	-.----	-.----	-.----	-.----	2.237	2.237	-.----	-.----	-.----	-.----
318.000	-.----	-.----	-.----	-.----	2.590	2.590	-.----	-.----	-.----	-.----
319.000	-.----	-.----	-.----	-.----	2.941	2.941	-.----	-.----	-.----	-.----
320.000	578.997	635.079	158.175	158.234	3.290	3.290	-.----	-.----	-.----	-.----
325.000	-.----	-.----	-.----	-.----	5.010	5.010	-.----	-.----	-.----	-.----
330.000	580.244	640.957	162.856	163.100	6.687	6.687	-.----	-.----	-.----	-.----
335.000	-.----	-.----	-.----	-.----	8.323	8.323	-.----	-.----	-.----	-.----
340.000	581.327	646.645	167.228	167.768	9.920	9.920	-.----	-.----	-.----	-.----
345.000	-.----	-.----	-.----	-.----	11.481	11.481	-.----	-.----	-.----	-.----
350.000	582.267	652.164	171.323	172.256	13.006	13.006	-.----	-.----	-.----	-.----
355.000	-.----	-.----	-.----	-.----	14.498	14.498	-.----	-.----	-.----	-.----
360.000	583.087	657.531	175.170	176.580	15.957	15.957	-.----	-.----	-.----	-.----
365.000	-.----	-.----	-.----	-.----	17.386	17.386	-.----	-.----	-.----	-.----
370.000	583.802	662.761	178.792	180.754	18.786	18.786	-.----	-.----	-.----	-.----

Cu, Copper

A = 63.546

Z = 29

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$		$4T_s$		$5T_s$		T_d		
Energy(eV)=	3.500	7.000		14.000		17.500		19.000		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
371.540	----	----	----	----	----	----	0.000	0.000	----	----
372.000	----	----	----	----	----	----	0.092	0.092	----	----
373.000	----	----	----	----	----	----	0.293	0.293	----	----
374.000	----	----	----	----	----	----	0.493	0.493	----	----
375.000	----	----	----	----	20.158	20.158	0.692	0.692	----	----
376.000	----	----	----	----	----	----	0.891	0.891	----	----
377.000	----	----	----	----	----	----	1.090	1.090	----	----
378.000	----	----	----	----	----	----	1.287	1.287	----	----
379.000	----	----	----	----	----	----	1.485	1.485	----	----
380.000	584.426	667.867	182.210	184.789	21.502	21.502	1.682	1.682	----	----
385.000	----	----	----	----	----	----	2.658	2.658	----	----
390.000	584.972	672.860	185.442	188.698	24.113	24.113	3.622	3.622	----	----
395.000	----	----	----	----	----	----	4.574	4.574	----	----
396.330	----	----	----	----	----	----	----	----	0.000	0.000
397.000	----	----	----	----	----	----	----	----	0.107	0.107
398.000	----	----	----	----	----	----	----	----	0.268	0.268
399.000	----	----	----	----	----	----	----	----	0.429	0.429
400.000	585.449	677.750	188.504	192.491	26.628	26.628	5.513	5.513	0.590	0.590
405.000	----	----	----	----	----	----	6.442	6.442	1.388	1.388
410.000	----	----	191.411	196.175	29.052	29.052	7.358	7.358	2.180	2.180
415.000	----	----	----	----	----	----	8.264	8.264	2.965	2.965
420.000	----	----	194.174	199.758	31.392	31.392	9.159	9.159	3.743	3.743
425.000	----	----	----	----	----	----	10.044	10.044	4.514	4.514
430.000	----	----	196.806	203.249	33.654	33.654	10.918	10.918	5.279	5.279
435.000	----	----	----	----	----	----	11.782	11.782	6.037	6.037
440.000	----	----	199.316	206.652	35.840	35.840	12.636	12.636	6.789	6.789
445.000	----	----	----	----	----	----	----	----	7.533	7.533
450.000	587.072	700.929	201.712	209.974	37.957	37.957	14.315	14.315	8.272	8.272
455.000	----	----	----	----	----	----	----	----	9.004	9.004
460.000	----	----	204.004	213.221	40.008	40.008	15.956	15.956	9.730	9.730
470.000	----	----	206.197	216.396	41.996	41.996	17.560	17.560	11.162	11.162
480.000	----	----	208.299	219.504	43.925	43.925	19.130	19.130	12.570	12.570
490.000	----	----	210.316	222.548	45.797	45.797	20.665	20.665	13.953	13.953
500.000	587.875	722.486	212.252	225.534	47.615	47.615	22.167	22.167	15.311	15.311
510.000	----	----	----	----	49.382	49.382	23.638	23.638	16.646	16.646

Cu, Copper

A = 63.546

Z = 29

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.500		7.000		14.000		17.500		19.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
520.000	----	----	----	----	51.099	51.099	25.077	25.077	17.957	17.957
530.000	----	----	----	----	52.770	52.770	26.485	26.485	19.245	19.245
540.000	----	----	----	----	54.396	54.400	27.864	27.864	20.511	20.511
550.000	588.218	742.856	220.891	239.673	55.979	56.000	29.215	29.215	21.753	21.753
560.000	----	----	----	----	57.520	57.573	30.538	30.538	22.974	22.974
570.000	----	----	----	----	59.022	59.119	31.833	31.833	24.173	24.173
580.000	----	----	----	----	60.486	60.641	33.102	33.102	25.350	25.350
590.000	----	----	----	----	61.913	62.138	34.345	34.345	26.507	26.507
600.000	588.287	762.296	228.111	252.718	63.304	63.612	35.563	35.563	27.643	27.643
610.000	----	----	----	----	----	----	36.757	36.757	28.758	28.758
620.000	----	----	----	----	----	----	37.926	37.926	29.854	29.854
630.000	----	----	----	----	----	----	39.073	39.073	30.929	30.929
640.000	----	----	----	----	----	----	40.196	40.202	31.986	31.986
650.000	588.184	780.969	234.235	264.887	69.773	70.663	41.298	41.316	33.024	33.024
660.000	----	----	----	----	----	----	42.378	42.415	34.043	34.043
670.000	----	----	----	----	----	----	43.437	43.500	35.044	35.045
680.000	----	----	----	----	----	----	44.475	44.571	36.028	36.033
690.000	----	----	----	----	----	----	45.493	45.630	36.994	37.010
700.000	587.968	798.982	239.492	276.336	75.523	77.252	46.492	46.675	37.942	37.974
750.000	587.674	816.411	244.045	287.177	80.662	83.448	51.207	51.723	42.441	42.635
800.000	587.324	833.311	248.019	297.494	85.276	89.307	55.497	56.501	46.559	47.051
850.000	586.932	849.723	251.509	307.354	89.435	94.873	59.408	61.042	50.335	51.250
900.000	586.510	865.683	254.590	316.807	93.197	100.179	62.983	65.374	53.800	55.258
950.000	586.065	881.218	257.323	325.895	96.610	105.254	66.255	69.517	56.985	59.093
1000.000	585.601	896.354	259.756	334.654	99.716	110.120	69.258	73.490	59.918	62.771
1050.000	585.124	911.112	261.929	343.111	102.550	114.798	72.017	77.310	62.622	66.308
1100.000	584.636	925.509	263.876	351.291	105.142	119.303	74.558	80.988	65.118	69.715
1150.000	584.140	939.563	265.625	359.215	107.517	123.651	76.901	84.536	67.426	73.002
1200.000	583.637	953.289	267.199	366.900	109.699	127.852	79.065	87.965	69.564	76.178
1250.000	583.130	966.701	268.619	374.364	111.706	131.918	81.068	91.283	71.546	79.252
1300.000	582.620	979.814	269.901	381.619	113.556	135.859	82.924	94.497	73.386	82.230
1350.000	582.109	992.638	271.062	388.680	115.264	139.682	84.646	97.615	75.097	85.118
1400.000	581.598	1005.187	272.113	395.556	116.844	143.395	86.246	100.642	76.690	87.923
1450.000	581.089	1017.472	273.067	402.258	118.307	147.005	87.734	103.584	78.174	90.648
1500.000	580.582	1029.502	273.933	408.795	119.664	150.517	89.121	106.446	79.559	93.300

Zn, Zinc

A = 65.380

Z = 30

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 15.780	
	T _s	2T _s	4T _s	5T _s						
	1.350	2.700	5.400	6.750						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
38.740	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
39.000	70.418	70.418	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
40.000	326.157	326.157	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
45.000	1292.016	1292.016	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
50.000	1901.375	1901.375	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
55.000	2294.393	2294.393	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	2550.629	2550.629	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	2717.559	2717.559	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	2824.681	2824.681	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
74.920	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
75.000	2890.942	2890.944	2.674	2.674	-.----	-.----	-.----	-.----	-.----	-.----
76.000	-.----	-.----	38.137	38.137	-.----	-.----	-.----	-.----	-.----	-.----
77.000	-.----	-.----	71.922	71.922	-.----	-.----	-.----	-.----	-.----	-.----
78.000	-.----	-.----	104.126	104.126	-.----	-.----	-.----	-.----	-.----	-.----
79.000	-.----	-.----	134.839	134.839	-.----	-.----	-.----	-.----	-.----	-.----
80.000	2928.859	2934.650	164.145	164.145	-.----	-.----	-.----	-.----	-.----	-.----
85.000	2946.891	2966.871	292.115	292.115	-.----	-.----	-.----	-.----	-.----	-.----
90.000	2950.871	2990.344	394.671	394.671	-.----	-.----	-.----	-.----	-.----	-.----
95.000	2944.888	3007.102	477.658	477.658	-.----	-.----	-.----	-.----	-.----	-.----
100.000	2931.847	3018.675	545.376	545.376	-.----	-.----	-.----	-.----	-.----	-.----
105.000	-.----	-.----	601.041	601.041	-.----	-.----	-.----	-.----	-.----	-.----
110.000	2892.384	3030.655	647.090	647.090	-.----	-.----	-.----	-.----	-.----	-.----
115.000	-.----	-.----	685.399	685.399	-.----	-.----	-.----	-.----	-.----	-.----
120.000	2843.277	3032.760	717.421	717.421	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	744.301	744.301	-.----	-.----	-.----	-.----	-.----	-.----
130.000	2790.354	3028.925	766.943	766.943	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	786.074	786.074	-.----	-.----	-.----	-.----	-.----	-.----
140.000	2736.801	3021.604	802.275	802.275	-.----	-.----	-.----	-.----	-.----	-.----
141.300	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
142.000	-.----	-.----	-.----	-.----	3.490	3.490	-.----	-.----	-.----	-.----
143.000	-.----	-.----	-.----	-.----	8.397	8.397	-.----	-.----	-.----	-.----
144.000	-.----	-.----	-.----	-.----	13.196	13.196	-.----	-.----	-.----	-.----
145.000	-.----	-.----	-.----	-.----	17.888	17.888	-.----	-.----	-.----	-.----
146.000	-.----	-.----	-.----	-.----	22.477	22.477	-.----	-.----	-.----	-.----
147.000	-.----	-.----	-.----	-.----	26.967	26.967	-.----	-.----	-.----	-.----
148.000	-.----	-.----	-.----	-.----	31.360	31.360	-.----	-.----	-.----	-.----

Zn, Zinc

A = 65.380

Z = 30

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.350		2.700		5.400		6.750		15.780	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
149.000	-.----	-.----	-.----	-.----	35.659	35.659	-.----	-.----	-.----	-.----
150.000	2684.353	3012.356	827.702	829.041	39.867	39.867	-.----	-.----	-.----	-.----
155.000	-.----	-.----	-.----	-.----	59.628	59.628	-.----	-.----	-.----	-.----
160.000	2633.926	3002.185	846.079	851.512	77.467	77.467	-.----	-.----	-.----	-.----
165.000	-.----	-.----	-.----	-.----	93.634	93.634	-.----	-.----	-.----	-.----
170.000	2585.967	2991.739	859.359	870.691	108.338	108.338	-.----	-.----	-.----	-.----
172.070	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
173.000	-.----	-.----	-.----	-.----	-.----	-.----	2.475	2.475	-.----	-.----
174.000	-.----	-.----	-.----	-.----	-.----	-.----	5.108	5.108	-.----	-.----
175.000	-.----	-.----	-.----	-.----	121.758	121.758	7.697	7.697	-.----	-.----
176.000	-.----	-.----	-.----	-.----	-.----	-.----	10.242	10.242	-.----	-.----
177.000	-.----	-.----	-.----	-.----	-.----	-.----	12.745	12.745	-.----	-.----
178.000	-.----	-.----	-.----	-.----	-.----	-.----	15.206	15.206	-.----	-.----
179.000	-.----	-.----	-.----	-.----	-.----	-.----	17.627	17.627	-.----	-.----
180.000	2540.649	2981.434	868.900	887.297	134.045	134.045	20.008	20.008	-.----	-.----
185.000	-.----	-.----	-.----	-.----	145.330	145.330	31.352	31.352	-.----	-.----
190.000	2497.990	2971.540	875.669	901.867	155.723	155.723	41.836	41.836	-.----	-.----
195.000	-.----	-.----	-.----	-.----	165.323	165.323	51.554	51.554	-.----	-.----
200.000	2457.918	2962.221	880.363	914.810	174.212	174.212	60.585	60.585	-.----	-.----
205.000	-.----	-.----	-.----	-.----	-.----	-.----	69.000	69.000	-.----	-.----
210.000	2420.314	2953.575	883.493	926.442	190.142	190.142	76.859	76.859	-.----	-.----
215.000	-.----	-.----	-.----	-.----	-.----	-.----	84.217	84.217	-.----	-.----
220.000	2385.035	2945.657	885.435	937.008	203.994	203.994	91.119	91.119	-.----	-.----
225.000	-.----	-.----	-.----	-.----	-.----	-.----	97.608	97.608	-.----	-.----
230.000	2351.930	2938.487	886.473	946.701	216.142	216.142	103.721	103.721	-.----	-.----
235.000	-.----	-.----	-.----	-.----	-.----	-.----	109.489	109.489	-.----	-.----
240.000	2320.848	2932.066	886.821	955.674	226.875	226.875	114.943	114.943	-.----	-.----
250.000	2291.641	2926.383	886.641	964.049	236.425	236.425	125.006	125.006	-.----	-.----
260.000	2264.170	2921.414	886.058	971.925	244.977	244.992	134.088	134.088	-.----	-.----
270.000	2238.306	2917.134	885.169	979.381	252.680	252.947	142.330	142.330	-.----	-.----
280.000	2213.927	2913.511	884.049	986.484	259.655	260.442	149.851	149.851	-.----	-.----
290.000	2190.921	2910.514	882.756	993.285	266.003	267.533	156.745	156.745	-.----	-.----
300.000	2169.187	2908.110	881.335	999.830	271.806	274.264	163.094	163.094	-.----	-.----
310.000	2148.630	2906.265	879.824	1006.154	277.133	280.674	168.962	168.964	-.----	-.----
320.000	2129.165	2904.950	878.249	1012.289	282.042	286.798	174.408	174.503	-.----	-.----
330.000	2110.712	2904.132	876.633	1018.259	286.582	292.664	179.477	179.804	-.----	-.----

Zn, Zinc

A = 65.380

Z = 30

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.350		2.700		5.400		6.750		15.780	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
340.000	2093.200	2903.782	874.993	1024.086	290.795	298.298	184.211	184.888	-.----	-.----
350.000	2076.562	2903.873	873.344	1029.788	294.716	303.720	188.644	189.775	-.----	-.----
350.080	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
351.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.243	0.243
352.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.506	0.506
353.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.769	0.769
354.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.031	1.031
355.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.292	1.292
356.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.552	1.552
357.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.812	1.812
358.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.070	2.070
359.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.328	2.328
360.000	2060.738	2904.377	871.696	1035.379	298.376	308.952	192.807	194.483	2.584	2.584
365.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.855	3.855
370.000	2045.673	2905.268	870.057	1040.874	301.802	314.009	196.725	199.027	5.105	5.105
375.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.334	6.334
380.000	2031.316	2906.525	868.433	1046.281	305.015	318.907	200.421	203.420	7.545	7.545
385.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	8.737	8.737
390.000	2017.620	2908.122	866.831	1051.612	308.036	323.657	203.915	207.675	9.911	9.911
395.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	11.067	11.067
400.000	2004.543	2910.041	865.253	1056.873	310.883	328.274	207.224	211.802	12.207	12.207
405.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	13.330	13.330
410.000	-.----	-.----	-.----	-.----	313.571	332.765	210.364	215.811	14.436	14.436
415.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	15.528	15.528
420.000	-.----	-.----	-.----	-.----	316.113	337.141	213.348	219.710	16.604	16.604
430.000	-.----	-.----	-.----	-.----	318.522	341.411	216.188	223.508	18.711	18.711
440.000	-.----	-.----	-.----	-.----	320.807	345.581	218.896	227.210	20.763	20.763
450.000	1947.159	2923.790	857.804	1082.348	322.980	349.658	221.480	230.823	22.760	22.760
460.000	-.----	-.----	-.----	-.----	325.047	353.648	223.950	234.354	24.706	24.706
470.000	-.----	-.----	-.----	-.----	327.017	357.557	226.313	237.806	26.603	26.603
480.000	-.----	-.----	-.----	-.----	328.897	361.390	228.577	241.186	28.452	28.452
490.000	-.----	-.----	-.----	-.----	330.693	365.151	230.747	244.496	30.255	30.255
500.000	1900.470	2943.050	851.152	1106.789	332.410	368.844	232.831	247.741	32.015	32.015
510.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	33.732	33.732
520.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	35.408	35.408
530.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	37.045	37.045

Zn, Zinc

A = 65.380

Z = 30

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement Energy(eV)= T_s $2T_s$ $4T_s$ $5T_s$ T_d </div> <div> 1.350 2.700 5.400 6.750 15.780 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
540.000	-----	-----	-----	-----	-----	-----	-----	-----	38.644	38.644
550.000	1861.796	2966.316	845.259	1130.475	339.981	386.414	242.110	263.107	40.206	40.206
560.000	-----	-----	-----	-----	-----	-----	-----	-----	41.732	41.732
570.000	-----	-----	-----	-----	-----	-----	-----	-----	43.224	43.224
580.000	-----	-----	-----	-----	-----	-----	-----	-----	44.682	44.682
590.000	-----	-----	-----	-----	-----	-----	-----	-----	46.108	46.108
600.000	1829.262	2992.485	840.034	1153.546	346.194	402.738	249.846	277.275	47.503	47.504
610.000	-----	-----	-----	-----	-----	-----	-----	-----	48.866	48.878
620.000	-----	-----	-----	-----	-----	-----	-----	-----	50.201	50.232
630.000	-----	-----	-----	-----	-----	-----	-----	-----	51.506	51.567
640.000	-----	-----	-----	-----	-----	-----	-----	-----	52.783	52.883
650.000	1801.522	3020.740	835.379	1176.074	351.375	418.064	256.392	290.487	54.034	54.181
660.000	-----	-----	-----	-----	-----	-----	-----	-----	55.257	55.462
670.000	-----	-----	-----	-----	-----	-----	-----	-----	56.456	56.726
680.000	-----	-----	-----	-----	-----	-----	-----	-----	57.629	57.974
690.000	-----	-----	-----	-----	-----	-----	-----	-----	58.778	59.205
700.000	1777.591	3050.478	831.205	1198.100	355.750	432.563	261.995	302.912	59.903	60.422
750.000	1756.736	3081.245	827.437	1219.648	359.481	446.361	266.836	314.673	65.196	66.292
800.000	1738.402	3112.702	824.013	1240.734	362.687	459.550	271.051	325.862	69.984	71.842
850.000	1722.157	3144.589	820.882	1261.372	365.460	472.203	274.742	336.552	74.327	77.113
900.000	1707.661	3176.703	818.001	1281.572	367.870	484.377	277.993	346.799	78.278	82.136
950.000	1694.643	3208.890	815.336	1301.346	369.973	496.117	280.868	356.648	81.881	86.937
1000.000	1682.883	3241.026	812.858	1320.704	371.814	507.462	283.421	366.137	85.173	91.539
1050.000	1672.203	3273.017	810.542	1339.654	373.430	518.444	285.695	375.298	88.188	95.961
1100.000	1662.456	3304.790	808.370	1358.209	374.852	529.089	287.727	384.158	90.955	100.217
1150.000	1653.520	3336.288	806.324	1376.380	376.103	539.421	289.546	392.738	93.499	104.322
1200.000	1645.294	3367.469	804.393	1394.178	377.207	549.461	291.179	401.060	95.842	108.287
1250.000	1637.693	3398.302	802.564	1411.614	378.181	559.227	292.646	409.140	98.004	112.123
1300.000	1630.648	3428.763	800.828	1428.700	379.040	568.735	293.968	416.994	100.002	115.837
1350.000	1624.097	3458.836	799.176	1445.446	379.798	578.000	295.160	424.635	101.851	119.440
1400.000	1617.989	3488.511	797.602	1461.864	380.466	587.035	296.237	432.076	103.564	122.937
1450.000	1612.280	3517.782	796.098	1477.964	381.054	595.851	297.209	439.328	105.155	126.335
1500.000	1606.932	3546.644	794.659	1493.754	381.572	604.460	298.089	446.401	106.632	129.640

Ga, Gallium

A = 69.720

Z = 31

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 2.840		2T _s 5.680		4T _s 11.360		5T _s 14.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
83.390	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
84.000	16.740	16.740	-.----	-.----	-.----	-.----	-.----	-.----		
85.000	43.650	43.650	-.----	-.----	-.----	-.----	-.----	-.----		
86.000	69.436	69.436	-.----	-.----	-.----	-.----	-.----	-.----		
87.000	94.154	94.154	-.----	-.----	-.----	-.----	-.----	-.----		
88.000	117.860	117.860	-.----	-.----	-.----	-.----	-.----	-.----		
89.000	140.604	140.604	-.----	-.----	-.----	-.----	-.----	-.----		
90.000	162.434	162.434	-.----	-.----	-.----	-.----	-.----	-.----		
95.000	259.362	259.362	-.----	-.----	-.----	-.----	-.----	-.----		
100.000	339.191	339.191	-.----	-.----	-.----	-.----	-.----	-.----		
105.000	405.482	405.482	-.----	-.----	-.----	-.----	-.----	-.----		
110.000	460.934	460.934	-.----	-.----	-.----	-.----	-.----	-.----		
115.000	507.625	507.625	-.----	-.----	-.----	-.----	-.----	-.----		
120.000	547.170	547.170	-.----	-.----	-.----	-.----	-.----	-.----		
125.000	580.843	580.843	-.----	-.----	-.----	-.----	-.----	-.----		
130.000	609.652	609.652	-.----	-.----	-.----	-.----	-.----	-.----		
135.000	634.406	634.406	-.----	-.----	-.----	-.----	-.----	-.----		
140.000	655.760	655.760	-.----	-.----	-.----	-.----	-.----	-.----		
150.000	690.300	690.300	-.----	-.----	-.----	-.----	-.----	-.----		
156.450	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
157.000	-.----	-.----	2.125	2.125	-.----	-.----	-.----	-.----		
158.000	-.----	-.----	5.980	5.980	-.----	-.----	-.----	-.----		
159.000	-.----	-.----	9.760	9.760	-.----	-.----	-.----	-.----		
160.000	716.493	716.664	13.468	13.468	-.----	-.----	-.----	-.----		
165.000	-.----	-.----	30.980	30.980	-.----	-.----	-.----	-.----		
170.000	736.554	738.767	46.940	46.940	-.----	-.----	-.----	-.----		
175.000	-.----	-.----	61.537	61.537	-.----	-.----	-.----	-.----		
180.000	752.038	758.013	74.932	74.932	-.----	-.----	-.----	-.----		
185.000	-.----	-.----	87.262	87.262	-.----	-.----	-.----	-.----		
190.000	764.061	774.975	98.645	98.645	-.----	-.----	-.----	-.----		
195.000	-.----	-.----	109.184	109.184	-.----	-.----	-.----	-.----		
200.000	773.435	790.092	118.966	118.966	-.----	-.----	-.----	-.----		
205.000	-.----	-.----	128.068	128.068	-.----	-.----	-.----	-.----		
210.000	780.761	803.705	136.558	136.558	-.----	-.----	-.----	-.----		
215.000	-.----	-.----	144.496	144.496	-.----	-.----	-.----	-.----		

Ga, Gallium

A = 69.720

Z = 31

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T _s	2T _s		4T _s	Displacement	5T _s			T _d	
Energy(eV)=		2.840	5.680		11.360		14.200				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
220.000	786.488	816.081	151.932	151.932	----	----	----	----			
230.000	790.959	827.430	165.479	165.479	----	----	----	----			
240.000	794.433	837.922	177.507	177.507	----	----	----	----			
250.000	797.114	847.694	188.261	188.261	----	----	----	----			
260.000	799.159	856.856	197.935	197.935	----	----	----	----			
270.000	800.693	865.498	206.689	206.689	----	----	----	----			
280.000	801.812	873.696	214.650	214.650	----	----	----	----			
282.640	----	----	----	----	0.000	0.000	----	----			
283.000	----	----	----	----	0.205	0.205	----	----			
284.000	----	----	----	----	0.784	0.784	----	----			
285.000	----	----	----	----	1.359	1.359	----	----			
286.000	----	----	----	----	1.930	1.930	----	----			
287.000	----	----	----	----	2.497	2.497	----	----			
288.000	----	----	----	----	3.060	3.060	----	----			
289.000	----	----	----	----	3.620	3.620	----	----			
290.000	802.596	881.510	221.927	221.992	4.176	4.176	----	----			
295.000	----	----	----	----	6.901	6.901	----	----			
300.000	803.108	888.992	228.606	228.948	9.541	9.541	----	----			
305.000	----	----	----	----	12.100	12.100	----	----			
310.000	803.397	896.185	234.761	235.569	14.583	14.583	----	----			
315.000	----	----	----	----	16.995	16.995	----	----			
320.000	803.505	903.126	240.455	241.890	19.338	19.338	----	----			
325.000	----	----	----	----	21.618	21.618	----	----			
330.000	803.466	909.844	245.740	247.938	23.836	23.836	----	----			
335.000	----	----	----	----	25.997	25.997	----	----			
338.740	----	----	----	----	----	----	0.000	0.000			
339.000	----	----	----	----	----	----	0.082	0.082			
340.000	803.306	916.367	250.660	253.742	28.103	28.103	0.400	0.400			
345.000	----	----	----	----	----	----	1.971	1.971			
350.000	803.048	922.715	255.255	259.323	32.160	32.160	3.512	3.512			
355.000	----	----	----	----	----	----	5.026	5.026			
360.000	802.710	928.908	259.558	264.701	36.027	36.027	6.512	6.512			
365.000	----	----	----	----	----	----	7.971	7.971			
370.000	802.307	934.962	263.596	269.894	39.719	39.719	9.406	9.406			
375.000	----	----	----	----	----	----	10.816	10.816			

Ga, Gallium

A = 69.720

Z = 31

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	2.840		5.680		11.360		14.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
380.000	801.852	940.890	267.395	274.918	43.251	43.251	12.203	12.203		
385.000	-----	-----	-----	-----	-----	-----	13.567	13.567		
390.000	801.355	946.706	270.976	279.786	46.635	46.635	14.909	14.909		
395.000	-----	-----	-----	-----	-----	-----	16.230	16.230		
400.000	800.825	952.420	274.360	284.510	49.882	49.882	17.530	17.530		
410.000	-----	-----	277.562	289.101	53.001	53.001	20.071	20.071		
420.000	-----	-----	280.597	293.569	56.002	56.002	22.536	22.536		
430.000	-----	-----	283.480	297.922	58.892	58.892	24.930	24.930		
440.000	-----	-----	286.220	302.169	61.678	61.678	27.255	27.255		
450.000	797.886	979.728	288.830	306.317	64.366	64.366	29.516	29.516		
460.000	-----	-----	291.319	310.371	66.962	66.962	31.715	31.715		
470.000	-----	-----	293.695	314.339	69.471	69.471	33.854	33.854		
480.000	-----	-----	295.966	318.224	71.898	71.898	35.938	35.938		
490.000	-----	-----	298.139	322.032	74.247	74.248	37.966	37.966		
500.000	794.799	1005.446	300.220	325.768	76.523	76.539	39.943	39.943		
510.000	-----	-----	-----	-----	78.727	78.784	41.870	41.870		
520.000	-----	-----	-----	-----	80.865	80.984	43.748	43.748		
530.000	-----	-----	-----	-----	82.940	83.142	45.580	45.580		
540.000	-----	-----	-----	-----	84.953	85.259	47.368	47.368		
550.000	791.788	1030.003	309.434	343.484	86.908	87.339	49.112	49.112		
560.000	-----	-----	-----	-----	88.808	89.381	50.814	50.814		
570.000	-----	-----	-----	-----	90.654	91.389	52.476	52.476		
580.000	-----	-----	-----	-----	92.450	93.363	54.098	54.099		
590.000	-----	-----	-----	-----	94.196	95.305	55.684	55.694		
600.000	788.935	1053.639	317.042	359.862	95.896	97.217	57.232	57.264		
610.000	-----	-----	-----	-----	-----	-----	58.745	58.811		
620.000	-----	-----	-----	-----	-----	-----	60.224	60.334		
630.000	-----	-----	-----	-----	-----	-----	61.670	61.836		
640.000	-----	-----	-----	-----	-----	-----	63.083	63.316		
650.000	786.261	1076.503	323.422	375.171	103.749	106.353	64.465	64.775		
660.000	-----	-----	-----	-----	-----	-----	65.817	66.215		
670.000	-----	-----	-----	-----	-----	-----	67.139	67.635		
680.000	-----	-----	-----	-----	-----	-----	68.433	69.037		
690.000	-----	-----	-----	-----	-----	-----	69.699	70.421		
700.000	783.762	1098.686	328.836	389.598	110.664	114.876	70.938	71.788		

Ga, Gallium

A = 69.720

Z = 31

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s			4T _s			5T _s		
Energy(eV)=	2.840	5.680			11.360			14.200		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
750.000	781.425	1120.251	333.475	403.280	116.792	122.884	76.752	78.378		
800.000	779.234	1141.245	337.479	416.319	122.251	130.449	81.994	84.604		
850.000	777.173	1161.702	340.958	428.795	127.136	137.629	86.735	90.512		
900.000	775.229	1181.653	343.995	440.770	131.526	144.470	91.035	96.140		
950.000	773.388	1201.121	346.659	452.294	135.484	151.010	94.945	101.517		
1000.000	771.640	1220.129	349.003	463.410	139.064	157.278	98.509	106.668		
1050.000	769.973	1238.694	351.072	474.151	142.312	163.300	101.766	111.615		
1100.000	768.381	1256.834	352.903	484.547	145.266	169.099	104.748	116.376		
1150.000	766.855	1274.567	354.527	494.624	147.959	174.693	107.484	120.965		
1200.000	765.391	1291.907	355.968	504.404	150.419	180.097	109.999	125.397		
1250.000	763.982	1308.870	357.250	513.906	152.671	185.326	112.314	129.683		
1300.000	762.626	1325.470	358.391	523.147	154.737	190.393	114.450	133.834		
1350.000	761.318	1341.721	359.407	532.144	156.635	195.308	116.422	137.858		
1400.000	760.056	1357.637	360.312	540.909	158.382	200.080	118.247	141.763		
1450.000	758.837	1373.229	361.119	549.456	159.992	204.719	119.937	145.558		
1500.000	757.658	1388.509	361.837	557.795	161.477	209.233	121.505	149.247		

Ge, Germanium

A=72.590

Z=32

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	3.880		7.760		15.520		19.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
115.300	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
116.000	7.651	7.651	-.----	-.----	-.----	-.----	-.----	-.----		
117.000	18.342	18.342	-.----	-.----	-.----	-.----	-.----	-.----		
118.000	28.726	28.726	-.----	-.----	-.----	-.----	-.----	-.----		
119.000	38.816	38.816	-.----	-.----	-.----	-.----	-.----	-.----		
120.000	48.621	48.621	-.----	-.----	-.----	-.----	-.----	-.----		
125.000	93.732	93.732	-.----	-.----	-.----	-.----	-.----	-.----		
130.000	133.119	133.119	-.----	-.----	-.----	-.----	-.----	-.----		
135.000	167.698	167.698	-.----	-.----	-.----	-.----	-.----	-.----		
140.000	198.213	198.213	-.----	-.----	-.----	-.----	-.----	-.----		
145.000	225.270	225.270	-.----	-.----	-.----	-.----	-.----	-.----		
150.000	249.368	249.368	-.----	-.----	-.----	-.----	-.----	-.----		
155.000	270.920	270.920	-.----	-.----	-.----	-.----	-.----	-.----		
160.000	290.270	290.270	-.----	-.----	-.----	-.----	-.----	-.----		
165.000	307.706	307.706	-.----	-.----	-.----	-.----	-.----	-.----		
170.000	323.473	323.473	-.----	-.----	-.----	-.----	-.----	-.----		
175.000	337.776	337.776	-.----	-.----	-.----	-.----	-.----	-.----		
180.000	350.791	350.791	-.----	-.----	-.----	-.----	-.----	-.----		
190.000	373.540	373.540	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	392.689	392.689	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	408.966	408.966	-.----	-.----	-.----	-.----	-.----	-.----		
212.450	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
213.000	-.----	-.----	0.864	0.864	-.----	-.----	-.----	-.----		
214.000	-.----	-.----	2.433	2.433	-.----	-.----	-.----	-.----		
215.000	-.----	-.----	3.983	3.983	-.----	-.----	-.----	-.----		
216.000	-.----	-.----	5.515	5.515	-.----	-.----	-.----	-.----		
217.000	-.----	-.----	7.028	7.028	-.----	-.----	-.----	-.----		
218.000	-.----	-.----	8.523	8.523	-.----	-.----	-.----	-.----		
219.000	-.----	-.----	10.001	10.001	-.----	-.----	-.----	-.----		
220.000	422.927	423.161	11.461	11.461	-.----	-.----	-.----	-.----		
225.000	-.----	-.----	18.514	18.514	-.----	-.----	-.----	-.----		
230.000	434.998	436.165	25.180	25.180	-.----	-.----	-.----	-.----		
235.000	-.----	-.----	31.493	31.493	-.----	-.----	-.----	-.----		
240.000	445.514	448.178	37.482	37.482	-.----	-.----	-.----	-.----		
245.000	-.----	-.----	43.174	43.174	-.----	-.----	-.----	-.----		

Ge, Germanium

A = 72.590

Z = 32

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.880		7.760		15.520		19.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
250.000	454.738	459.340	48.592	48.592	-.----	-.----	-.----	-.----		
255.000	-.----	-.----	53.757	53.757	-.----	-.----	-.----	-.----		
260.000	462.880	469.768	58.689	58.689	-.----	-.----	-.----	-.----		
265.000	-.----	-.----	63.405	63.405	-.----	-.----	-.----	-.----		
270.000	470.109	479.559	67.919	67.919	-.----	-.----	-.----	-.----		
275.000	-.----	-.----	72.247	72.247	-.----	-.----	-.----	-.----		
280.000	476.562	488.792	76.400	76.400	-.----	-.----	-.----	-.----		
290.000	482.353	497.536	84.228	84.228	-.----	-.----	-.----	-.----		
300.000	487.572	505.849	91.485	91.485	-.----	-.----	-.----	-.----		
310.000	492.298	513.779	98.238	98.238	-.----	-.----	-.----	-.----		
320.000	496.594	521.368	104.543	104.543	-.----	-.----	-.----	-.----		
330.000	500.514	528.652	110.449	110.449	-.----	-.----	-.----	-.----		
340.000	504.103	535.663	115.997	115.997	-.----	-.----	-.----	-.----		
350.000	507.400	542.426	121.222	121.222	-.----	-.----	-.----	-.----		
360.000	510.439	548.966	126.155	126.155	-.----	-.----	-.----	-.----		
370.000	513.247	555.303	130.822	130.822	-.----	-.----	-.----	-.----		
375.360	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
376.000	-.----	-.----	-.----	-.----	0.153	0.153	-.----	-.----		
377.000	-.----	-.----	-.----	-.----	0.395	0.395	-.----	-.----		
378.000	-.----	-.----	-.----	-.----	0.636	0.636	-.----	-.----		
379.000	-.----	-.----	-.----	-.----	0.877	0.877	-.----	-.----		
380.000	515.849	561.455	135.246	135.255	1.117	1.117	-.----	-.----		
385.000	-.----	-.----	-.----	-.----	2.310	2.310	-.----	-.----		
390.000	518.267	567.438	139.449	139.532	3.491	3.491	-.----	-.----		
395.000	-.----	-.----	-.----	-.----	4.658	4.658	-.----	-.----		
400.000	520.517	573.265	143.447	143.677	5.813	5.813	-.----	-.----		
405.000	-.----	-.----	-.----	-.----	6.955	6.955	-.----	-.----		
410.000	-.----	-.----	147.257	147.698	8.085	8.085	-.----	-.----		
415.000	-.----	-.----	-.----	-.----	9.203	9.203	-.----	-.----		
420.000	-.----	-.----	150.893	151.604	10.309	10.309	-.----	-.----		
425.000	-.----	-.----	-.----	-.----	11.404	11.404	-.----	-.----		
430.000	-.----	-.----	154.368	155.403	12.487	12.487	-.----	-.----		
435.000	-.----	-.----	-.----	-.----	13.558	13.558	-.----	-.----		
440.000	-.----	-.----	157.693	159.102	14.619	14.619	-.----	-.----		
446.480	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		

Ge, Germanium

A=72.590

Z=32

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d			
Energy(eV)=		3.880	7.760		15.520	19.400					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
447.000	----	----	----	----	----	----	0.069	0.069			
448.000	----	----	----	----	----	----	0.203	0.203			
449.000	----	----	----	----	----	----	0.337	0.337			
450.000	529.772	600.456	160.878	162.708	16.707	16.707	0.471	0.471			
455.000	----	----	----	----	----	----	1.142	1.142			
460.000	----	----	163.933	166.227	18.751	18.751	1.813	1.813			
465.000	----	----	----	----	----	----	2.484	2.484			
470.000	----	----	166.865	169.662	20.753	20.753	3.155	3.155			
475.000	----	----	----	----	----	----	3.826	3.826			
480.000	----	----	169.683	173.021	22.715	22.715	4.496	4.496			
485.000	----	----	----	----	----	----	5.165	5.165			
490.000	----	----	172.393	176.306	24.636	24.636	5.833	5.833			
495.000	----	----	----	----	----	----	6.500	6.500			
500.000	536.608	625.142	175.001	179.522	26.517	26.517	7.165	7.165			
510.000	----	----	----	----	28.360	28.360	8.490	8.490			
520.000	----	----	----	----	30.166	30.166	9.806	9.806			
530.000	----	----	----	----	31.934	31.934	11.113	11.113			
540.000	----	----	----	----	33.667	33.667	12.410	12.410			
550.000	541.826	647.991	186.711	194.688	35.365	35.365	13.695	13.695			
560.000	----	----	----	----	37.028	37.028	14.968	14.968			
570.000	----	----	----	----	38.658	38.658	16.228	16.228			
580.000	----	----	----	----	40.255	40.255	17.475	17.475			
590.000	----	----	----	----	41.820	41.820	18.708	18.708			
600.000	545.903	669.420	196.586	208.579	43.353	43.353	19.927	19.927			
610.000	----	----	----	----	44.856	44.856	21.131	21.131			
620.000	----	----	----	----	46.329	46.329	22.321	22.321			
630.000	----	----	----	----	47.773	47.773	23.495	23.495			
640.000	----	----	----	----	49.188	49.190	24.654	24.654			
650.000	549.142	689.704	205.024	221.452	50.575	50.587	25.798	25.798			
660.000	----	----	----	----	51.935	51.965	26.927	26.927			
670.000	----	----	----	----	53.268	53.325	28.040	28.040			
680.000	----	----	----	----	54.576	54.667	29.137	29.137			
690.000	----	----	----	----	55.857	55.993	30.219	30.219			
700.000	551.746	709.032	212.307	233.487	57.114	57.302	31.286	31.286			
710.000	----	----	----	----	----	----	32.337	32.337			

Ge, Germanium

A=72.590

Z=32

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.880		7.760		15.520		19.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
720.000	-.----	-.----	-.----	-.----	-.----	-.----	33.373	33.373		
730.000	-.----	-.----	-.----	-.----	-.----	-.----	34.394	34.394		
740.000	-.----	-.----	-.----	-.----	-.----	-.----	35.400	35.400		
750.000	553.853	727.538	218.646	244.820	63.045	63.615	36.390	36.391		
760.000	-.----	-.----	-.----	-.----	-.----	-.----	37.366	37.373		
770.000	-.----	-.----	-.----	-.----	-.----	-.----	38.328	38.343		
780.000	-.----	-.----	-.----	-.----	-.----	-.----	39.275	39.304		
790.000	-.----	-.----	-.----	-.----	-.----	-.----	40.207	40.255		
800.000	555.566	745.323	224.202	255.551	68.434	69.581	41.125	41.197		
850.000	556.959	762.465	229.100	265.758	73.341	75.243	45.511	45.768		
900.000	558.090	779.024	233.438	275.504	77.816	80.635	49.570	50.130		
950.000	559.003	795.051	237.298	284.839	81.906	85.786	53.327	54.303		
1000.000	559.733	810.587	240.744	293.803	85.650	90.719	56.804	58.304		
1050.000	560.310	825.668	243.831	302.433	89.083	95.455	60.025	62.149		
1100.000	560.755	840.323	246.605	310.755	92.238	100.011	63.010	65.851		
1150.000	561.089	854.579	249.103	318.796	95.142	104.401	65.780	69.420		
1200.000	561.327	868.460	251.359	326.576	97.818	108.639	68.351	72.866		
1250.000	561.484	881.987	253.400	334.115	100.288	112.735	70.741	76.199		
1300.000	561.569	895.178	255.249	341.429	102.571	116.701	72.965	79.425		
1350.000	561.592	908.051	256.929	348.532	104.686	120.544	75.035	82.552		
1400.000	561.561	920.620	258.455	355.438	106.645	124.272	76.966	85.587		
1450.000	561.484	932.899	259.845	362.159	108.464	127.893	78.767	88.533		
1500.000	561.366	944.903	261.112	368.704	110.155	131.413	80.449	91.398		

As, Arsenic

A=74.922

Z=33

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 3.140		2T _s 6.280		4T _s 12.560		5T _s 15.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
97.810	0.000	0.000	----	----	----	----	----	----	----	----
98.000	3.700	3.700	----	----	----	----	----	----	----	----
99.000	23.093	23.093	----	----	----	----	----	----	----	----
100.000	41.807	41.807	----	----	----	----	----	----	----	----
105.000	126.184	126.184	----	----	----	----	----	----	----	----
110.000	197.472	197.472	----	----	----	----	----	----	----	----
115.000	258.149	258.149	----	----	----	----	----	----	----	----
120.000	310.143	310.143	----	----	----	----	----	----	----	----
125.000	354.968	354.968	----	----	----	----	----	----	----	----
130.000	393.832	393.832	----	----	----	----	----	----	----	----
135.000	427.701	427.701	----	----	----	----	----	----	----	----
140.000	457.358	457.358	----	----	----	----	----	----	----	----
145.000	483.442	483.442	----	----	----	----	----	----	----	----
150.000	506.477	506.477	----	----	----	----	----	----	----	----
155.000	526.898	526.898	----	----	----	----	----	----	----	----
160.000	545.066	545.066	----	----	----	----	----	----	----	----
170.000	575.805	575.805	----	----	----	----	----	----	----	----
180.000	600.592	600.592	----	----	----	----	----	----	----	----
181.950	----	----	0.000	0.000	----	----	----	----	----	----
182.000	----	----	0.129	0.129	----	----	----	----	----	----
183.000	----	----	2.913	2.913	----	----	----	----	----	----
184.000	----	----	5.654	5.654	----	----	----	----	----	----
185.000	----	----	8.353	8.353	----	----	----	----	----	----
186.000	----	----	11.010	11.010	----	----	----	----	----	----
187.000	----	----	13.627	13.627	----	----	----	----	----	----
188.000	----	----	16.205	16.205	----	----	----	----	----	----
189.000	----	----	18.743	18.743	----	----	----	----	----	----
190.000	620.798	621.327	21.244	21.244	----	----	----	----	----	----
195.000	----	----	33.210	33.210	----	----	----	----	----	----
200.000	637.429	639.842	44.349	44.349	----	----	----	----	----	----
205.000	----	----	54.743	54.743	----	----	----	----	----	----
210.000	651.237	656.554	64.466	64.466	----	----	----	----	----	----
215.000	----	----	73.583	73.583	----	----	----	----	----	----
220.000	662.793	671.763	82.149	82.149	----	----	----	----	----	----
225.000	----	----	90.216	90.216	----	----	----	----	----	----

As, Arsenic

A=74.922

Z=33

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.140		6.280		12.560		15.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
230.000	672.533	685.713	97.826	97.826	-.---	-.---	-.---	-.---		
235.000	-.---	-.---	105.019	105.019	-.---	-.---	-.---	-.---		
240.000	680.796	698.596	111.829	111.829	-.---	-.---	-.---	-.---		
250.000	687.848	710.572	124.424	124.424	-.---	-.---	-.---	-.---		
260.000	693.899	721.770	135.822	135.822	-.---	-.---	-.---	-.---		
270.000	699.118	732.297	146.195	146.195	-.---	-.---	-.---	-.---		
280.000	703.641	742.243	155.683	155.683	-.---	-.---	-.---	-.---		
290.000	707.576	751.682	164.401	164.401	-.---	-.---	-.---	-.---		
300.000	711.013	760.676	172.446	172.446	-.---	-.---	-.---	-.---		
310.000	714.028	769.279	179.897	179.897	-.---	-.---	-.---	-.---		
320.000	716.679	777.535	186.823	186.823	-.---	-.---	-.---	-.---		
325.210	-.---	-.---	-.---	-.---	0.000	0.000	-.---	-.---		
326.000	-.---	-.---	-.---	-.---	0.332	0.332	-.---	-.---		
327.000	-.---	-.---	-.---	-.---	0.752	0.752	-.---	-.---		
328.000	-.---	-.---	-.---	-.---	1.169	1.169	-.---	-.---		
329.000	-.---	-.---	-.---	-.---	1.585	1.585	-.---	-.---		
330.000	719.019	785.483	193.282	193.300	1.999	1.999	-.---	-.---		
335.000	-.---	-.---	-.---	-.---	4.042	4.042	-.---	-.---		
340.000	721.089	793.156	199.321	199.486	6.043	6.043	-.---	-.---		
345.000	-.---	-.---	-.---	-.---	8.004	8.004	-.---	-.---		
350.000	722.926	800.582	204.985	205.430	9.926	9.926	-.---	-.---		
355.000	-.---	-.---	-.---	-.---	11.811	11.811	-.---	-.---		
360.000	724.559	807.786	210.309	211.152	13.660	13.660	-.---	-.---		
365.000	-.---	-.---	-.---	-.---	15.475	15.475	-.---	-.---		
370.000	726.014	814.790	215.325	216.670	17.258	17.258	-.---	-.---		
375.000	-.---	-.---	-.---	-.---	19.008	19.008	-.---	-.---		
380.000	727.313	821.611	220.061	222.001	20.727	20.727	-.---	-.---		
388.320	-.---	-.---	-.---	-.---	-.---	-.---	0.000	0.000		
389.000	-.---	-.---	-.---	-.---	-.---	-.---	0.157	0.157		
390.000	728.474	828.265	224.542	227.160	24.078	24.078	0.389	0.389		
395.000	-.---	-.---	-.---	-.---	-.---	-.---	1.540	1.540		
400.000	729.514	834.768	228.788	232.160	27.318	27.318	2.683	2.683		
405.000	-.---	-.---	-.---	-.---	-.---	-.---	3.816	3.816		
410.000	-.---	-.---	232.819	237.013	30.453	30.453	4.939	4.939		
415.000	-.---	-.---	-.---	-.---	-.---	-.---	6.053	6.053		

As, Arsenic

A = 74.922

Z = 33

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d
Energy(eV)=		3.140	6.280		12.560	15.700				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
420.000	----	----	236.651	241.729	33.488	33.488	7.158	7.158		
425.000	----	----	----	----	----	----	8.253	8.253		
430.000	----	----	240.300	246.317	36.430	36.430	9.339	9.339		
435.000	----	----	----	----	----	----	10.416	10.416		
440.000	----	----	243.779	250.787	39.284	39.284	11.484	11.484		
450.000	733.315	865.397	247.101	255.147	42.053	42.053	13.591	13.591		
460.000	----	----	250.275	259.402	44.741	44.741	15.662	15.662		
470.000	----	----	253.313	263.560	47.353	47.353	17.696	17.696		
480.000	----	----	256.222	267.626	49.891	49.891	19.694	19.694		
490.000	----	----	259.011	271.606	52.360	52.360	21.656	21.656		
500.000	735.534	893.611	261.688	275.504	54.761	54.761	23.583	23.583		
510.000	----	----	----	----	57.098	57.098	25.475	25.475		
520.000	----	----	----	----	59.372	59.372	27.332	27.332		
530.000	----	----	----	----	61.587	61.587	29.154	29.154		
540.000	----	----	----	----	63.745	63.745	30.943	30.943		
550.000	736.793	920.059	273.602	293.916	65.847	65.847	32.699	32.699		
560.000	----	----	----	----	67.897	67.898	34.422	34.422		
570.000	----	----	----	----	69.894	69.911	36.113	36.113		
580.000	----	----	----	----	71.843	71.891	37.772	37.772		
590.000	----	----	----	----	73.743	73.838	39.400	39.400		
600.000	737.439	945.135	283.514	310.829	75.598	75.755	40.998	40.998		
610.000	----	----	----	----	----	----	42.565	42.565		
620.000	----	----	----	----	----	----	44.103	44.103		
630.000	----	----	----	----	----	----	45.612	45.612		
640.000	----	----	----	----	----	----	47.092	47.092		
650.000	737.673	969.090	291.878	326.544	84.227	84.910	48.545	48.545		
660.000	----	----	----	----	----	----	49.970	49.971		
670.000	----	----	----	----	----	----	51.368	51.379		
680.000	----	----	----	----	----	----	52.740	52.768		
690.000	----	----	----	----	----	----	54.087	54.140		
700.000	737.620	992.093	299.015	341.276	91.905	93.443	55.408	55.495		
750.000	737.362	1014.266	305.159	355.181	98.766	101.451	61.655	62.028		
800.000	736.952	1035.695	310.488	368.377	104.920	109.006	67.345	68.201		
850.000	736.429	1056.450	315.137	380.954	110.461	116.167	72.537	74.057		
900.000	735.820	1076.584	319.214	392.985	115.465	122.980	77.279	79.632		

As, Arsenic

A = 74.922

Z = 33

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	3.140	6.280	12.560	15.700						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
950.000	735.145	1096.142	322.805	404.528	119.996	129.484	81.619	84.956		
1000.000	734.421	1115.162	325.980	415.631	124.111	135.710	85.597	90.054		
1050.000	733.658	1133.677	328.795	426.333	127.856	141.685	89.247	94.946		
1100.000	732.867	1151.715	331.299	436.668	131.273	147.430	92.604	99.650		
1150.000	732.055	1169.301	333.530	446.665	134.396	152.966	95.694	104.182		
1200.000	731.227	1186.457	335.522	456.348	137.257	158.308	98.544	108.555		
1250.000	730.387	1203.204	337.305	465.741	139.883	163.472	101.176	112.781		
1300.000	729.540	1219.561	338.902	474.862	142.296	168.470	103.609	116.870		
1350.000	728.689	1235.546	340.333	483.727	144.517	173.314	105.863	120.832		
1400.000	727.837	1251.174	341.619	492.353	146.565	178.013	107.952	124.674		
1450.000	726.987	1266.462	342.773	500.754	148.456	182.577	109.891	128.405		
1500.000	726.140	1281.424	343.810	508.941	150.205	187.013	111.693	132.030		

Se, Selenium

A = 78.960

Z = 34

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->		<-----Bulk Displacement Regime----->							
	T_s 2.350	$2T_s$ 4.700	$4T_s$ 9.400	$5T_s$ 11.750	T_d					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
78.500	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
79.000	20.714	20.714	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
80.000	61.001	61.001	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
85.000	237.214	237.214	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
90.000	378.904	378.904	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
95.000	494.018	494.018	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	588.391	588.391	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	666.377	666.377	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	731.274	731.274	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	785.615	785.615	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	831.366	831.366	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
125.000	870.071	870.071	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
130.000	902.956	902.956	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
135.000	931.000	931.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
140.000	954.994	954.994	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
147.710	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
148.000	-.----	-.----	1.655	1.655	-.----	-.----	-.----	-.----	-.----	-.----
149.000	-.----	-.----	7.404	7.404	-.----	-.----	-.----	-.----	-.----	-.----
150.000	993.287	993.399	13.034	13.034	-.----	-.----	-.----	-.----	-.----	-.----
155.000	-.----	-.----	39.494	39.494	-.----	-.----	-.----	-.----	-.----	-.----
160.000	1021.716	1024.578	63.420	63.420	-.----	-.----	-.----	-.----	-.----	-.----
165.000	-.----	-.----	85.141	85.141	-.----	-.----	-.----	-.----	-.----	-.----
170.000	1042.941	1051.289	104.933	104.933	-.----	-.----	-.----	-.----	-.----	-.----
175.000	-.----	-.----	123.030	123.030	-.----	-.----	-.----	-.----	-.----	-.----
180.000	1058.828	1074.483	139.630	139.630	-.----	-.----	-.----	-.----	-.----	-.----
185.000	-.----	-.----	154.905	154.905	-.----	-.----	-.----	-.----	-.----	-.----
190.000	1070.707	1094.875	169.002	169.002	-.----	-.----	-.----	-.----	-.----	-.----
195.000	-.----	-.----	182.046	182.046	-.----	-.----	-.----	-.----	-.----	-.----
200.000	1079.544	1113.013	194.148	194.148	-.----	-.----	-.----	-.----	-.----	-.----
210.000	1086.052	1129.321	215.896	215.896	-.----	-.----	-.----	-.----	-.----	-.----
220.000	1090.760	1144.131	234.876	234.876	-.----	-.----	-.----	-.----	-.----	-.----
230.000	1094.071	1157.703	251.577	251.577	-.----	-.----	-.----	-.----	-.----	-.----
240.000	1096.290	1170.248	266.382	266.382	-.----	-.----	-.----	-.----	-.----	-.----
250.000	1097.652	1181.932	279.594	279.594	-.----	-.----	-.----	-.----	-.----	-.----
260.000	1098.340	1192.892	291.458	291.458	-.----	-.----	-.----	-.----	-.----	-.----

Se, Selenium

A = 78.960

Z = 34

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		2.350	4.700		9.400	11.750					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
267.900	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----			
268.000	-.----	-.----	-.----	-.----	0.082	0.082	-.----	-.----			
269.000	-.----	-.----	-.----	-.----	0.938	0.938	-.----	-.----			
270.000	1098.495	1203.238	302.170	302.179	1.786	1.786	-.----	-.----			
275.000	-.----	-.----	-.----	-.----	5.936	5.936	-.----	-.----			
280.000	1098.230	1213.062	311.892	312.155	9.938	9.938	-.----	-.----			
285.000	-.----	-.----	-.----	-.----	13.801	13.801	-.----	-.----			
290.000	1097.635	1222.437	320.756	321.586	17.535	17.535	-.----	-.----			
295.000	-.----	-.----	-.----	-.----	21.146	21.146	-.----	-.----			
300.000	1096.778	1231.426	328.873	330.532	24.643	24.643	-.----	-.----			
305.000	-.----	-.----	-.----	-.----	28.033	28.033	-.----	-.----			
310.000	1095.718	1240.081	336.335	339.045	31.320	31.320	-.----	-.----			
315.000	-.----	-.----	-.----	-.----	34.511	34.511	-.----	-.----			
320.000	1094.498	1248.446	343.219	347.168	37.611	37.611	-.----	-.----			
321.510	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
322.000	-.----	-.----	-.----	-.----	-.----	-.----	0.227	0.227			
323.000	-.----	-.----	-.----	-.----	-.----	-.----	0.694	0.694			
324.000	-.----	-.----	-.----	-.----	-.----	-.----	1.160	1.160			
325.000	-.----	-.----	-.----	-.----	-.----	-.----	1.623	1.623			
326.000	-.----	-.----	-.----	-.----	-.----	-.----	2.084	2.084			
327.000	-.----	-.----	-.----	-.----	-.----	-.----	2.543	2.543			
328.000	-.----	-.----	-.----	-.----	-.----	-.----	3.001	3.001			
329.000	-.----	-.----	-.----	-.----	-.----	-.----	3.456	3.456			
330.000	1093.154	1256.557	349.592	354.942	43.557	43.557	3.909	3.909			
335.000	-.----	-.----	-.----	-.----	-.----	-.----	6.147	6.147			
340.000	1091.718	1264.444	355.510	362.400	49.190	49.190	8.338	8.338			
345.000	-.----	-.----	-.----	-.----	-.----	-.----	10.485	10.485			
350.000	1090.211	1272.135	361.021	369.570	54.540	54.540	12.590	12.590			
355.000	-.----	-.----	-.----	-.----	-.----	-.----	14.654	14.654			
360.000	1088.653	1279.651	366.166	376.480	59.632	59.632	16.678	16.678			
365.000	-.----	-.----	-.----	-.----	-.----	-.----	18.665	18.665			
370.000	1087.059	1287.011	370.982	383.151	64.486	64.486	20.615	20.615			
375.000	-.----	-.----	-.----	-.----	-.----	-.----	22.531	22.531			
380.000	1085.443	1294.232	375.499	389.603	69.123	69.123	24.412	24.412			
390.000	1083.813	1301.327	379.746	395.855	73.559	73.559	28.077	28.077			

Se, Selenium

A = 78.960

Z = 34

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	2.350		4.700		9.400		11.750			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
400.000	1082.180	1308.310	383.746	401.922	77.808	77.808	31.618	31.618		
410.000	-----	-----	387.520	407.818	81.884	81.884	35.044	35.044		
420.000	-----	-----	391.088	413.555	85.798	85.798	38.360	38.360		
430.000	-----	-----	394.465	419.146	89.561	89.561	41.573	41.573		
440.000	-----	-----	397.667	424.600	93.183	93.183	44.688	44.688		
450.000	1074.134	1341.843	400.708	429.926	96.671	96.671	47.709	47.709		
460.000	-----	-----	403.598	435.132	100.034	100.034	50.641	50.641		
470.000	-----	-----	406.349	440.227	103.279	103.284	53.488	53.488		
480.000	-----	-----	408.971	445.216	106.412	106.454	56.253	56.253		
490.000	-----	-----	411.472	450.106	109.439	109.554	58.942	58.942		
500.000	1066.559	1373.647	413.861	454.903	112.366	112.587	61.555	61.555		
510.000	-----	-----	-----	-----	115.198	115.556	64.098	64.098		
520.000	-----	-----	-----	-----	117.940	118.465	66.572	66.572		
530.000	-----	-----	-----	-----	120.595	121.317	68.980	68.980		
540.000	-----	-----	-----	-----	123.168	124.114	71.324	71.324		
550.000	1059.583	1404.192	424.345	477.655	125.662	126.859	73.608	73.608		
560.000	-----	-----	-----	-----	128.082	129.554	75.833	75.842		
570.000	-----	-----	-----	-----	130.430	132.203	78.001	78.038		
580.000	-----	-----	-----	-----	132.710	134.805	80.114	80.197		
590.000	-----	-----	-----	-----	134.924	137.365	82.175	82.320		
600.000	1053.205	1433.733	432.873	498.691	137.075	139.883	84.185	84.408		
650.000	1047.376	1462.417	439.919	518.357	146.970	151.904	93.526	94.383		
700.000	1042.032	1490.336	445.809	536.894	155.618	163.099	101.820	103.672		
750.000	1037.115	1517.547	450.778	554.476	163.228	173.600	109.217	112.383		
800.000	1032.569	1544.093	455.001	571.235	169.962	183.506	115.840	120.597		
850.000	1028.349	1570.009	458.611	587.271	175.949	192.898	121.793	128.378		
900.000	1024.416	1595.322	461.710	602.665	181.294	201.835	127.159	135.778		
950.000	1020.734	1620.054	464.380	617.482	186.084	210.370	132.010	142.838		
1000.000	1017.275	1644.226	466.686	631.773	190.391	218.544	136.408	149.593		
1050.000	1014.013	1667.858	468.681	645.584	194.274	226.390	140.405	156.074		
1100.000	1010.927	1690.968	470.409	658.953	197.785	233.940	144.046	162.303		
1150.000	1008.000	1713.574	471.906	671.911	200.968	241.218	147.369	168.303		
1200.000	1005.218	1735.694	473.203	684.487	203.859	248.245	150.408	174.093		
1250.000	1002.568	1757.346	474.325	696.707	206.490	255.041	153.192	179.687		
1300.000	1000.039	1778.546	475.294	708.591	208.889	261.621	155.748	185.100		

Se, Selenium

A=78.960

Z=34

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s	2T _s	4T _s	5T _s						
	2.350	4.700	9.400	11.750						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1350.000	997.622	1799.309	476.129	720.161	211.080	268.002	158.097	190.344		
1400.000	995.309	1819.653	476.845	731.434	213.084	274.195	160.260	195.431		
1450.000	993.092	1839.589	477.458	742.426	214.921	280.212	162.254	200.370		
1500.000	990.963	1859.133	477.977	753.151	216.605	286.064	164.094	205.171		

Rb, Rubidium

A=85.470

Z=37

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 0.850		2T _s 1.700		4T _s 3.400		5T _s 4.250			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
32.080	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---		
33.000	691.571	691.571	-.---	-.---	-.---	-.---	-.---	-.---		
34.000	1366.937	1366.937	-.---	-.---	-.---	-.---	-.---	-.---		
35.000	1965.619	1965.619	-.---	-.---	-.---	-.---	-.---	-.---		
36.000	2497.484	2497.484	-.---	-.---	-.---	-.---	-.---	-.---		
37.000	2970.918	2970.918	-.---	-.---	-.---	-.---	-.---	-.---		
38.000	3393.082	3393.082	-.---	-.---	-.---	-.---	-.---	-.---		
39.000	3770.115	3770.115	-.---	-.---	-.---	-.---	-.---	-.---		
40.000	4107.301	4107.301	-.---	-.---	-.---	-.---	-.---	-.---		
45.000	5336.030	5336.030	-.---	-.---	-.---	-.---	-.---	-.---		
50.000	6053.031	6053.031	-.---	-.---	-.---	-.---	-.---	-.---		
55.000	6468.118	6468.118	-.---	-.---	-.---	-.---	-.---	-.---		
60.000	6698.208	6698.208	-.---	-.---	-.---	-.---	-.---	-.---		
62.380	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---		
63.000	-.---	-.---	63.366	63.366	-.---	-.---	-.---	-.---		
64.000	-.---	-.---	161.593	161.593	-.---	-.---	-.---	-.---		
65.000	6811.777	6817.326	254.137	254.137	-.---	-.---	-.---	-.---		
66.000	-.---	-.---	341.392	341.392	-.---	-.---	-.---	-.---		
67.000	-.---	-.---	423.719	423.719	-.---	-.---	-.---	-.---		
68.000	-.---	-.---	501.451	501.451	-.---	-.---	-.---	-.---		
69.000	-.---	-.---	574.893	574.893	-.---	-.---	-.---	-.---		
70.000	6850.551	6890.404	644.326	644.326	-.---	-.---	-.---	-.---		
75.000	6840.778	6934.531	939.769	939.769	-.---	-.---	-.---	-.---		
80.000	6799.403	6957.769	1166.581	1166.581	-.---	-.---	-.---	-.---		
85.000	6737.593	6965.840	1342.682	1342.682	-.---	-.---	-.---	-.---		
90.000	6662.828	6962.870	1480.666	1480.666	-.---	-.---	-.---	-.---		
95.000	6580.183	6951.871	1589.573	1589.573	-.---	-.---	-.---	-.---		
100.000	6493.131	6935.069	1676.011	1676.011	-.---	-.---	-.---	-.---		
105.000	-.---	-.---	1744.887	1744.887	-.---	-.---	-.---	-.---		
110.000	6314.615	6890.264	1799.901	1799.901	-.---	-.---	-.---	-.---		
115.000	-.---	-.---	1843.876	1843.876	-.---	-.---	-.---	-.---		
118.610	-.---	-.---	-.---	-.---	0.000	0.000	-.---	-.---		
119.000	-.---	-.---	-.---	-.---	5.406	5.406	-.---	-.---		
120.000	6138.748	6837.369	1878.992	1879.115	19.335	19.335	-.---	-.---		
125.000	-.---	-.---	-.---	-.---	83.455	83.455	-.---	-.---		

Rb, Rubidium

A = 85.470

Z = 37

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s		4T _s		5T _s				
Energy(eV)=	0.850	1.700		3.400		4.250				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
130.000	5970.808	6781.491	1929.086	1936.189	139.504	139.504	-.----	-.----		
135.000	-.----	-.----	-.----	-.----	188.780	188.780	-.----	-.----		
140.000	5812.987	6725.582	1959.944	1981.447	232.333	232.333	-.----	-.----		
144.930	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
145.000	-.----	-.----	-.----	-.----	271.017	271.017	0.525	0.525		
146.000	-.----	-.----	-.----	-.----	-.----	-.----	8.027	8.027		
147.000	-.----	-.----	-.----	-.----	-.----	-.----	15.369	15.369		
148.000	-.----	-.----	-.----	-.----	-.----	-.----	22.555	22.555		
149.000	-.----	-.----	-.----	-.----	-.----	-.----	29.589	29.589		
150.000	5665.916	6671.335	1977.795	2018.009	305.533	305.533	36.476	36.476		
155.000	-.----	-.----	-.----	-.----	336.461	336.461	68.851	68.851		
160.000	5529.439	6619.695	1986.727	2048.078	364.285	364.285	98.130	98.130		
165.000	-.----	-.----	-.----	-.----	389.409	389.409	124.713	124.713		
170.000	5403.022	6571.151	1989.486	2073.233	412.173	412.173	148.940	148.940		
175.000	-.----	-.----	-.----	-.----	432.868	432.868	171.094	171.094		
180.000	5285.965	6525.916	1987.951	2094.632	451.738	451.738	191.421	191.421		
185.000	-.----	-.----	-.----	-.----	-.----	-.----	210.127	210.127		
190.000	5177.520	6484.036	1983.430	2113.129	484.819	484.819	227.392	227.392		
195.000	-.----	-.----	-.----	-.----	-.----	-.----	243.369	243.369		
200.000	5076.946	6445.451	1976.843	2129.370	512.777	512.777	258.194	258.194		
210.000	4983.543	6410.046	1968.847	2143.841	536.632	536.632	284.835	284.835		
220.000	4896.663	6377.669	1959.914	2156.919	557.164	557.182	308.085	308.085		
230.000	4815.713	6348.155	1950.386	2168.892	574.973	575.674	328.537	328.537		
240.000	4740.160	6321.330	1940.510	2179.987	590.532	592.750	346.661	346.661		
250.000	4669.520	6297.024	1930.467	2190.381	604.214	608.605	362.827	362.827		
260.000	4603.362	6275.070	1920.387	2200.216	616.317	623.405	377.332	377.332		
270.000	4541.295	6255.310	1910.366	2209.601	627.081	637.285	390.417	390.530		
280.000	4482.972	6237.592	1900.472	2218.625	636.704	650.360	402.281	402.931		
290.000	4428.079	6221.778	1890.754	2227.361	645.345	662.726	413.085	414.648		
300.000	4376.336	6207.734	1881.244	2235.865	653.139	674.466	422.966	425.758		
310.000	4327.488	6195.338	1871.966	2244.182	660.197	685.649	432.036	436.324		
320.000	4281.308	6184.476	1862.934	2252.351	666.611	696.335	440.392	446.403		
330.000	4237.590	6175.043	1854.154	2260.402	672.460	706.576	448.114	456.044		
340.000	4196.148	6166.941	1845.632	2268.357	677.810	716.417	455.272	465.288		
350.000	4156.813	6160.079	1837.366	2276.238	682.719	725.896	461.925	474.172		

Rb, Rubidium

A = 85.470

Z = 37

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	0.850		1.700		3.400		4.250			
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)
360.000	4119.433	6154.373	1829.355	2284.060	687.235	735.046	468.125	482.729		
370.000	4083.869	6149.747	1821.593	2291.835	691.400	743.899	473.916	490.987		
380.000	4049.994	6146.129	1814.075	2299.575	695.250	752.479	479.338	498.971		
390.000	4017.695	6143.452	1806.794	2307.287	698.818	760.810	484.423	506.703		
400.000	3986.865	6141.655	1799.743	2314.977	702.129	768.911	489.202	514.203		
410.000	-----	-----	-----	-----	-----	-----	493.701	521.488		
420.000	-----	-----	-----	-----	-----	-----	497.944	528.576		
430.000	-----	-----	-----	-----	-----	-----	501.952	535.478		
440.000	-----	-----	-----	-----	-----	-----	505.742	542.210		
450.000	3851.653	6144.012	1767.664	2353.256	715.607	806.550	509.332	548.781		
460.000	-----	-----	-----	-----	-----	-----	512.737	555.202		
470.000	-----	-----	-----	-----	-----	-----	515.969	561.483		
480.000	-----	-----	-----	-----	-----	-----	519.042	567.632		
490.000	-----	-----	-----	-----	-----	-----	521.965	573.657		
500.000	3741.626	6161.330	1740.178	2391.422	725.342	840.487	524.749	579.565		
550.000	3650.381	6189.526	1716.428	2429.515	732.566	871.712	536.876	607.559		
600.000	3573.495	6225.692	1695.711	2467.470	738.026	900.849	546.604	633.409		
650.000	3507.829	6267.729	1677.473	2505.193	742.199	928.310	554.525	657.545		
700.000	3451.097	6314.097	1661.281	2542.595	745.404	954.378	561.046	680.272		
750.000	3401.595	6363.643	1646.790	2579.602	747.863	979.259	566.460	701.810		
800.000	3358.020	6415.491	1633.730	2616.150	749.738	1003.105	570.984	722.324		
850.000	3319.358	6468.966	1621.881	2652.190	751.147	1026.034	574.781	741.939		
900.000	3284.812	6523.544	1611.064	2687.685	752.181	1048.137	577.978	760.758		
950.000	3253.744	6578.818	1601.138	2722.612	752.907	1069.491	580.674	778.860		
1000.000	3225.641	6634.472	1591.985	2756.954	753.381	1090.156	582.949	796.313		
1050.000	3200.089	6690.256	1583.511	2790.707	753.646	1110.186	584.867	813.172		
1100.000	3176.746	6745.982	1575.635	2823.867	753.738	1129.626	586.480	829.484		
1150.000	3155.333	6801.499	1568.293	2856.438	753.686	1148.514	587.833	845.290		
1200.000	3135.618	6856.694	1561.425	2888.425	753.512	1166.886	588.961	860.625		
1250.000	3117.403	6911.477	1554.985	2919.834	753.237	1184.772	589.894	875.520		
1300.000	3100.525	6965.779	1548.927	2950.675	752.877	1202.199	590.660	890.003		
1350.000	3084.841	7019.550	1543.216	2980.956	752.444	1219.190	591.279	904.099		
1400.000	3070.229	7072.749	1537.819	3010.688	751.951	1235.769	591.771	917.829		
1450.000	3056.584	7125.345	1532.706	3039.881	751.406	1251.955	592.151	931.215		
1500.000	3043.813	7177.317	1527.852	3068.548	750.818	1267.767	592.432	944.272		

Sr, Strontium

A = 87.620

Z = 38

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		1.700	3.400		6.800	8.500				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
63.860	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
64.000	13.768	13.768	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	114.283	114.283	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
66.000	209.079	209.079	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
67.000	298.550	298.550	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
68.000	383.055	383.055	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
69.000	462.925	462.925	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	538.463	538.463	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	860.280	860.280	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
80.000	1107.959	1107.959	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
85.000	1300.848	1300.848	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
90.000	1452.534	1452.534	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
95.000	1572.764	1572.764	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	1668.660	1668.660	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	1745.514	1745.514	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
110.000	1807.313	1807.313	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
115.000	1857.102	1857.102	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
120.000	1897.235	1897.235	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
121.310	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
122.000	-.----	-.----	9.618	9.618	-.----	-.----	-.----	-.----	-.----	-.----
123.000	-.----	-.----	23.365	23.365	-.----	-.----	-.----	-.----	-.----	-.----
124.000	-.----	-.----	36.742	36.742	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	49.762	49.762	-.----	-.----	-.----	-.----	-.----	-.----
126.000	-.----	-.----	62.439	62.439	-.----	-.----	-.----	-.----	-.----	-.----
127.000	-.----	-.----	74.783	74.783	-.----	-.----	-.----	-.----	-.----	-.----
128.000	-.----	-.----	86.807	86.807	-.----	-.----	-.----	-.----	-.----	-.----
129.000	-.----	-.----	98.522	98.522	-.----	-.----	-.----	-.----	-.----	-.----
130.000	1955.485	1959.709	109.937	109.937	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	162.874	162.874	-.----	-.----	-.----	-.----	-.----	-.----
140.000	1992.613	2009.388	209.696	209.696	-.----	-.----	-.----	-.----	-.----	-.----
145.000	-.----	-.----	251.315	251.315	-.----	-.----	-.----	-.----	-.----	-.----
150.000	2015.368	2049.698	288.481	288.481	-.----	-.----	-.----	-.----	-.----	-.----
155.000	-.----	-.----	321.814	321.814	-.----	-.----	-.----	-.----	-.----	-.----
160.000	2028.192	2082.983	351.828	351.828	-.----	-.----	-.----	-.----	-.----	-.----
165.000	-.----	-.----	378.956	378.956	-.----	-.----	-.----	-.----	-.----	-.----

Sr, Strontium

A = 87.620

Z = 38

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T _s	2T _s		4T _s	5T _s				T _d	
Energy(eV)=		1.700	3.400		6.800	8.500					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
170.000	2034.077	2110.928	403.561	403.561	-.----	-.----	-.----	-.----			
175.000	-.----	-.----	425.950	425.950	-.----	-.----	-.----	-.----			
180.000	2035.079	2134.772	446.388	446.388	-.----	-.----	-.----	-.----			
190.000	2032.633	2155.431	482.272	482.272	-.----	-.----	-.----	-.----			
200.000	2027.758	2173.599	512.663	512.663	-.----	-.----	-.----	-.----			
210.000	2021.182	2189.803	538.649	538.649	-.----	-.----	-.----	-.----			
220.000	2013.432	2204.448	561.062	561.062	-.----	-.----	-.----	-.----			
222.840	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----			
223.000	-.----	-.----	-.----	-.----	0.320	0.320	-.----	-.----			
224.000	-.----	-.----	-.----	-.----	2.349	2.349	-.----	-.----			
225.000	-.----	-.----	-.----	-.----	4.356	4.356	-.----	-.----			
226.000	-.----	-.----	-.----	-.----	6.341	6.341	-.----	-.----			
227.000	-.----	-.----	-.----	-.----	8.305	8.305	-.----	-.----			
228.000	-.----	-.----	-.----	-.----	10.249	10.249	-.----	-.----			
229.000	-.----	-.----	-.----	-.----	12.172	12.172	-.----	-.----			
230.000	2004.894	2217.849	580.545	580.807	14.075	14.075	-.----	-.----			
235.000	-.----	-.----	-.----	-.----	23.300	23.300	-.----	-.----			
240.000	1995.850	2230.252	597.601	598.995	32.073	32.073	-.----	-.----			
245.000	-.----	-.----	-.----	-.----	40.430	40.430	-.----	-.----			
250.000	1986.506	2241.853	612.628	615.883	48.403	48.403	-.----	-.----			
255.000	-.----	-.----	-.----	-.----	56.022	56.022	-.----	-.----			
260.000	1977.016	2252.804	625.947	631.643	63.312	63.312	-.----	-.----			
265.000	-.----	-.----	-.----	-.----	70.296	70.296	-.----	-.----			
268.660	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
269.000	-.----	-.----	-.----	-.----	-.----	-.----	0.372	0.372			
270.000	1967.492	2263.229	637.815	646.419	76.997	76.997	1.474	1.474			
275.000	-.----	-.----	-.----	-.----	83.433	83.433	6.870	6.870			
280.000	1958.017	2273.227	648.444	660.334	89.621	89.621	12.081	12.081			
285.000	-.----	-.----	-.----	-.----	-.----	-.----	17.119	17.119			
290.000	1948.650	2282.876	658.005	673.489	101.318	101.318	21.993	21.993			
295.000	-.----	-.----	-.----	-.----	-.----	-.----	26.714	26.714			
300.000	1939.436	2292.241	666.643	685.973	112.196	112.196	31.291	31.291			
305.000	-.----	-.----	-.----	-.----	-.----	-.----	35.732	35.732			
310.000	1930.405	2301.373	674.477	697.859	122.349	122.349	40.044	40.044			
315.000	-.----	-.----	-.----	-.----	-.----	-.----	44.234	44.234			

Sr, Strontium

A = 87.620

Z = 38

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement Energy(eV)= T_s 2T_s 4T_s 5T_s T_d </div> </div>										
<div> <div> 1.700 3.400 6.800 8.500 </div> <div> </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
320.000	1921.577	2310.315	681.608	709.211	131.855	131.855	48.308	48.308		
330.000	1912.966	2319.101	688.119	720.084	140.781	140.781	56.131	56.131		
340.000	1904.580	2327.760	694.084	730.526	149.183	149.183	63.554	63.554		
350.000	1896.425	2336.313	699.563	740.579	157.111	157.111	70.612	70.612		
360.000	1888.499	2344.781	704.610	750.279	164.607	164.607	77.337	77.337		
370.000	1880.802	2353.178	709.271	759.656	171.708	171.708	83.754	83.754		
380.000	1873.331	2361.516	713.584	768.741	178.448	178.448	89.888	89.888		
390.000	1866.081	2369.806	717.584	777.555	184.856	184.856	95.758	95.758		
400.000	1859.046	2378.056	721.301	786.123	190.956	190.985	101.384	101.384		
410.000	-	-	-	-	196.772	196.924	106.782	106.782		
420.000	-	-	-	-	202.324	202.686	111.965	111.965		
430.000	-	-	-	-	207.630	208.285	116.949	116.949		
440.000	-	-	-	-	212.708	213.730	121.745	121.745		
450.000	1826.891	2418.898	736.465	825.860	217.571	219.032	126.363	126.363		
460.000	-	-	-	-	222.234	224.198	130.814	130.814		
470.000	-	-	-	-	226.709	229.238	135.108	135.111		
480.000	-	-	-	-	231.007	234.159	139.251	139.298		
490.000	-	-	-	-	235.138	238.966	143.253	143.388		
500.000	1799.153	2459.329	747.456	861.595	239.112	243.667	147.120	147.387		
510.000	-	-	-	-	-	-	150.859	151.299		
520.000	-	-	-	-	-	-	154.477	155.130		
530.000	-	-	-	-	-	-	157.978	158.882		
540.000	-	-	-	-	-	-	161.368	162.561		
550.000	1775.057	2499.473	755.636	894.398	256.908	265.761	164.653	166.168		
560.000	-	-	-	-	-	-	167.836	169.708		
570.000	-	-	-	-	-	-	170.923	173.184		
580.000	-	-	-	-	-	-	173.917	176.598		
590.000	-	-	-	-	-	-	176.822	179.953		
600.000	1753.943	2539.317	761.832	924.945	271.838	285.886	179.642	183.252		
650.000	1735.283	2578.801	766.576	953.684	284.513	304.440	192.579	198.971		
700.000	1718.657	2617.861	770.228	980.925	295.376	321.706	203.832	213.569		
750.000	1703.732	2656.437	773.038	1006.891	304.759	337.893	213.681	227.226		
800.000	1690.243	2694.480	775.187	1031.749	312.916	353.161	222.350	240.080		
850.000	1677.974	2731.950	776.809	1055.627	320.046	367.631	230.015	252.237		
900.000	1666.749	2768.819	778.006	1078.626	326.307	381.403	236.820	263.785		

Sr, Strontium

A=87.620

Z=38

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.700		3.400		6.800		8.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
950.000	1656.425	2805.067	778.856	1100.827	331.827	394.554	242.885	274.791		
1000.000	1646.888	2840.683	779.422	1122.299	336.711	407.150	248.306	285.314		
1050.000	1638.041	2875.666	779.751	1143.098	341.045	419.244	253.166	295.401		
1100.000	1629.805	2910.016	779.885	1163.274	344.900	430.882	257.535	305.091		
1150.000	1622.114	2943.740	779.856	1182.868	348.338	442.101	261.471	314.420		
1200.000	1614.910	2976.845	779.691	1201.917	351.410	452.937	265.024	323.417		
1250.000	1608.145	3009.341	779.411	1220.456	354.159	463.418	268.238	332.108		
1300.000	1601.775	3041.239	779.036	1238.512	356.623	473.568	271.149	340.515		
1350.000	1595.763	3072.550	778.579	1256.111	358.834	483.412	273.792	348.657		
1400.000	1590.075	3103.285	778.054	1273.278	360.820	492.968	276.193	356.554		
1450.000	1584.683	3133.458	777.472	1290.034	362.605	502.255	278.377	364.220		
1500.000	1579.560	3163.080	776.841	1306.399	364.211	511.288	280.367	371.669		

Y, Yttrium

A=88.906

Z=39

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.400		8.800		17.600		22.000			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
154.770	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
155.000	1.591	1.591	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
156.000	8.507	8.507	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
157.000	15.287	15.287	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
158.000	21.936	21.936	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
159.000	28.458	28.458	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
160.000	34.856	34.856	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
165.000	65.096	65.096	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
170.000	92.693	92.693	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
175.000	117.967	117.967	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
180.000	141.192	141.192	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
185.000	162.601	162.601	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
190.000	182.393	182.393	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
195.000	200.742	200.742	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
200.000	217.796	217.796	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
205.000	233.687	233.687	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
210.000	248.526	248.526	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
215.000	262.415	262.415	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
220.000	275.441	275.441	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
230.000	299.204	299.204	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
240.000	320.336	320.336	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
250.000	339.249	339.249	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
260.000	356.277	356.277	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
270.000	371.688	371.688	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
279.810	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
280.000	385.703	385.703	0.194	0.194	-.----	-.----	-.----	-.----	-.----	-.----
281.000	-.----	-.----	1.223	1.223	-.----	-.----	-.----	-.----	-.----	-.----
282.000	-.----	-.----	2.246	2.246	-.----	-.----	-.----	-.----	-.----	-.----
283.000	-.----	-.----	3.262	3.262	-.----	-.----	-.----	-.----	-.----	-.----
284.000	-.----	-.----	4.272	4.272	-.----	-.----	-.----	-.----	-.----	-.----
285.000	-.----	-.----	5.275	5.275	-.----	-.----	-.----	-.----	-.----	-.----
286.000	-.----	-.----	6.272	6.272	-.----	-.----	-.----	-.----	-.----	-.----
287.000	-.----	-.----	7.263	7.263	-.----	-.----	-.----	-.----	-.----	-.----
288.000	-.----	-.----	8.248	8.248	-.----	-.----	-.----	-.----	-.----	-.----
289.000	-.----	-.----	9.227	9.227	-.----	-.----	-.----	-.----	-.----	-.----
290.000	398.505	398.725	10.200	10.200	-.----	-.----	-.----	-.----	-.----	-.----

Y, Yttrium

A=88.906

Z=39

Displacement		Surface Sputtering Regime		Bulk Displacement Regime		Displacement		Regime		T _d	
Energy(eV)=		T _s	2T _s	4T _s	5T _s						
		4.400	8.800	17.600	22.000						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)
295.000	-.----	-.----	14.977	14.977	-.----	-.----	-.----	-.----	-.----	-.----	-.----
300.000	410.245	411.065	19.615	19.615	-.----	-.----	-.----	-.----	-.----	-.----	-.----
305.000	-.----	-.----	24.122	24.122	-.----	-.----	-.----	-.----	-.----	-.----	-.----
310.000	421.050	422.795	28.504	28.504	-.----	-.----	-.----	-.----	-.----	-.----	-.----
315.000	-.----	-.----	32.768	32.768	-.----	-.----	-.----	-.----	-.----	-.----	-.----
320.000	431.030	433.976	36.920	36.920	-.----	-.----	-.----	-.----	-.----	-.----	-.----
325.000	-.----	-.----	40.966	40.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----
330.000	440.274	444.662	44.909	44.909	-.----	-.----	-.----	-.----	-.----	-.----	-.----
335.000	-.----	-.----	48.756	48.756	-.----	-.----	-.----	-.----	-.----	-.----	-.----
340.000	448.862	454.901	52.510	52.510	-.----	-.----	-.----	-.----	-.----	-.----	-.----
350.000	456.861	464.732	59.755	59.755	-.----	-.----	-.----	-.----	-.----	-.----	-.----
360.000	464.330	474.192	66.674	66.674	-.----	-.----	-.----	-.----	-.----	-.----	-.----
370.000	471.319	483.313	73.291	73.291	-.----	-.----	-.----	-.----	-.----	-.----	-.----
380.000	477.873	492.122	79.628	79.628	-.----	-.----	-.----	-.----	-.----	-.----	-.----
390.000	484.030	500.645	85.705	85.705	-.----	-.----	-.----	-.----	-.----	-.----	-.----
400.000	489.826	508.904	91.540	91.540	-.----	-.----	-.----	-.----	-.----	-.----	-.----
410.000	495.290	516.919	97.148	97.148	-.----	-.----	-.----	-.----	-.----	-.----	-.----
420.000	500.450	524.707	102.543	102.543	-.----	-.----	-.----	-.----	-.----	-.----	-.----
430.000	505.329	532.285	107.737	107.737	-.----	-.----	-.----	-.----	-.----	-.----	-.----
440.000	509.949	539.667	112.742	112.742	-.----	-.----	-.----	-.----	-.----	-.----	-.----
450.000	514.329	546.865	117.570	117.570	-.----	-.----	-.----	-.----	-.----	-.----	-.----
460.000	518.488	553.893	122.228	122.228	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	522.440	560.760	126.726	126.726	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	526.199	567.476	131.073	131.073	-.----	-.----	-.----	-.----	-.----	-.----	-.----
483.800	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----
484.000	-.----	-.----	-.----	-.----	0.031	0.031	-.----	-.----	-.----	-.----	-.----
485.000	-.----	-.----	-.----	-.----	0.193	0.193	-.----	-.----	-.----	-.----	-.----
486.000	-.----	-.----	-.----	-.----	0.355	0.355	-.----	-.----	-.----	-.----	-.----
487.000	-.----	-.----	-.----	-.----	0.518	0.518	-.----	-.----	-.----	-.----	-.----
488.000	-.----	-.----	-.----	-.----	0.681	0.681	-.----	-.----	-.----	-.----	-.----
489.000	-.----	-.----	-.----	-.----	0.845	0.845	-.----	-.----	-.----	-.----	-.----
490.000	529.779	574.050	135.275	135.284	1.008	1.008	-.----	-.----	-.----	-.----	-.----
495.000	-.----	-.----	-.----	-.----	1.832	1.832	-.----	-.----	-.----	-.----	-.----
500.000	533.191	580.491	139.340	139.397	2.662	2.662	-.----	-.----	-.----	-.----	-.----
505.000	-.----	-.----	-.----	-.----	3.499	3.499	-.----	-.----	-.----	-.----	-.----
510.000	-.----	-.----	143.275	143.421	4.342	4.342	-.----	-.----	-.----	-.----	-.----

Y, Yttrium

A = 88.906

Z = 39

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	4.400		8.800		17.600		22.000			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
515.000	-.----	-.----	-.----	-.----	5.189	5.189	-.----	-.----		
520.000	-.----	-.----	147.084	147.360	6.042	6.042	-.----	-.----		
525.000	-.----	-.----	-.----	-.----	6.898	6.898	-.----	-.----		
530.000	-.----	-.----	150.774	151.219	7.757	7.757	-.----	-.----		
535.000	-.----	-.----	-.----	-.----	8.619	8.619	-.----	-.----		
540.000	-.----	-.----	154.351	155.000	9.484	9.484	-.----	-.----		
550.000	548.082	610.925	157.818	158.708	11.218	11.218	-.----	-.----		
560.000	-.----	-.----	161.181	162.346	12.956	12.956	-.----	-.----		
570.000	-.----	-.----	164.444	165.918	14.694	14.694	-.----	-.----		
571.480	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
572.000	-.----	-.----	-.----	-.----	-.----	-.----	0.046	0.046		
573.000	-.----	-.----	-.----	-.----	-.----	-.----	0.137	0.137		
574.000	-.----	-.----	-.----	-.----	-.----	-.----	0.228	0.228		
575.000	-.----	-.----	-.----	-.----	-.----	-.----	0.319	0.319		
576.000	-.----	-.----	-.----	-.----	-.----	-.----	0.411	0.411		
577.000	-.----	-.----	-.----	-.----	-.----	-.----	0.503	0.503		
578.000	-.----	-.----	-.----	-.----	-.----	-.----	0.595	0.595		
579.000	-.----	-.----	-.----	-.----	-.----	-.----	0.688	0.688		
580.000	-.----	-.----	167.611	169.425	16.431	16.431	0.781	0.781		
585.000	-.----	-.----	-.----	-.----	-.----	-.----	1.253	1.253		
590.000	-.----	-.----	170.686	172.871	18.163	18.163	1.733	1.733		
595.000	-.----	-.----	-.----	-.----	-.----	-.----	2.221	2.221		
600.000	560.059	638.906	173.673	176.259	19.889	19.889	2.717	2.717		
605.000	-.----	-.----	-.----	-.----	-.----	-.----	3.220	3.220		
610.000	-.----	-.----	-.----	-.----	21.607	21.607	3.730	3.730		
615.000	-.----	-.----	-.----	-.----	-.----	-.----	4.246	4.246		
620.000	-.----	-.----	-.----	-.----	23.315	23.315	4.767	4.767		
625.000	-.----	-.----	-.----	-.----	-.----	-.----	5.294	5.294		
630.000	-.----	-.----	-.----	-.----	25.011	25.011	5.825	5.825		
635.000	-.----	-.----	-.----	-.----	-.----	-.----	6.361	6.361		
640.000	-.----	-.----	-.----	-.----	26.694	26.694	6.901	6.901		
650.000	569.830	664.932	187.396	192.393	28.364	28.364	7.992	7.992		
660.000	-.----	-.----	-.----	-.----	30.018	30.018	9.096	9.096		
670.000	-.----	-.----	-.----	-.----	31.657	31.657	10.209	10.209		
680.000	-.----	-.----	-.----	-.----	33.280	33.280	11.330	11.330		
690.000	-.----	-.----	-.----	-.----	34.885	34.885	12.458	12.458		

Y, Yttrium

A = 88.906

Z = 39

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.400		8.800		17.600		22.000			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
700.000	577.888	689.355	199.357	207.363	36.473	36.473	13.589	13.589		
710.000	-.----	-.----	-.----	-.----	38.043	38.043	14.723	14.723		
720.000	-.----	-.----	-.----	-.----	39.594	39.594	15.857	15.857		
730.000	-.----	-.----	-.----	-.----	41.127	41.127	16.992	16.992		
740.000	-.----	-.----	-.----	-.----	42.640	42.640	18.125	18.125		
750.000	584.588	712.430	209.844	221.354	44.135	44.135	19.256	19.256		
760.000	-.----	-.----	-.----	-.----	45.610	45.610	20.383	20.383		
770.000	-.----	-.----	-.----	-.----	47.066	47.066	21.505	21.505		
780.000	-.----	-.----	-.----	-.----	48.502	48.502	22.623	22.623		
790.000	-.----	-.----	-.----	-.----	49.919	49.919	23.734	23.734		
800.000	590.193	734.348	219.087	234.510	51.317	51.317	24.839	24.839		
810.000	-.----	-.----	-.----	-.----	-.----	-.----	25.937	25.937		
820.000	-.----	-.----	-.----	-.----	-.----	-.----	27.027	27.027		
830.000	-.----	-.----	-.----	-.----	-.----	-.----	28.109	28.109		
840.000	-.----	-.----	-.----	-.----	-.----	-.----	29.183	29.183		
850.000	594.904	755.257	227.268	246.943	58.015	58.080	30.248	30.248		
860.000	-.----	-.----	-.----	-.----	-.----	-.----	31.303	31.303		
870.000	-.----	-.----	-.----	-.----	-.----	-.----	32.349	32.349		
880.000	-.----	-.----	-.----	-.----	-.----	-.----	33.385	33.385		
890.000	-.----	-.----	-.----	-.----	-.----	-.----	34.412	34.412		
900.000	598.876	775.274	234.539	258.742	64.242	64.515	35.428	35.428		
950.000	602.232	794.493	241.022	269.980	70.022	70.653	40.354	40.358		
1000.000	605.070	812.991	246.822	280.716	75.379	76.523	45.013	45.076		
1050.000	607.468	830.831	252.023	291.000	80.344	82.147	49.404	49.610		
1100.000	609.493	848.070	256.701	300.874	84.944	87.547	53.534	53.972		
1150.000	611.196	864.752	260.916	310.373	89.208	92.740	57.412	58.176		
1200.000	612.623	880.919	264.723	319.529	93.162	97.743	61.048	62.230		
1250.000	613.811	896.606	268.168	328.369	96.830	102.568	64.457	66.147		
1300.000	614.793	911.845	271.289	336.915	100.235	107.230	67.652	69.934		
1350.000	615.595	926.663	274.122	345.190	103.398	111.738	70.645	73.600		
1400.000	616.240	941.085	276.697	353.210	106.340	116.102	73.450	77.152		
1450.000	616.748	955.134	279.040	360.993	109.077	120.333	76.080	80.596		
1500.000	617.135	968.829	281.174	368.553	111.625	124.438	78.545	83.940		

Zr, Zirconium

A=91.220

Z=40

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->				T _d					
	T _s 6.310	2T _s 12.620	4T _s 25.240	5T _s 31.550						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
216.400	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
217.000	1.521	1.521	-.----	-.----	-.----	-.----	-.----	-.----		
218.000	4.040	4.040	-.----	-.----	-.----	-.----	-.----	-.----		
219.000	6.530	6.530	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	8.992	8.992	-.----	-.----	-.----	-.----	-.----	-.----		
225.000	20.901	20.901	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	32.184	32.184	-.----	-.----	-.----	-.----	-.----	-.----		
235.000	42.894	42.894	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	53.078	53.078	-.----	-.----	-.----	-.----	-.----	-.----		
245.000	62.778	62.778	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	72.032	72.032	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	80.873	80.873	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	89.331	89.331	-.----	-.----	-.----	-.----	-.----	-.----		
265.000	97.433	97.433	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	105.204	105.204	-.----	-.----	-.----	-.----	-.----	-.----		
275.000	112.666	112.666	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	119.838	119.838	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	133.388	133.388	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	145.981	145.981	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	157.725	157.725	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	168.711	168.711	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	179.016	179.016	-.----	-.----	-.----	-.----	-.----	-.----		
340.000	188.707	188.707	-.----	-.----	-.----	-.----	-.----	-.----		
350.000	197.841	197.841	-.----	-.----	-.----	-.----	-.----	-.----		
360.000	206.468	206.468	-.----	-.----	-.----	-.----	-.----	-.----		
370.000	214.632	214.632	-.----	-.----	-.----	-.----	-.----	-.----		
380.000	222.372	222.372	-.----	-.----	-.----	-.----	-.----	-.----		
381.800	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
382.000	-.----	-.----	0.075	0.075	-.----	-.----	-.----	-.----		
383.000	-.----	-.----	0.464	0.464	-.----	-.----	-.----	-.----		
384.000	-.----	-.----	0.852	0.852	-.----	-.----	-.----	-.----		
385.000	-.----	-.----	1.240	1.240	-.----	-.----	-.----	-.----		
386.000	-.----	-.----	1.627	1.627	-.----	-.----	-.----	-.----		
387.000	-.----	-.----	2.013	2.013	-.----	-.----	-.----	-.----		
388.000	-.----	-.----	2.399	2.399	-.----	-.----	-.----	-.----		

Zr, Zirconium

A=91.220

Z=40

Displacement		Surface Sputtering Regime		Bulk Displacement Regime		Displacement		Regime		T _d	
Energy(eV)=		T _s	2T _s	4T _s	5T _s						
		6.310	12.620	25.240	31.550						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)
389.000	-.----	-.----	2.785	2.785	-.----	-.----	-.----	-.----	-.----	-.----	-.----
390.000	229.720	229.763	3.170	3.170	-.----	-.----	-.----	-.----	-.----	-.----	-.----
395.000	-.----	-.----	5.088	5.088	-.----	-.----	-.----	-.----	-.----	-.----	-.----
400.000	236.709	236.912	6.994	6.994	-.----	-.----	-.----	-.----	-.----	-.----	-.----
405.000	-.----	-.----	8.886	8.886	-.----	-.----	-.----	-.----	-.----	-.----	-.----
410.000	243.363	243.838	10.766	10.766	-.----	-.----	-.----	-.----	-.----	-.----	-.----
415.000	-.----	-.----	12.632	12.632	-.----	-.----	-.----	-.----	-.----	-.----	-.----
420.000	249.708	250.557	14.484	14.484	-.----	-.----	-.----	-.----	-.----	-.----	-.----
425.000	-.----	-.----	16.322	16.322	-.----	-.----	-.----	-.----	-.----	-.----	-.----
430.000	255.765	257.082	18.146	18.146	-.----	-.----	-.----	-.----	-.----	-.----	-.----
435.000	-.----	-.----	19.955	19.955	-.----	-.----	-.----	-.----	-.----	-.----	-.----
440.000	261.553	263.426	21.750	21.750	-.----	-.----	-.----	-.----	-.----	-.----	-.----
450.000	267.090	269.601	25.296	25.296	-.----	-.----	-.----	-.----	-.----	-.----	-.----
460.000	272.392	275.616	28.782	28.782	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	277.474	281.482	32.209	32.209	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	282.349	287.207	35.575	35.575	-.----	-.----	-.----	-.----	-.----	-.----	-.----
490.000	287.029	292.799	38.880	38.880	-.----	-.----	-.----	-.----	-.----	-.----	-.----
500.000	291.525	298.266	42.124	42.124	-.----	-.----	-.----	-.----	-.----	-.----	-.----
510.000	-.----	-.----	45.309	45.309	-.----	-.----	-.----	-.----	-.----	-.----	-.----
520.000	-.----	-.----	48.433	48.433	-.----	-.----	-.----	-.----	-.----	-.----	-.----
530.000	-.----	-.----	51.497	51.497	-.----	-.----	-.----	-.----	-.----	-.----	-.----
540.000	-.----	-.----	54.502	54.502	-.----	-.----	-.----	-.----	-.----	-.----	-.----
550.000	311.584	323.937	57.449	57.449	-.----	-.----	-.----	-.----	-.----	-.----	-.----
560.000	-.----	-.----	60.338	60.338	-.----	-.----	-.----	-.----	-.----	-.----	-.----
570.000	-.----	-.----	63.170	63.170	-.----	-.----	-.----	-.----	-.----	-.----	-.----
580.000	-.----	-.----	65.946	65.946	-.----	-.----	-.----	-.----	-.----	-.----	-.----
590.000	-.----	-.----	68.666	68.666	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	328.307	347.292	71.332	71.332	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	-.----	-.----	73.944	73.944	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	-.----	-.----	76.504	76.504	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	-.----	-.----	79.012	79.012	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	-.----	-.----	81.469	81.469	-.----	-.----	-.----	-.----	-.----	-.----	-.----
643.590	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----
644.000	-.----	-.----	-.----	-.----	0.026	0.026	-.----	-.----	-.----	-.----	-.----
645.000	-.----	-.----	-.----	-.----	0.089	0.089	-.----	-.----	-.----	-.----	-.----

Zr, Zirconium

A = 91.220

Z = 40

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	6.310		12.620		25.240		31.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
646.000	-.----	-.----	-.----	-.----	0.152	0.152	-.----	-.----		
647.000	-.----	-.----	-.----	-.----	0.216	0.216	-.----	-.----		
648.000	-.----	-.----	-.----	-.----	0.280	0.280	-.----	-.----		
649.000	-.----	-.----	-.----	-.----	0.345	0.345	-.----	-.----		
650.000	342.417	368.801	83.877	83.880	0.409	0.409	-.----	-.----		
655.000	-.----	-.----	-.----	-.----	0.740	0.740	-.----	-.----		
660.000	-.----	-.----	86.236	86.255	1.079	1.079	-.----	-.----		
665.000	-.----	-.----	-.----	-.----	1.426	1.426	-.----	-.----		
670.000	-.----	-.----	88.548	88.595	1.782	1.782	-.----	-.----		
675.000	-.----	-.----	-.----	-.----	2.145	2.145	-.----	-.----		
680.000	-.----	-.----	90.812	90.903	2.516	2.516	-.----	-.----		
685.000	-.----	-.----	-.----	-.----	2.893	2.893	-.----	-.----		
690.000	-.----	-.----	93.031	93.179	3.276	3.276	-.----	-.----		
695.000	-.----	-.----	-.----	-.----	3.666	3.666	-.----	-.----		
700.000	354.435	388.798	95.205	95.424	4.061	4.061	-.----	-.----		
710.000	-.----	-.----	-.----	-.----	4.866	4.866	-.----	-.----		
720.000	-.----	-.----	-.----	-.----	5.690	5.690	-.----	-.----		
730.000	-.----	-.----	-.----	-.----	6.531	6.531	-.----	-.----		
740.000	-.----	-.----	-.----	-.----	7.386	7.386	-.----	-.----		
750.000	364.751	407.532	105.436	106.219	8.253	8.253	-.----	-.----		
754.330	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
755.000	-.----	-.----	-.----	-.----	-.----	-.----	0.024	0.024		
756.000	-.----	-.----	-.----	-.----	-.----	-.----	0.059	0.059		
757.000	-.----	-.----	-.----	-.----	-.----	-.----	0.095	0.095		
758.000	-.----	-.----	-.----	-.----	-.----	-.----	0.131	0.131		
759.000	-.----	-.----	-.----	-.----	-.----	-.----	0.167	0.167		
760.000	-.----	-.----	-.----	-.----	9.130	9.130	0.204	0.204		
765.000	-.----	-.----	-.----	-.----	-.----	-.----	0.391	0.391		
770.000	-.----	-.----	-.----	-.----	10.016	10.016	0.586	0.586		
775.000	-.----	-.----	-.----	-.----	-.----	-.----	0.788	0.788		
780.000	-.----	-.----	-.----	-.----	10.910	10.910	0.995	0.995		
785.000	-.----	-.----	-.----	-.----	-.----	-.----	1.209	1.209		
790.000	-.----	-.----	-.----	-.----	11.809	11.809	1.429	1.429		
795.000	-.----	-.----	-.----	-.----	-.----	-.----	1.655	1.655		
800.000	373.665	425.189	114.685	116.368	12.713	12.713	1.885	1.885		

Zr, Zirconium

A=91.220

Z=40

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	6.310		12.620		25.240		31.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
805.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	2.121	2.121		
810.000	-,-,-	-,-,-	-,-,-	-,-,-	13.620	13.620	2.362	2.362		
815.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	2.607	2.607		
820.000	-,-,-	-,-,-	-,-,-	-,-,-	14.529	14.529	2.857	2.857		
830.000	-,-,-	-,-,-	-,-,-	-,-,-	15.440	15.440	3.369	3.369		
840.000	-,-,-	-,-,-	-,-,-	-,-,-	16.351	16.351	3.896	3.896		
850.000	381.408	441.915	123.056	125.951	17.262	17.262	4.437	4.437		
860.000	-,-,-	-,-,-	-,-,-	-,-,-	18.171	18.171	4.991	4.991		
870.000	-,-,-	-,-,-	-,-,-	-,-,-	19.079	19.079	5.555	5.555		
880.000	-,-,-	-,-,-	-,-,-	-,-,-	19.984	19.984	6.129	6.129		
890.000	-,-,-	-,-,-	-,-,-	-,-,-	20.886	20.886	6.712	6.712		
900.000	388.164	457.824	130.643	135.037	21.785	21.785	7.303	7.303		
910.000	-,-,-	-,-,-	-,-,-	-,-,-	22.679	22.679	7.901	7.901		
920.000	-,-,-	-,-,-	-,-,-	-,-,-	23.569	23.569	8.504	8.504		
930.000	-,-,-	-,-,-	-,-,-	-,-,-	24.454	24.454	9.113	9.113		
940.000	-,-,-	-,-,-	-,-,-	-,-,-	25.334	25.334	9.726	9.726		
950.000	394.083	473.009	137.532	143.679	26.209	26.209	10.343	10.343		
960.000	-,-,-	-,-,-	-,-,-	-,-,-	27.077	27.077	10.962	10.962		
970.000	-,-,-	-,-,-	-,-,-	-,-,-	27.939	27.939	11.584	11.584		
980.000	-,-,-	-,-,-	-,-,-	-,-,-	28.795	28.795	12.207	12.207		
990.000	-,-,-	-,-,-	-,-,-	-,-,-	29.644	29.644	12.832	12.832		
1000.000	399.285	487.547	143.795	151.924	30.486	30.486	13.457	13.457		
1010.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	14.083	14.083		
1020.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	14.709	14.709		
1030.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	15.334	15.334		
1040.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	15.958	15.958		
1050.000	403.870	501.501	149.499	159.809	34.591	34.592	16.580	16.580		
1060.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	17.202	17.202		
1070.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	17.821	17.821		
1080.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	18.438	18.438		
1090.000	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	-,-,-	19.053	19.053		
1100.000	407.921	514.924	154.703	167.369	38.508	38.541	19.665	19.665		
1150.000	411.507	527.861	159.457	174.631	42.232	42.353	22.680	22.680		
1200.000	414.686	540.351	163.807	181.620	45.762	46.035	25.605	25.605		
1250.000	417.510	552.429	167.793	188.356	49.100	49.596	28.426	28.435		

Zr, Zirconium

A = 91.220

Z = 40

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Displacement		T _s		2T _s		4T _s		5T _s			
Energy(eV)=		6.310		12.620		25.240		31.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
1300.000	420.019	564.124	171.451	194.860	52.254	53.042	31.136	31.183			
1350.000	422.250	575.463	174.811	201.147	55.231	56.380	33.730	33.853			
1400.000	424.236	586.469	177.902	207.233	58.038	59.617	36.209	36.446			
1450.000	426.003	597.162	180.749	213.130	60.684	62.757	38.573	38.968			
1500.000	427.575	607.562	183.373	218.851	63.178	65.807	40.824	41.422			

Nb, Niobium

A=92.906

Z=41

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 7.480		$2T_s$ 14.960		$4T_s$ 29.920		$5T_s$ 37.400		T_d 24.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
253.640	0.000	0.000	----	----	----	----	----	----	----	----
254.000	0.580	0.580	----	----	----	----	----	----	----	----
255.000	2.186	2.186	----	----	----	----	----	----	----	----
256.000	3.779	3.779	----	----	----	----	----	----	----	----
257.000	5.360	5.360	----	----	----	----	----	----	----	----
258.000	6.927	6.927	----	----	----	----	----	----	----	----
259.000	8.483	8.483	----	----	----	----	----	----	----	----
260.000	10.026	10.026	----	----	----	----	----	----	----	----
265.000	17.564	17.564	----	----	----	----	----	----	----	----
270.000	24.821	24.821	----	----	----	----	----	----	----	----
275.000	31.815	31.815	----	----	----	----	----	----	----	----
280.000	38.565	38.565	----	----	----	----	----	----	----	----
285.000	45.084	45.084	----	----	----	----	----	----	----	----
290.000	51.388	51.388	----	----	----	----	----	----	----	----
295.000	57.488	57.488	----	----	----	----	----	----	----	----
300.000	63.395	63.395	----	----	----	----	----	----	----	----
305.000	69.122	69.122	----	----	----	----	----	----	----	----
310.000	74.677	74.677	----	----	----	----	----	----	----	----
315.000	80.069	80.069	----	----	----	----	----	----	----	----
320.000	85.307	85.307	----	----	----	----	----	----	----	----
330.000	95.348	95.348	----	----	----	----	----	----	----	----
340.000	104.855	104.855	----	----	----	----	----	----	----	----
350.000	113.875	113.875	----	----	----	----	----	----	----	----
360.000	122.449	122.449	----	----	----	----	----	----	----	----
370.000	130.612	130.612	----	----	----	----	----	----	----	----
380.000	138.396	138.396	----	----	----	----	----	----	----	----
390.000	145.828	145.828	----	----	----	----	----	----	----	----
400.000	152.935	152.935	----	----	----	----	----	----	----	----
410.000	159.736	159.736	----	----	----	----	----	----	----	----
420.000	166.254	166.254	----	----	----	----	----	----	----	----
430.000	172.506	172.506	----	----	----	----	----	----	----	----
440.000	178.507	178.507	----	----	----	----	----	----	----	----
442.000	----	----	0.000	0.000	----	----	----	----	----	----
443.000	----	----	0.248	0.248	----	----	----	----	----	----
444.000	----	----	0.499	0.499	----	----	----	----	----	----

Nb, Niobium

A = 92.906

Z = 41

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	7.480		14.960		29.920		37.400		24.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
445.000	-.----	-.----	0.750	0.750	-.----	-.----	-.----	-.----	-.----	-.----
446.000	-.----	-.----	1.002	1.002	-.----	-.----	-.----	-.----	-.----	-.----
447.000	-.----	-.----	1.253	1.253	-.----	-.----	-.----	-.----	-.----	-.----
448.000	-.----	-.----	1.505	1.505	-.----	-.----	-.----	-.----	-.----	-.----
449.000	-.----	-.----	1.758	1.758	-.----	-.----	-.----	-.----	-.----	-.----
450.000	184.274	184.297	2.010	2.010	-.----	-.----	-.----	-.----	-.----	-.----
455.000	-.----	-.----	3.275	3.275	-.----	-.----	-.----	-.----	-.----	-.----
460.000	189.820	189.935	4.544	4.544	-.----	-.----	-.----	-.----	-.----	-.----
465.000	-.----	-.----	5.817	5.817	-.----	-.----	-.----	-.----	-.----	-.----
470.000	195.156	195.431	7.092	7.092	-.----	-.----	-.----	-.----	-.----	-.----
475.000	-.----	-.----	8.369	8.369	-.----	-.----	-.----	-.----	-.----	-.----
480.000	200.296	200.793	9.648	9.648	-.----	-.----	-.----	-.----	-.----	-.----
485.000	-.----	-.----	10.927	10.927	-.----	-.----	-.----	-.----	-.----	-.----
490.000	205.248	206.029	12.205	12.205	-.----	-.----	-.----	-.----	-.----	-.----
495.000	-.----	-.----	13.483	13.483	-.----	-.----	-.----	-.----	-.----	-.----
500.000	210.024	211.145	14.760	14.760	-.----	-.----	-.----	-.----	-.----	-.----
510.000	214.632	216.147	17.306	17.306	-.----	-.----	-.----	-.----	-.----	-.----
520.000	219.080	221.042	19.841	19.841	-.----	-.----	-.----	-.----	-.----	-.----
530.000	223.376	225.835	22.362	22.362	-.----	-.----	-.----	-.----	-.----	-.----
540.000	227.527	230.530	24.864	24.864	-.----	-.----	-.----	-.----	-.----	-.----
550.000	231.541	235.133	27.346	27.346	-.----	-.----	-.----	-.----	-.----	-.----
560.000	235.423	239.648	29.806	29.806	-.----	-.----	-.----	-.----	-.----	-.----
570.000	239.180	244.078	32.242	32.242	-.----	-.----	-.----	-.----	-.----	-.----
580.000	242.816	248.427	34.651	34.651	-.----	-.----	-.----	-.----	-.----	-.----
590.000	246.338	252.700	37.033	37.033	-.----	-.----	-.----	-.----	-.----	-.----
600.000	249.750	256.898	39.387	39.387	-.----	-.----	-.----	-.----	-.----	-.----
610.000	-.----	-.----	41.711	41.711	-.----	-.----	-.----	-.----	-.----	-.----
620.000	-.----	-.----	44.005	44.005	-.----	-.----	-.----	-.----	-.----	-.----
628.840	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
629.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.011	0.011
630.000	-.----	-.----	46.268	46.268	-.----	-.----	-.----	-.----	0.084	0.084
635.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.454	0.454
640.000	-.----	-.----	48.500	48.500	-.----	-.----	-.----	-.----	0.834	0.834
645.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.225	1.225
650.000	265.315	276.884	50.700	50.700	-.----	-.----	-.----	-.----	1.625	1.625

Nb, Niobium

A = 92.906

Z = 41

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	7.480		14.960		29.920		37.400		24.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
655.000	----	----	----	----	----	----	----	----	2.033	2.033
660.000	----	----	52.868	52.868	----	----	----	----	2.451	2.451
665.000	----	----	----	----	----	----	----	----	2.876	2.876
670.000	----	----	55.005	55.005	----	----	----	----	3.309	3.309
675.000	----	----	----	----	----	----	----	----	3.748	3.748
680.000	----	----	57.109	57.109	----	----	----	----	4.195	4.195
690.000	----	----	59.180	59.180	----	----	----	----	5.105	5.105
700.000	278.726	295.411	61.220	61.220	----	----	----	----	6.038	6.038
710.000	----	----	63.228	63.228	----	----	----	----	6.989	6.989
720.000	----	----	65.204	65.204	----	----	----	----	7.956	7.956
730.000	----	----	67.148	67.148	----	----	----	----	8.938	8.938
736.120	----	----	----	----	0.000	0.000	----	----	----	----
737.000	----	----	----	----	0.036	0.036	----	----	----	----
738.000	----	----	----	----	0.077	0.077	----	----	----	----
739.000	----	----	----	----	0.119	0.119	----	----	----	----
740.000	----	----	69.061	69.061	0.161	0.161	----	----	9.931	9.931
745.000	----	----	----	----	0.376	0.376	----	----	----	----
750.000	290.361	312.717	70.942	70.950	0.599	0.599	----	----	10.934	10.934
755.000	----	----	----	----	0.830	0.830	----	----	----	----
760.000	----	----	72.793	72.816	1.068	1.068	----	----	11.946	11.946
765.000	----	----	----	----	1.313	1.313	----	----	----	----
770.000	----	----	74.613	74.660	1.565	1.565	----	----	12.964	12.964
775.000	----	----	----	----	1.823	1.823	----	----	----	----
780.000	----	----	76.403	76.483	2.087	2.087	----	----	13.986	13.986
785.000	----	----	----	----	2.358	2.358	----	----	----	----
790.000	----	----	78.164	78.285	2.633	2.633	----	----	15.013	15.013
795.000	----	----	----	----	2.914	2.914	----	----	----	----
800.000	300.511	328.983	79.894	80.067	3.200	3.200	----	----	16.042	16.042
810.000	----	----	----	----	3.786	3.786	----	----	17.071	17.071
820.000	----	----	----	----	4.389	4.389	----	----	18.101	18.101
830.000	----	----	----	----	5.008	5.008	----	----	19.131	19.131
840.000	----	----	----	----	5.640	5.640	----	----	20.158	20.158
850.000	309.409	344.350	88.121	88.685	6.285	6.285	----	----	21.183	21.183
859.720	----	----	----	----	----	----	0.000	0.000	----	----
860.000	----	----	----	----	6.941	6.941	0.006	0.006	22.205	22.205

Nb, Niobium

A=92.906

Z=41

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->											
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		7.480		14.960		29.920		37.400		24.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
861.000	-.----	-.----	-.----	-.----	-.----	-.----	0.030	0.030	-.----	-.----	
862.000	-.----	-.----	-.----	-.----	-.----	-.----	0.053	0.053	-.----	-.----	
863.000	-.----	-.----	-.----	-.----	-.----	-.----	0.077	0.077	-.----	-.----	
864.000	-.----	-.----	-.----	-.----	-.----	-.----	0.101	0.101	-.----	-.----	
865.000	-.----	-.----	-.----	-.----	-.----	-.----	0.125	0.125	-.----	-.----	
866.000	-.----	-.----	-.----	-.----	-.----	-.----	0.149	0.149	-.----	-.----	
867.000	-.----	-.----	-.----	-.----	-.----	-.----	0.174	0.174	-.----	-.----	
868.000	-.----	-.----	-.----	-.----	-.----	-.----	0.199	0.199	-.----	-.----	
869.000	-.----	-.----	-.----	-.----	-.----	-.----	0.224	0.224	-.----	-.----	
870.000	-.----	-.----	-.----	-.----	7.606	7.606	0.249	0.249	23.222	23.222	
875.000	-.----	-.----	-.----	-.----	-.----	-.----	0.379	0.379	-.----	-.----	
880.000	-.----	-.----	-.----	-.----	8.280	8.280	0.515	0.515	24.236	24.236	
885.000	-.----	-.----	-.----	-.----	-.----	-.----	0.656	0.656	-.----	-.----	
890.000	-.----	-.----	-.----	-.----	8.961	8.961	0.802	0.802	25.244	25.244	
895.000	-.----	-.----	-.----	-.----	-.----	-.----	0.953	0.953	-.----	-.----	
900.000	317.243	358.932	95.674	96.861	9.648	9.648	1.109	1.109	26.247	26.247	
905.000	-.----	-.----	-.----	-.----	-.----	-.----	1.270	1.270	-.----	-.----	
910.000	-.----	-.----	-.----	-.----	10.341	10.341	1.435	1.435	-.----	-.----	
915.000	-.----	-.----	-.----	-.----	-.----	-.----	1.604	1.604	-.----	-.----	
920.000	-.----	-.----	-.----	-.----	11.038	11.038	1.778	1.778	-.----	-.----	
930.000	-.----	-.----	-.----	-.----	11.739	11.739	2.136	2.136	-.----	-.----	
940.000	-.----	-.----	-.----	-.----	12.442	12.442	2.509	2.509	-.----	-.----	
950.000	324.164	372.818	102.607	104.641	13.148	13.148	2.895	2.895	31.163	31.163	
960.000	-.----	-.----	-.----	-.----	13.856	13.856	3.293	3.293	-.----	-.----	
970.000	-.----	-.----	-.----	-.----	14.564	14.564	3.702	3.702	-.----	-.----	
980.000	-.----	-.----	-.----	-.----	15.273	15.273	4.121	4.121	-.----	-.----	
990.000	-.----	-.----	-.----	-.----	15.982	15.982	4.550	4.550	-.----	-.----	
1000.000	330.300	386.083	108.971	112.064	16.690	16.690	4.987	4.987	35.889	35.889	
1010.000	-.----	-.----	-.----	-.----	17.397	17.397	5.432	5.432	-.----	-.----	
1020.000	-.----	-.----	-.----	-.----	18.103	18.103	5.883	5.883	-.----	-.----	
1030.000	-.----	-.----	-.----	-.----	18.806	18.806	6.341	6.341	-.----	-.----	
1040.000	-.----	-.----	-.----	-.----	19.508	19.508	6.805	6.805	-.----	-.----	
1050.000	335.754	398.789	114.817	119.164	20.207	20.207	7.273	7.273	40.403	40.413	
1060.000	-.----	-.----	-.----	-.----	20.903	20.903	7.746	7.746	-.----	-.----	
1070.000	-.----	-.----	-.----	-.----	21.597	21.597	8.223	8.223	-.----	-.----	

Nb, Niobium

A = 92.906

Z = 41

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 24.000	
	T _s 7.480		2T _s 14.960		4T _s 29.920		5T _s 37.400			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1080.000	-----	-----	-----	-----	22.286	22.286	8.703	8.703	-----	-----
1090.000	-----	-----	-----	-----	22.973	22.973	9.185	9.185	-----	-----
1100.000	340.615	410.989	120.191	125.969	23.655	23.655	9.671	9.671	44.692	44.767
1110.000	-----	-----	-----	-----	-----	-----	10.158	10.158	-----	-----
1120.000	-----	-----	-----	-----	-----	-----	10.647	10.647	-----	-----
1130.000	-----	-----	-----	-----	-----	-----	11.137	11.137	-----	-----
1140.000	-----	-----	-----	-----	-----	-----	11.628	11.628	-----	-----
1150.000	344.956	422.726	125.135	132.504	27.005	27.005	12.120	12.120	48.755	48.964
1160.000	-----	-----	-----	-----	-----	-----	12.612	12.612	-----	-----
1170.000	-----	-----	-----	-----	-----	-----	13.104	13.104	-----	-----
1180.000	-----	-----	-----	-----	-----	-----	13.596	13.596	-----	-----
1190.000	-----	-----	-----	-----	-----	-----	14.088	14.088	-----	-----
1200.000	348.840	434.040	129.687	138.790	30.238	30.241	14.579	14.579	52.594	53.015
1250.000	352.321	444.964	133.883	144.848	33.344	33.375	17.015	17.015	56.215	56.929
1300.000	355.445	455.526	137.754	150.694	36.316	36.413	19.408	19.408	59.627	60.714
1350.000	358.253	465.753	141.329	156.343	39.152	39.362	21.743	21.743	62.839	64.378
1400.000	360.779	475.667	144.634	161.808	41.854	42.225	24.008	24.013	65.861	67.928
1450.000	363.054	485.288	147.693	167.101	44.423	45.005	26.197	26.224	68.705	71.370
1500.000	365.103	494.635	150.525	172.233	46.864	47.708	28.307	28.379	71.380	74.710

Mo, Molybdenum

A=95.940

Z=42

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		6.810	13.620		27.240	34.050		36.000		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
240.870	0.000	0.000	----	----	----	----	----	----	----	----
241.000	0.257	0.257	----	----	----	----	----	----	----	----
242.000	2.281	2.281	----	----	----	----	----	----	----	----
243.000	4.287	4.287	----	----	----	----	----	----	----	----
244.000	6.275	6.275	----	----	----	----	----	----	----	----
245.000	8.245	8.245	----	----	----	----	----	----	----	----
246.000	10.197	10.197	----	----	----	----	----	----	----	----
247.000	12.133	12.133	----	----	----	----	----	----	----	----
248.000	14.051	14.051	----	----	----	----	----	----	----	----
249.000	15.953	15.953	----	----	----	----	----	----	----	----
250.000	17.838	17.838	----	----	----	----	----	----	----	----
255.000	27.027	27.027	----	----	----	----	----	----	----	----
260.000	35.843	35.843	----	----	----	----	----	----	----	----
265.000	44.310	44.310	----	----	----	----	----	----	----	----
270.000	52.452	52.452	----	----	----	----	----	----	----	----
275.000	60.292	60.292	----	----	----	----	----	----	----	----
280.000	67.849	67.849	----	----	----	----	----	----	----	----
285.000	75.139	75.139	----	----	----	----	----	----	----	----
290.000	82.180	82.180	----	----	----	----	----	----	----	----
295.000	88.985	88.985	----	----	----	----	----	----	----	----
300.000	95.569	95.569	----	----	----	----	----	----	----	----
310.000	108.118	108.118	----	----	----	----	----	----	----	----
320.000	119.915	119.915	----	----	----	----	----	----	----	----
330.000	131.033	131.033	----	----	----	----	----	----	----	----
340.000	141.535	141.535	----	----	----	----	----	----	----	----
350.000	151.477	151.477	----	----	----	----	----	----	----	----
360.000	160.905	160.905	----	----	----	----	----	----	----	----
370.000	169.862	169.862	----	----	----	----	----	----	----	----
380.000	178.385	178.385	----	----	----	----	----	----	----	----
390.000	186.506	186.506	----	----	----	----	----	----	----	----
400.000	194.255	194.255	----	----	----	----	----	----	----	----
410.000	201.657	201.657	----	----	----	----	----	----	----	----
420.000	208.736	208.736	----	----	----	----	----	----	----	----
421.470	----	----	0.000	0.000	----	----	----	----	----	----
422.000	----	----	0.166	0.166	----	----	----	----	----	----

Mo, Molybdenum

A=95.940

Z=42

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T _s 6.810		2T _s 13.620		4T _s 27.240		5T _s 34.050		T _d 36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
423.000	----	----	0.479	0.479	----	----	----	----	----	----
424.000	----	----	0.793	0.793	----	----	----	----	----	----
425.000	----	----	1.107	1.107	----	----	----	----	----	----
426.000	----	----	1.421	1.421	----	----	----	----	----	----
427.000	----	----	1.736	1.736	----	----	----	----	----	----
428.000	----	----	2.050	2.050	----	----	----	----	----	----
429.000	----	----	2.364	2.364	----	----	----	----	----	----
430.000	215.513	215.547	2.679	2.679	----	----	----	----	----	----
435.000	----	----	4.253	4.253	----	----	----	----	----	----
440.000	222.007	222.165	5.827	5.827	----	----	----	----	----	----
445.000	----	----	7.402	7.402	----	----	----	----	----	----
450.000	228.235	228.604	8.977	8.977	----	----	----	----	----	----
455.000	----	----	10.550	10.550	----	----	----	----	----	----
460.000	234.214	234.873	12.120	12.120	----	----	----	----	----	----
465.000	----	----	13.688	13.688	----	----	----	----	----	----
470.000	239.958	240.983	15.252	15.252	----	----	----	----	----	----
475.000	----	----	16.811	16.811	----	----	----	----	----	----
480.000	245.480	246.943	18.366	18.366	----	----	----	----	----	----
490.000	250.793	252.761	21.459	21.459	----	----	----	----	----	----
500.000	255.908	258.446	24.528	24.528	----	----	----	----	----	----
510.000	260.834	264.003	27.567	27.567	----	----	----	----	----	----
520.000	265.583	269.440	30.576	30.576	----	----	----	----	----	----
530.000	270.163	274.763	33.551	33.551	----	----	----	----	----	----
540.000	274.582	279.977	36.491	36.491	----	----	----	----	----	----
550.000	278.848	285.088	39.393	39.393	----	----	----	----	----	----
560.000	282.968	290.100	42.257	42.257	----	----	----	----	----	----
570.000	286.950	295.018	45.081	45.081	----	----	----	----	----	----
580.000	290.799	299.847	47.865	47.865	----	----	----	----	----	----
590.000	294.521	304.589	50.608	50.608	----	----	----	----	----	----
600.000	298.122	309.249	53.309	53.309	----	----	----	----	----	----
610.000	----	----	55.968	55.968	----	----	----	----	----	----
620.000	----	----	58.585	58.585	----	----	----	----	----	----
630.000	----	----	61.160	61.160	----	----	----	----	----	----
640.000	----	----	63.692	63.692	----	----	----	----	----	----
650.000	314.488	331.428	66.182	66.182	----	----	----	----	----	----

Mo, Molybdenum

A=95.940

Z=42

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	6.810		13.620		27.240		34.050		36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
660.000	-.----	-.----	68.631	68.631	-.----	-.----	-.----	-.----	-.----	-.----
670.000	-.----	-.----	71.037	71.037	-.----	-.----	-.----	-.----	-.----	-.----
680.000	-.----	-.----	73.402	73.402	-.----	-.----	-.----	-.----	-.----	-.----
690.000	-.----	-.----	75.727	75.727	-.----	-.----	-.----	-.----	-.----	-.----
700.000	328.503	351.984	78.010	78.010	-.----	-.----	-.----	-.----	-.----	-.----
704.680	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
705.000	-.----	-.----	-.----	-.----	0.016	0.016	-.----	-.----	-.----	-.----
706.000	-.----	-.----	-.----	-.----	0.068	0.068	-.----	-.----	-.----	-.----
707.000	-.----	-.----	-.----	-.----	0.119	0.119	-.----	-.----	-.----	-.----
708.000	-.----	-.----	-.----	-.----	0.171	0.171	-.----	-.----	-.----	-.----
709.000	-.----	-.----	-.----	-.----	0.224	0.224	-.----	-.----	-.----	-.----
710.000	-.----	-.----	-.----	-.----	0.276	0.276	-.----	-.----	-.----	-.----
715.000	-.----	-.----	-.----	-.----	0.546	0.546	-.----	-.----	-.----	-.----
720.000	-.----	-.----	-.----	-.----	0.826	0.826	-.----	-.----	-.----	-.----
725.000	-.----	-.----	-.----	-.----	1.114	1.114	-.----	-.----	-.----	-.----
730.000	-.----	-.----	-.----	-.----	1.410	1.410	-.----	-.----	-.----	-.----
735.000	-.----	-.----	-.----	-.----	1.715	1.715	-.----	-.----	-.----	-.----
740.000	-.----	-.----	-.----	-.----	2.027	2.027	-.----	-.----	-.----	-.----
745.000	-.----	-.----	-.----	-.----	2.347	2.347	-.----	-.----	-.----	-.----
750.000	340.590	371.184	88.836	88.945	2.673	2.673	-.----	-.----	-.----	-.----
755.000	-.----	-.----	-.----	-.----	3.006	3.006	-.----	-.----	-.----	-.----
760.000	-.----	-.----	-.----	-.----	3.345	3.345	-.----	-.----	-.----	-.----
770.000	-.----	-.----	-.----	-.----	4.041	4.041	-.----	-.----	-.----	-.----
780.000	-.----	-.----	-.----	-.----	4.757	4.757	-.----	-.----	-.----	-.----
790.000	-.----	-.----	-.----	-.----	5.493	5.493	-.----	-.----	-.----	-.----
800.000	351.074	389.231	98.726	99.223	6.245	6.245	-.----	-.----	-.----	-.----
810.000	-.----	-.----	-.----	-.----	7.012	7.012	-.----	-.----	-.----	-.----
820.000	-.----	-.----	-.----	-.----	7.793	7.793	-.----	-.----	-.----	-.----
823.940	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
824.000	-.----	-.----	-.----	-.----	-.----	-.----	0.002	0.002	-.----	-.----
825.000	-.----	-.----	-.----	-.----	-.----	-.----	0.030	0.030	-.----	-.----
826.000	-.----	-.----	-.----	-.----	-.----	-.----	0.060	0.060	-.----	-.----
827.000	-.----	-.----	-.----	-.----	-.----	-.----	0.089	0.089	-.----	-.----
828.000	-.----	-.----	-.----	-.----	-.----	-.----	0.119	0.119	-.----	-.----
829.000	-.----	-.----	-.----	-.----	-.----	-.----	0.148	0.148	-.----	-.----

Mo, Molybdenum

A=95.940

Z=42

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 36.000	
	T _s 6.810		2T _s 13.620		4T _s 27.240		5T _s 34.050			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
830.000	-----	-----	-----	-----	8.584	8.584	0.179	0.179	-----	-----
835.000	-----	-----	-----	-----	-----	-----	0.334	0.334	-----	-----
840.000	-----	-----	-----	-----	9.386	9.386	0.496	0.496	-----	-----
845.000	-----	-----	-----	-----	-----	-----	0.665	0.665	-----	-----
850.000	360.215	406.281	107.752	108.925	10.196	10.196	0.840	0.840	-----	-----
855.000	-----	-----	-----	-----	-----	-----	1.021	1.021	-----	-----
856.170	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
857.000	-----	-----	-----	-----	-----	-----	-----	-----	0.000	0.000
858.000	-----	-----	-----	-----	-----	-----	-----	-----	0.021	0.021
859.000	-----	-----	-----	-----	-----	-----	-----	-----	0.046	0.046
860.000	-----	-----	-----	-----	-----	-----	-----	-----	0.071	0.071
865.000	-----	-----	-----	-----	11.014	11.014	1.208	1.208	0.097	0.097
870.000	-----	-----	-----	-----	-----	-----	1.400	1.400	0.229	0.229
875.000	-----	-----	-----	-----	11.837	11.837	1.598	1.598	0.368	0.368
880.000	-----	-----	-----	-----	-----	-----	1.801	1.801	0.513	0.513
885.000	-----	-----	-----	-----	12.666	12.666	2.009	2.009	0.663	0.663
890.000	-----	-----	-----	-----	-----	-----	-----	-----	0.820	0.820
895.000	-----	-----	-----	-----	13.498	13.498	2.438	2.438	0.982	0.982
900.000	368.218	422.460	115.991	118.117	-----	-----	-----	-----	1.149	1.149
905.000	-----	-----	-----	-----	14.334	14.334	2.885	2.885	1.321	1.321
910.000	-----	-----	-----	-----	-----	-----	-----	-----	1.499	1.499
915.000	-----	-----	-----	-----	15.171	15.171	3.348	3.348	1.680	1.680
920.000	-----	-----	-----	-----	-----	-----	-----	-----	1.867	1.867
930.000	-----	-----	-----	-----	16.010	16.010	3.825	3.825	2.057	2.057
940.000	-----	-----	-----	-----	16.850	16.850	4.315	4.315	2.450	2.450
950.000	375.252	437.869	123.513	126.855	17.690	17.690	4.817	4.817	2.859	2.859
960.000	-----	-----	-----	-----	18.528	18.528	5.329	5.329	3.281	3.281
970.000	-----	-----	-----	-----	19.366	19.366	5.852	5.852	3.716	3.716
980.000	-----	-----	-----	-----	20.201	20.201	6.383	6.383	4.163	4.163
990.000	-----	-----	-----	-----	21.035	21.035	6.922	6.922	4.620	4.620
1000.000	381.453	452.590	130.386	135.184	21.865	21.865	7.469	7.469	5.087	5.087
1010.000	-----	-----	-----	-----	22.693	22.693	8.021	8.021	5.563	5.563
1020.000	-----	-----	-----	-----	-----	-----	8.579	8.579	6.047	6.047
1030.000	-----	-----	-----	-----	-----	-----	9.142	9.142	6.538	6.538
1040.000	-----	-----	-----	-----	-----	-----	9.708	9.708	7.035	7.035
					-----	-----	10.279	10.279	7.538	7.538

Mo, Molybdenum

A = 95.940

Z = 42

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	6.810		13.620		27.240		34.050		36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1050.000	386.934	466.694	136.672	143.144	26.770	26.770	10.852	10.852	8.046	8.046
1060.000	-.----	-.----	-.----	-.----	-.----	-.----	11.428	11.428	8.559	8.559
1070.000	-.----	-.----	-.----	-.----	-.----	-.----	12.006	12.006	9.075	9.075
1080.000	-.----	-.----	-.----	-.----	-.----	-.----	12.585	12.585	9.595	9.595
1090.000	-.----	-.----	-.----	-.----	-.----	-.----	13.165	13.165	10.117	10.117
1100.000	391.792	480.236	142.427	150.768	30.722	30.722	13.746	13.746	10.642	10.642
1110.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	11.169	11.169
1120.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	11.698	11.698
1130.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	12.227	12.227
1140.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	12.758	12.758
1150.000	396.105	493.267	147.701	158.086	34.527	34.529	16.647	16.647	13.288	13.288
1160.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	13.820	13.820
1170.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	14.350	14.350
1180.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	14.881	14.881
1190.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	15.411	15.411
1200.000	399.941	505.830	152.541	165.122	38.171	38.206	19.519	19.519	15.940	15.940
1250.000	403.359	517.960	156.986	171.898	41.648	41.764	22.332	22.332	18.563	18.563
1300.000	406.406	529.691	161.074	178.435	44.957	45.209	25.070	25.070	21.136	21.136
1350.000	409.126	541.050	164.837	184.749	48.099	48.548	27.719	27.726	23.642	23.642
1400.000	411.556	552.062	168.305	190.856	51.079	51.785	30.274	30.310	26.071	26.078
1450.000	413.727	562.751	171.505	196.769	53.901	54.927	32.728	32.823	28.417	28.450
1500.000	415.668	573.137	174.459	202.501	56.573	57.978	35.081	35.270	30.674	30.760

Ru, Ruthenium

A = 101.070

Z = 44

		<-----Surface Sputtering Regime----->			<-----Bulk Displacement Regime----->					T _d
Displacement		T _s	2T _s		4T _s	5T _s				
Energy(eV)=		6.740	13.480		26.960	33.700				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
249.450	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	1.122	1.122	-.----	-.----	-.----	-.----	-.----	-.----		
251.000	3.151	3.151	-.----	-.----	-.----	-.----	-.----	-.----		
252.000	5.164	5.164	-.----	-.----	-.----	-.----	-.----	-.----		
253.000	7.160	7.160	-.----	-.----	-.----	-.----	-.----	-.----		
254.000	9.139	9.139	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	11.103	11.103	-.----	-.----	-.----	-.----	-.----	-.----		
256.000	13.051	13.051	-.----	-.----	-.----	-.----	-.----	-.----		
257.000	14.984	14.984	-.----	-.----	-.----	-.----	-.----	-.----		
258.000	16.901	16.901	-.----	-.----	-.----	-.----	-.----	-.----		
259.000	18.803	18.803	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	20.690	20.690	-.----	-.----	-.----	-.----	-.----	-.----		
265.000	29.911	29.911	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	38.790	38.790	-.----	-.----	-.----	-.----	-.----	-.----		
275.000	47.350	47.350	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	55.611	55.611	-.----	-.----	-.----	-.----	-.----	-.----		
285.000	63.591	63.591	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	71.308	71.308	-.----	-.----	-.----	-.----	-.----	-.----		
295.000	78.775	78.775	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	86.008	86.008	-.----	-.----	-.----	-.----	-.----	-.----		
305.000	93.018	93.018	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	99.817	99.817	-.----	-.----	-.----	-.----	-.----	-.----		
315.000	106.417	106.417	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	112.827	112.827	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	125.112	125.112	-.----	-.----	-.----	-.----	-.----	-.----		
340.000	136.739	136.739	-.----	-.----	-.----	-.----	-.----	-.----		
350.000	147.764	147.764	-.----	-.----	-.----	-.----	-.----	-.----		
360.000	158.237	158.237	-.----	-.----	-.----	-.----	-.----	-.----		
370.000	168.201	168.201	-.----	-.----	-.----	-.----	-.----	-.----		
380.000	177.695	177.695	-.----	-.----	-.----	-.----	-.----	-.----		
390.000	186.753	186.753	-.----	-.----	-.----	-.----	-.----	-.----		
400.000	195.406	195.406	-.----	-.----	-.----	-.----	-.----	-.----		
410.000	203.680	203.680	-.----	-.----	-.----	-.----	-.----	-.----		
420.000	211.600	211.600	-.----	-.----	-.----	-.----	-.----	-.----		
430.000	219.189	219.189	-.----	-.----	-.----	-.----	-.----	-.----		

Ru, Ruthenium

A = 101.070

Z = 44

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	6.740		13.480		26.960		33.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
435.280	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---	-.---	
436.000	-.---	-.---	0.228	0.228	-.---	-.---	-.---	-.---	-.---	
437.000	-.---	-.---	0.544	0.544	-.---	-.---	-.---	-.---	-.---	
438.000	-.---	-.---	0.861	0.861	-.---	-.---	-.---	-.---	-.---	
439.000	-.---	-.---	1.179	1.179	-.---	-.---	-.---	-.---	-.---	
440.000	226.467	226.478	1.497	1.497	-.---	-.---	-.---	-.---	-.---	
445.000	-.---	-.---	3.090	3.090	-.---	-.---	-.---	-.---	-.---	
450.000	233.453	233.552	4.690	4.690	-.---	-.---	-.---	-.---	-.---	
455.000	-.---	-.---	6.295	6.295	-.---	-.---	-.---	-.---	-.---	
460.000	240.163	240.438	7.904	7.904	-.---	-.---	-.---	-.---	-.---	
465.000	-.---	-.---	9.517	9.517	-.---	-.---	-.---	-.---	-.---	
470.000	246.613	247.147	11.131	11.131	-.---	-.---	-.---	-.---	-.---	
475.000	-.---	-.---	12.747	12.747	-.---	-.---	-.---	-.---	-.---	
480.000	252.817	253.688	14.363	14.363	-.---	-.---	-.---	-.---	-.---	
485.000	-.---	-.---	15.978	15.978	-.---	-.---	-.---	-.---	-.---	
490.000	258.788	260.070	17.591	17.591	-.---	-.---	-.---	-.---	-.---	
495.000	-.---	-.---	19.203	19.203	-.---	-.---	-.---	-.---	-.---	
500.000	264.539	266.303	20.811	20.811	-.---	-.---	-.---	-.---	-.---	
510.000	270.081	272.394	24.016	24.016	-.---	-.---	-.---	-.---	-.---	
520.000	275.425	278.351	27.202	27.202	-.---	-.---	-.---	-.---	-.---	
530.000	280.579	284.180	30.365	30.365	-.---	-.---	-.---	-.---	-.---	
540.000	285.554	289.887	33.501	33.501	-.---	-.---	-.---	-.---	-.---	
550.000	290.357	295.479	36.608	36.608	-.---	-.---	-.---	-.---	-.---	
560.000	294.997	300.960	39.683	39.683	-.---	-.---	-.---	-.---	-.---	
570.000	299.481	306.336	42.723	42.723	-.---	-.---	-.---	-.---	-.---	
580.000	303.817	311.612	45.727	45.727	-.---	-.---	-.---	-.---	-.---	
590.000	308.010	316.791	48.693	48.693	-.---	-.---	-.---	-.---	-.---	
600.000	312.067	321.879	51.620	51.620	-.---	-.---	-.---	-.---	-.---	
610.000	-.---	-.---	54.508	54.508	-.---	-.---	-.---	-.---	-.---	
620.000	-.---	-.---	57.354	57.354	-.---	-.---	-.---	-.---	-.---	
630.000	-.---	-.---	60.159	60.159	-.---	-.---	-.---	-.---	-.---	
640.000	-.---	-.---	62.922	62.922	-.---	-.---	-.---	-.---	-.---	
650.000	330.503	346.062	65.643	65.643	-.---	-.---	-.---	-.---	-.---	
660.000	-.---	-.---	68.321	68.321	-.---	-.---	-.---	-.---	-.---	
670.000	-.---	-.---	70.957	70.957	-.---	-.---	-.---	-.---	-.---	

Ru, Ruthenium

A = 101.070

Z = 44

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 6.740		2T _s 13.480		4T _s 26.960		5T _s 33.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
680.000	----	----	73.551	73.551	----	----	----	----		
690.000	----	----	76.102	76.102	----	----	----	----		
700.000	346.283	368.431	78.610	78.610	----	----	----	----		
710.000	----	----	81.077	81.077	----	----	----	----		
720.000	----	----	83.503	83.503	----	----	----	----		
725.830	----	----	----	----	0.000	0.000	----	----		
726.000	----	----	----	----	0.008	0.008	----	----		
727.000	----	----	----	----	0.060	0.060	----	----		
728.000	----	----	----	----	0.112	0.112	----	----		
729.000	----	----	----	----	0.165	0.165	----	----		
730.000	----	----	85.887	85.888	0.218	0.218	----	----		
735.000	----	----	----	----	0.490	0.490	----	----		
740.000	----	----	88.230	88.240	0.772	0.772	----	----		
745.000	----	----	----	----	1.065	1.065	----	----		
750.000	359.881	389.285	90.533	90.563	1.366	1.366	----	----		
755.000	----	----	----	----	1.677	1.677	----	----		
760.000	----	----	92.795	92.856	1.996	1.996	----	----		
765.000	----	----	----	----	2.324	2.324	----	----		
770.000	----	----	95.019	95.122	2.659	2.659	----	----		
775.000	----	----	----	----	3.002	3.002	----	----		
780.000	----	----	97.203	97.360	3.352	3.352	----	----		
790.000	----	----	99.349	99.571	4.071	4.071	----	----		
800.000	371.663	408.853	101.457	101.756	4.814	4.814	----	----		
810.000	----	----	----	----	5.579	5.579	----	----		
820.000	----	----	----	----	6.363	6.363	----	----		
830.000	----	----	----	----	7.164	7.164	----	----		
840.000	----	----	----	----	7.981	7.981	----	----		
848.010	----	----	----	----	----	----	0.000	0.000		
849.000	----	----	----	----	----	----	0.029	0.029		
850.000	381.922	427.311	111.449	112.310	8.811	8.811	0.058	0.058		
855.000	----	----	----	----	----	----	0.210	0.210		
860.000	----	----	----	----	9.653	9.653	0.369	0.369		
865.000	----	----	----	----	----	----	0.536	0.536		
870.000	----	----	----	----	10.506	10.506	0.710	0.710		
875.000	----	----	----	----	----	----	0.891	0.891		

Ru, Ruthenium

A = 101.070

Z = 44

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	6.740		13.480		26.960		33.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
880.000	----	----	----	----	11.367	11.367	1.078	1.078		
885.000	----	----	----	----	----	----	1.272	1.272		
890.000	----	----	----	----	12.235	12.235	1.472	1.472		
895.000	----	----	----	----	----	----	1.677	1.677		
900.000	390.889	444.800	120.582	122.299	13.110	13.110	1.888	1.888		
910.000	----	----	----	----	13.990	13.990	2.326	2.326		
920.000	----	----	----	----	14.875	14.875	2.784	2.784		
930.000	----	----	----	----	15.762	15.762	3.260	3.260		
940.000	----	----	----	----	16.651	16.651	3.752	3.752		
950.000	398.757	461.434	128.928	131.784	17.542	17.542	4.259	4.259		
960.000	----	----	----	----	18.434	18.434	4.780	4.780		
970.000	----	----	----	----	19.326	19.326	5.314	5.314		
980.000	----	----	----	----	20.216	20.216	5.859	5.859		
990.000	----	----	----	----	21.106	21.106	6.415	6.415		
1000.000	405.679	477.306	136.558	140.816	21.994	21.994	6.979	6.979		
1010.000	----	----	----	----	----	----	7.552	7.552		
1020.000	----	----	----	----	----	----	8.133	8.133		
1030.000	----	----	----	----	----	----	8.720	8.720		
1040.000	----	----	----	----	----	----	9.313	9.313		
1050.000	411.787	492.494	143.537	149.439	26.387	26.387	9.911	9.911		
1060.000	----	----	----	----	----	----	10.514	10.514		
1070.000	----	----	----	----	----	----	11.120	11.120		
1080.000	----	----	----	----	----	----	11.730	11.730		
1090.000	----	----	----	----	----	----	12.342	12.342		
1100.000	417.188	507.063	149.927	157.691	30.671	30.671	12.957	12.957		
1110.000	----	----	----	----	----	----	13.573	13.573		
1120.000	----	----	----	----	----	----	14.190	14.190		
1130.000	----	----	----	----	----	----	14.808	14.808		
1140.000	----	----	----	----	----	----	15.426	15.426		
1150.000	421.972	521.068	155.782	165.603	34.815	34.815	16.045	16.045		
1160.000	----	----	----	----	----	----	16.663	16.663		
1170.000	----	----	----	----	----	----	17.280	17.280		
1180.000	----	----	----	----	----	----	17.897	17.897		
1190.000	----	----	----	----	----	----	18.512	18.512		
1200.000	426.217	534.557	161.151	173.205	38.797	38.807	19.126	19.126		

Ru, Ruthenium

A=101.070

Z=44

		<-----Surface Sputtering Regime----->			<-----Bulk Displacement Regime----->					T _d
Displacement		T _s	2T _s		4T _s	5T _s				
Energy(eV)=		6.740	13.480		26.960	33.700				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1250.000	429.988	547.571	166.081	180.520	42.607	42.666	22.163	22.163		
1300.000	433.342	560.147	170.612	187.570	46.240	46.402	25.133	25.133		
1350.000	436.326	572.315	174.780	194.375	49.695	50.020	28.018	28.018		
1400.000	438.984	584.104	178.618	200.951	52.976	53.526	30.807	30.820		
1450.000	441.351	595.539	182.156	207.315	56.086	56.927	33.493	33.544		
1500.000	443.458	606.643	185.420	213.479	59.033	60.228	36.073	36.195		

Rh, Rhodium

A = 102.905

Z = 45

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T _s	2T _s		4T _s	Displacement	5T _s	T _d			
Energy(eV)=		5.770	11.540		23.080		28.850				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
222.190	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----			
223.000	2.550	2.550	-.----	-.----	-.----	-.----	-.----	-.----			
224.000	5.673	5.673	-.----	-.----	-.----	-.----	-.----	-.----			
225.000	8.763	8.763	-.----	-.----	-.----	-.----	-.----	-.----			
226.000	11.821	11.821	-.----	-.----	-.----	-.----	-.----	-.----			
227.000	14.848	14.848	-.----	-.----	-.----	-.----	-.----	-.----			
228.000	17.843	17.843	-.----	-.----	-.----	-.----	-.----	-.----			
229.000	20.807	20.807	-.----	-.----	-.----	-.----	-.----	-.----			
230.000	23.741	23.741	-.----	-.----	-.----	-.----	-.----	-.----			
235.000	37.978	37.978	-.----	-.----	-.----	-.----	-.----	-.----			
240.000	51.534	51.534	-.----	-.----	-.----	-.----	-.----	-.----			
245.000	64.465	64.465	-.----	-.----	-.----	-.----	-.----	-.----			
250.000	76.817	76.817	-.----	-.----	-.----	-.----	-.----	-.----			
255.000	88.633	88.633	-.----	-.----	-.----	-.----	-.----	-.----			
260.000	99.953	99.953	-.----	-.----	-.----	-.----	-.----	-.----			
265.000	110.810	110.810	-.----	-.----	-.----	-.----	-.----	-.----			
270.000	121.236	121.236	-.----	-.----	-.----	-.----	-.----	-.----			
275.000	131.259	131.259	-.----	-.----	-.----	-.----	-.----	-.----			
280.000	140.904	140.904	-.----	-.----	-.----	-.----	-.----	-.----			
290.000	159.153	159.153	-.----	-.----	-.----	-.----	-.----	-.----			
300.000	176.145	176.145	-.----	-.----	-.----	-.----	-.----	-.----			
310.000	192.018	192.018	-.----	-.----	-.----	-.----	-.----	-.----			
320.000	206.888	206.888	-.----	-.----	-.----	-.----	-.----	-.----			
330.000	220.852	220.852	-.----	-.----	-.----	-.----	-.----	-.----			
340.000	233.998	233.998	-.----	-.----	-.----	-.----	-.----	-.----			
350.000	246.398	246.398	-.----	-.----	-.----	-.----	-.----	-.----			
360.000	258.117	258.117	-.----	-.----	-.----	-.----	-.----	-.----			
370.000	269.211	269.211	-.----	-.----	-.----	-.----	-.----	-.----			
380.000	279.731	279.731	-.----	-.----	-.----	-.----	-.----	-.----			
390.000	289.720	289.720	-.----	-.----	-.----	-.----	-.----	-.----			
391.220	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----			
392.000	-.----	-.----	0.373	0.373	-.----	-.----	-.----	-.----			
393.000	-.----	-.----	0.856	0.856	-.----	-.----	-.----	-.----			
394.000	-.----	-.----	1.339	1.339	-.----	-.----	-.----	-.----			
395.000	-.----	-.----	1.822	1.822	-.----	-.----	-.----	-.----			

Rh, Rhodium

A = 102.905

Z = 45

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		5.770	11.540		23.080	28.850					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
396.000	-.----	-.----	2.305	2.305	-.----	-.----	-.----	-.----	-.----	-.----	
397.000	-.----	-.----	2.787	2.787	-.----	-.----	-.----	-.----	-.----	-.----	
398.000	-.----	-.----	3.269	3.269	-.----	-.----	-.----	-.----	-.----	-.----	
399.000	-.----	-.----	3.751	3.751	-.----	-.----	-.----	-.----	-.----	-.----	
400.000	299.219	299.279	4.232	4.232	-.----	-.----	-.----	-.----	-.----	-.----	
405.000	-.----	-.----	6.636	6.636	-.----	-.----	-.----	-.----	-.----	-.----	
410.000	308.263	308.527	9.032	9.032	-.----	-.----	-.----	-.----	-.----	-.----	
415.000	-.----	-.----	11.419	11.419	-.----	-.----	-.----	-.----	-.----	-.----	
420.000	316.882	317.489	13.796	13.796	-.----	-.----	-.----	-.----	-.----	-.----	
425.000	-.----	-.----	16.163	16.163	-.----	-.----	-.----	-.----	-.----	-.----	
430.000	325.107	326.184	18.518	18.518	-.----	-.----	-.----	-.----	-.----	-.----	
435.000	-.----	-.----	20.861	20.861	-.----	-.----	-.----	-.----	-.----	-.----	
440.000	332.963	334.627	23.192	23.192	-.----	-.----	-.----	-.----	-.----	-.----	
445.000	-.----	-.----	25.508	25.508	-.----	-.----	-.----	-.----	-.----	-.----	
450.000	340.473	342.836	27.811	27.811	-.----	-.----	-.----	-.----	-.----	-.----	
455.000	-.----	-.----	30.099	30.099	-.----	-.----	-.----	-.----	-.----	-.----	
460.000	347.660	350.824	32.372	32.372	-.----	-.----	-.----	-.----	-.----	-.----	
470.000	354.542	358.606	36.871	36.871	-.----	-.----	-.----	-.----	-.----	-.----	
480.000	361.138	366.192	41.305	41.305	-.----	-.----	-.----	-.----	-.----	-.----	
490.000	367.464	373.594	45.672	45.672	-.----	-.----	-.----	-.----	-.----	-.----	
500.000	373.535	380.822	49.969	49.969	-.----	-.----	-.----	-.----	-.----	-.----	
510.000	-.----	-.----	54.196	54.196	-.----	-.----	-.----	-.----	-.----	-.----	
520.000	-.----	-.----	58.351	58.351	-.----	-.----	-.----	-.----	-.----	-.----	
530.000	-.----	-.----	62.433	62.433	-.----	-.----	-.----	-.----	-.----	-.----	
540.000	-.----	-.----	66.443	66.443	-.----	-.----	-.----	-.----	-.----	-.----	
550.000	400.530	414.658	70.379	70.379	-.----	-.----	-.----	-.----	-.----	-.----	
560.000	-.----	-.----	74.242	74.242	-.----	-.----	-.----	-.----	-.----	-.----	
570.000	-.----	-.----	78.033	78.033	-.----	-.----	-.----	-.----	-.----	-.----	
580.000	-.----	-.----	81.752	81.752	-.----	-.----	-.----	-.----	-.----	-.----	
590.000	-.----	-.----	85.398	85.398	-.----	-.----	-.----	-.----	-.----	-.----	
600.000	422.885	445.288	88.974	88.974	-.----	-.----	-.----	-.----	-.----	-.----	
610.000	-.----	-.----	92.479	92.479	-.----	-.----	-.----	-.----	-.----	-.----	
620.000	-.----	-.----	95.915	95.915	-.----	-.----	-.----	-.----	-.----	-.----	
630.000	-.----	-.----	99.282	99.282	-.----	-.----	-.----	-.----	-.----	-.----	
640.000	-.----	-.----	102.582	102.582	-.----	-.----	-.----	-.----	-.----	-.----	

Rh, Rhodium

A=102.905

Z=45

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement T_s $2T_s$ $4T_s$ $5T_s$ T_d </div> <div> Energy(eV)= 5.770 11.540 23.080 28.850 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
650.000	441.602	473.368	105.815	105.815	-.----	-.----	-.----	-.----		
658.140	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
659.000	-.----	-.----	-.----	-.----	0.067	0.067	-.----	-.----		
660.000	-.----	-.----	108.983	108.983	0.145	0.145	-.----	-.----		
665.000	-.----	-.----	-.----	-.----	0.547	0.547	-.----	-.----		
670.000	-.----	-.----	112.087	112.098	0.963	0.963	-.----	-.----		
675.000	-.----	-.----	-.----	-.----	1.391	1.391	-.----	-.----		
680.000	-.----	-.----	115.127	115.167	1.832	1.832	-.----	-.----		
685.000	-.----	-.----	-.----	-.----	2.284	2.284	-.----	-.----		
690.000	-.----	-.----	118.106	118.192	2.747	2.747	-.----	-.----		
695.000	-.----	-.----	-.----	-.----	3.220	3.220	-.----	-.----		
700.000	457.414	499.366	121.024	121.173	3.703	3.703	-.----	-.----		
705.000	-.----	-.----	-.----	-.----	4.195	4.195	-.----	-.----		
710.000	-.----	-.----	-.----	-.----	4.696	4.696	-.----	-.----		
715.000	-.----	-.----	-.----	-.----	5.205	5.205	-.----	-.----		
720.000	-.----	-.----	-.----	-.----	5.722	5.722	-.----	-.----		
730.000	-.----	-.----	-.----	-.----	6.776	6.776	-.----	-.----		
740.000	-.----	-.----	-.----	-.----	7.856	7.856	-.----	-.----		
750.000	470.867	523.629	134.742	135.473	8.958	8.958	-.----	-.----		
760.000	-.----	-.----	-.----	-.----	10.079	10.079	-.----	-.----		
770.000	-.----	-.----	-.----	-.----	11.217	11.217	-.----	-.----		
770.930	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
771.000	-.----	-.----	-.----	-.----	-.----	-.----	0.003	0.003		
772.000	-.----	-.----	-.----	-.----	-.----	-.----	0.047	0.047		
773.000	-.----	-.----	-.----	-.----	-.----	-.----	0.091	0.091		
774.000	-.----	-.----	-.----	-.----	-.----	-.----	0.136	0.136		
775.000	-.----	-.----	-.----	-.----	-.----	-.----	0.181	0.181		
776.000	-.----	-.----	-.----	-.----	-.----	-.----	0.227	0.227		
777.000	-.----	-.----	-.----	-.----	-.----	-.----	0.273	0.273		
778.000	-.----	-.----	-.----	-.----	-.----	-.----	0.320	0.320		
779.000	-.----	-.----	-.----	-.----	-.----	-.----	0.366	0.366		
780.000	-.----	-.----	-.----	-.----	12.369	12.369	0.414	0.414		
785.000	-.----	-.----	-.----	-.----	-.----	-.----	0.656	0.656		
790.000	-.----	-.----	-.----	-.----	13.532	13.532	0.908	0.908		
795.000	-.----	-.----	-.----	-.----	-.----	-.----	1.169	1.169		

Rh, Rhodium

A = 102.905

Z = 45

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 5.770		2T _s 11.540		4T _s 23.080		5T _s 28.850			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
800.000	482.382	546.419	147.116	148.867	14.706	14.706	1.439	1.439		
805.000	-----	-----	-----	-----	-----	-----	1.717	1.717		
810.000	-----	-----	-----	-----	15.888	15.888	2.003	2.003		
815.000	-----	-----	-----	-----	-----	-----	2.296	2.296		
820.000	-----	-----	-----	-----	17.076	17.076	2.597	2.597		
825.000	-----	-----	-----	-----	-----	-----	2.905	2.905		
830.000	-----	-----	-----	-----	18.268	18.268	3.220	3.220		
835.000	-----	-----	-----	-----	-----	-----	3.540	3.540		
840.000	-----	-----	-----	-----	19.464	19.464	3.867	3.867		
850.000	492.286	567.940	158.283	161.473	20.661	20.661	4.538	4.538		
860.000	-----	-----	-----	-----	21.860	21.860	5.229	5.229		
870.000	-----	-----	-----	-----	23.057	23.057	5.939	5.939		
880.000	-----	-----	-----	-----	24.253	24.253	6.666	6.666		
890.000	-----	-----	-----	-----	25.446	25.446	7.407	7.407		
900.000	500.840	588.354	168.370	173.384	26.637	26.637	8.163	8.163		
910.000	-----	-----	-----	-----	27.822	27.822	8.930	8.930		
920.000	-----	-----	-----	-----	29.003	29.003	9.707	9.707		
930.000	-----	-----	-----	-----	30.179	30.179	10.494	10.494		
940.000	-----	-----	-----	-----	31.348	31.348	11.289	11.289		
950.000	508.252	607.790	177.494	184.681	32.511	32.511	12.091	12.091		
960.000	-----	-----	-----	-----	33.667	33.667	12.898	12.898		
970.000	-----	-----	-----	-----	34.815	34.815	13.711	13.711		
980.000	-----	-----	-----	-----	35.955	35.955	14.527	14.527		
990.000	-----	-----	-----	-----	37.086	37.086	15.346	15.346		
1000.000	514.692	626.354	185.757	195.427	38.209	38.209	16.168	16.168		
1010.000	-----	-----	-----	-----	-----	-----	16.992	16.992		
1020.000	-----	-----	-----	-----	-----	-----	17.816	17.816		
1030.000	-----	-----	-----	-----	-----	-----	18.641	18.641		
1040.000	-----	-----	-----	-----	-----	-----	19.465	19.465		
1050.000	520.301	644.134	193.250	205.679	43.685	43.685	20.289	20.289		
1060.000	-----	-----	-----	-----	-----	-----	21.111	21.111		
1070.000	-----	-----	-----	-----	-----	-----	21.931	21.931		
1080.000	-----	-----	-----	-----	-----	-----	22.750	22.750		
1090.000	-----	-----	-----	-----	-----	-----	23.566	23.566		
1100.000	525.193	661.205	200.056	215.483	48.913	48.929	24.378	24.378		

Rh, Rhodium

A = 102.905

Z = 45

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		5.770	11.540		23.080	28.850				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1150.000	529.465	677.629	206.245	224.879	53.881	53.975	28.387	28.387		
1200.000	533.199	693.461	211.882	233.901	58.586	58.838	32.283	32.283		
1250.000	536.463	708.746	217.021	242.582	63.031	63.529	36.043	36.045		
1300.000	539.316	723.527	221.714	250.946	67.223	68.059	39.654	39.686		
1350.000	541.808	737.839	226.003	259.017	71.172	72.437	43.111	43.214		
1400.000	543.982	751.715	229.927	266.817	74.889	76.674	46.411	46.635		
1450.000	545.875	765.181	233.523	274.363	78.385	80.776	49.554	49.955		
1500.000	547.519	778.265	236.819	281.673	81.672	84.752	52.543	53.177		

Pd, Palladium

A = 106.400

Z = 46

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$					T_d
Energy(eV)=		3.900	7.800		15.600	19.500					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
163.030	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
164.000	8.705	8.705	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	17.557	17.557	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
166.000	26.250	26.250	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
167.000	34.788	34.788	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
168.000	43.176	43.176	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
169.000	51.416	51.416	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	59.514	59.514	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	97.982	97.982	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	133.375	133.375	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	166.046	166.046	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	196.297	196.297	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	224.387	224.387	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	250.539	250.539	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	274.947	274.947	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	297.781	297.781	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	319.188	319.188	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	339.298	339.298	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	376.073	376.073	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	408.877	408.877	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	438.320	438.320	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	464.894	464.894	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	488.997	488.997	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	510.957	510.957	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
290.000	531.047	531.047	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
293.680	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
294.000	-.----	-.----	0.420	0.420	-.----	-.----	-.----	-.----	-.----	-.----	
295.000	-.----	-.----	1.758	1.758	-.----	-.----	-.----	-.----	-.----	-.----	
296.000	-.----	-.----	3.090	3.090	-.----	-.----	-.----	-.----	-.----	-.----	
297.000	-.----	-.----	4.415	4.415	-.----	-.----	-.----	-.----	-.----	-.----	
298.000	-.----	-.----	5.733	5.733	-.----	-.----	-.----	-.----	-.----	-.----	
299.000	-.----	-.----	7.044	7.044	-.----	-.----	-.----	-.----	-.----	-.----	
300.000	549.491	549.599	8.349	8.349	-.----	-.----	-.----	-.----	-.----	-.----	
305.000	-.----	-.----	14.777	14.777	-.----	-.----	-.----	-.----	-.----	-.----	
310.000	566.482	567.170	21.050	21.050	-.----	-.----	-.----	-.----	-.----	-.----	

Pd, Palladium

A = 106.400

Z = 46

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s		$2T_s$		$4T_s$		$5T_s$			
	3.900		7.800		15.600		19.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
315.000	-.----	-.----	27.176	27.176	-.----	-.----	-.----	-.----		
320.000	582.182	583.891	33.161	33.161	-.----	-.----	-.----	-.----		
325.000	-.----	-.----	39.011	39.011	-.----	-.----	-.----	-.----		
330.000	596.729	599.844	44.731	44.731	-.----	-.----	-.----	-.----		
335.000	-.----	-.----	50.327	50.327	-.----	-.----	-.----	-.----		
340.000	610.241	615.099	55.802	55.802	-.----	-.----	-.----	-.----		
345.000	-.----	-.----	61.163	61.163	-.----	-.----	-.----	-.----		
350.000	622.823	629.720	66.412	66.412	-.----	-.----	-.----	-.----		
355.000	-.----	-.----	71.554	71.554	-.----	-.----	-.----	-.----		
360.000	634.563	643.762	76.592	76.592	-.----	-.----	-.----	-.----		
370.000	645.540	657.274	86.370	86.370	-.----	-.----	-.----	-.----		
380.000	655.822	670.298	95.771	95.771	-.----	-.----	-.----	-.----		
390.000	665.469	682.873	104.816	104.816	-.----	-.----	-.----	-.----		
400.000	674.536	695.034	113.526	113.526	-.----	-.----	-.----	-.----		
410.000	683.069	706.812	121.919	121.919	-.----	-.----	-.----	-.----		
420.000	691.112	718.235	130.012	130.012	-.----	-.----	-.----	-.----		
430.000	698.701	729.327	137.820	137.820	-.----	-.----	-.----	-.----		
440.000	705.872	740.111	145.356	145.356	-.----	-.----	-.----	-.----		
450.000	712.655	750.607	152.635	152.635	-.----	-.----	-.----	-.----		
460.000	719.077	760.834	159.667	159.667	-.----	-.----	-.----	-.----		
470.000	725.164	770.809	166.465	166.465	-.----	-.----	-.----	-.----		
480.000	730.938	780.546	173.039	173.039	-.----	-.----	-.----	-.----		
490.000	736.421	790.061	179.398	179.398	-.----	-.----	-.----	-.----		
500.000	741.631	799.366	185.552	185.552	-.----	-.----	-.----	-.----		
505.810	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
506.000	-.----	-.----	-.----	-.----	0.039	0.039	-.----	-.----		
507.000	-.----	-.----	-.----	-.----	0.250	0.250	-.----	-.----		
508.000	-.----	-.----	-.----	-.----	0.462	0.462	-.----	-.----		
509.000	-.----	-.----	-.----	-.----	0.675	0.675	-.----	-.----		
510.000	-.----	-.----	191.509	191.514	0.889	0.889	-.----	-.----		
515.000	-.----	-.----	-.----	-.----	1.968	1.968	-.----	-.----		
520.000	-.----	-.----	197.278	197.334	3.063	3.063	-.----	-.----		
525.000	-.----	-.----	-.----	-.----	4.174	4.174	-.----	-.----		
530.000	-.----	-.----	202.867	203.026	5.298	5.298	-.----	-.----		
535.000	-.----	-.----	-.----	-.----	6.435	6.435	-.----	-.----		

Pd, Palladium

A = 106.400

Z = 46

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		3.900	7.800		15.600	19.500					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
540.000	-.----	-.----	208.283	208.599	7.583	7.583	-.----	-.----			
545.000	-.----	-.----	-.----	-.----	8.742	8.742	-.----	-.----			
550.000	764.149	843.114	213.533	214.056	9.910	9.910	-.----	-.----			
555.000	-.----	-.----	-.----	-.----	11.086	11.086	-.----	-.----			
560.000	-.----	-.----	218.622	219.403	12.270	12.270	-.----	-.----			
570.000	-.----	-.----	223.559	224.644	14.655	14.655	-.----	-.----			
580.000	-.----	-.----	228.348	229.786	17.060	17.060	-.----	-.----			
590.000	-.----	-.----	232.995	234.831	19.479	19.479	-.----	-.----			
596.750	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
597.000	-.----	-.----	-.----	-.----	-.----	-.----	0.029	0.029			
598.000	-.----	-.----	-.----	-.----	-.----	-.----	0.147	0.147			
599.000	-.----	-.----	-.----	-.----	-.----	-.----	0.266	0.266			
600.000	781.933	883.024	237.505	239.784	21.906	21.906	0.385	0.385			
605.000	-.----	-.----	-.----	-.----	-.----	-.----	0.993	0.993			
610.000	-.----	-.----	-.----	-.----	24.336	24.336	1.616	1.616			
615.000	-.----	-.----	-.----	-.----	-.----	-.----	2.255	2.255			
620.000	-.----	-.----	-.----	-.----	26.767	26.767	2.908	2.908			
625.000	-.----	-.----	-.----	-.----	-.----	-.----	3.575	3.575			
630.000	-.----	-.----	-.----	-.----	29.193	29.193	4.254	4.254			
635.000	-.----	-.----	-.----	-.----	-.----	-.----	4.945	4.945			
640.000	-.----	-.----	-.----	-.----	31.612	31.612	5.647	5.647			
645.000	-.----	-.----	-.----	-.----	-.----	-.----	6.360	6.360			
650.000	796.145	919.892	258.179	263.289	34.021	34.021	7.082	7.082			
655.000	-.----	-.----	-.----	-.----	-.----	-.----	7.813	7.813			
660.000	-.----	-.----	-.----	-.----	36.417	36.417	8.552	8.552			
670.000	-.----	-.----	-.----	-.----	38.798	38.798	10.052	10.052			
680.000	-.----	-.----	-.----	-.----	41.163	41.163	11.579	11.579			
690.000	-.----	-.----	-.----	-.----	43.508	43.508	13.127	13.127			
700.000	807.599	954.278	276.108	284.968	45.834	45.834	14.694	14.694			
710.000	-.----	-.----	-.----	-.----	48.138	48.138	16.275	16.275			
720.000	-.----	-.----	-.----	-.----	50.419	50.419	17.868	17.868			
730.000	-.----	-.----	-.----	-.----	52.677	52.677	19.470	19.470			
740.000	-.----	-.----	-.----	-.----	54.910	54.910	21.077	21.077			
750.000	816.883	986.591	291.733	305.118	57.118	57.118	22.689	22.689			
760.000	-.----	-.----	-.----	-.----	59.300	59.300	24.302	24.302			

Pd, Palladium

A=106.400

Z=46

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 3.900		2T _s 7.800		4T _s 15.600		5T _s 19.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
770.000	----	----	----	----	61.455	61.455	25.915	25.915		
780.000	----	----	----	----	63.584	63.584	27.525	27.525		
790.000	----	----	----	----	65.686	65.686	29.133	29.133		
800.000	824.434	1017.141	305.409	323.969	67.760	67.760	30.735	30.735		
810.000	----	----	----	----	----	----	32.331	32.331		
820.000	----	----	----	----	----	----	33.919	33.919		
830.000	----	----	----	----	----	----	35.499	35.499		
840.000	----	----	----	----	----	----	37.070	37.070		
850.000	830.585	1046.162	317.426	341.701	77.717	77.726	38.630	38.630		
860.000	----	----	----	----	----	----	40.179	40.179		
870.000	----	----	----	----	----	----	41.717	41.717		
880.000	----	----	----	----	----	----	43.242	43.242		
890.000	----	----	----	----	----	----	44.754	44.754		
900.000	835.590	1073.841	328.020	358.455	86.985	87.139	46.253	46.253		
950.000	839.651	1100.328	337.389	374.348	95.583	96.080	53.534	53.534		
1000.000	842.928	1125.745	345.696	389.475	103.544	104.596	60.438	60.453		
1050.000	845.549	1150.193	353.081	403.916	110.904	112.725	66.953	67.071		
1100.000	847.618	1173.759	359.658	417.737	117.706	120.502	73.077	73.415		
1150.000	849.221	1196.516	365.529	430.995	123.990	127.955	78.822	79.507		
1200.000	850.429	1218.524	370.777	443.740	129.796	135.111	84.201	85.365		
1250.000	851.299	1239.841	375.475	456.013	135.162	141.993	89.233	91.004		
1300.000	851.883	1260.513	379.686	467.851	140.123	148.622	93.936	96.441		
1350.000	852.220	1280.583	383.465	479.287	144.713	155.016	98.331	101.689		
1400.000	852.347	1300.089	386.859	490.349	148.961	161.190	102.437	106.760		
1450.000	852.294	1319.066	389.908	501.064	152.895	167.160	106.272	111.665		
1500.000	852.086	1337.543	392.650	511.453	156.542	172.938	109.856	116.415		

Ag, Silver

A=107.868

Z=47

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 28.000	
	T _s 2.950		2T _s 5.900		4T _s 11.800		5T _s 14.750			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
128.740	0.000	0.000	----	----	----	----	----	----	----	----
129.000	5.131	5.131	----	----	----	----	----	----	----	----
130.000	25.112	25.112	----	----	----	----	----	----	----	----
135.000	117.779	117.779	----	----	----	----	----	----	----	----
140.000	199.790	199.790	----	----	----	----	----	----	----	----
145.000	272.767	272.767	----	----	----	----	----	----	----	----
150.000	338.032	338.032	----	----	----	----	----	----	----	----
155.000	396.669	396.669	----	----	----	----	----	----	----	----
160.000	449.576	449.576	----	----	----	----	----	----	----	----
165.000	497.501	497.501	----	----	----	----	----	----	----	----
170.000	541.072	541.072	----	----	----	----	----	----	----	----
175.000	580.818	580.818	----	----	----	----	----	----	----	----
180.000	617.191	617.191	----	----	----	----	----	----	----	----
190.000	681.298	681.298	----	----	----	----	----	----	----	----
200.000	735.869	735.869	----	----	----	----	----	----	----	----
210.000	782.761	782.761	----	----	----	----	----	----	----	----
220.000	823.392	823.392	----	----	----	----	----	----	----	----
230.000	858.857	858.857	----	----	----	----	----	----	----	----
235.610	----	----	0.000	0.000	----	----	----	----	----	----
236.000	----	----	1.135	1.135	----	----	----	----	----	----
237.000	----	----	4.050	4.050	----	----	----	----	----	----
238.000	----	----	6.939	6.939	----	----	----	----	----	----
239.000	----	----	9.800	9.800	----	----	----	----	----	----
240.000	890.020	890.158	12.636	12.636	----	----	----	----	----	----
245.000	----	----	26.434	26.434	----	----	----	----	----	----
250.000	917.565	918.951	39.638	39.638	----	----	----	----	----	----
255.000	----	----	52.290	52.290	----	----	----	----	----	----
260.000	942.042	945.771	64.430	64.430	----	----	----	----	----	----
265.000	----	----	76.095	76.095	----	----	----	----	----	----
270.000	963.899	970.865	87.315	87.315	----	----	----	----	----	----
275.000	----	----	98.119	98.119	----	----	----	----	----	----
280.000	983.501	994.439	108.534	108.534	----	----	----	----	----	----
285.000	----	----	118.583	118.583	----	----	----	----	----	----
290.000	1001.152	1016.670	128.288	128.288	----	----	----	----	----	----
295.000	----	----	137.668	137.668	----	----	----	----	----	----

Ag, Silver

A = 107.868

Z = 47

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.950		5.900		11.800		14.750		28.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
300.000	1017.102	1037.708	146.741	146.741	-.----	-.----	-.----	-.----	-.----	-.----
310.000	1031.565	1057.681	164.031	164.031	-.----	-.----	-.----	-.----	-.----	-.----
320.000	1044.718	1076.702	180.276	180.276	-.----	-.----	-.----	-.----	-.----	-.----
330.000	1056.713	1094.866	195.576	195.576	-.----	-.----	-.----	-.----	-.----	-.----
340.000	1067.680	1112.256	210.016	210.016	-.----	-.----	-.----	-.----	-.----	-.----
350.000	1077.731	1128.946	223.671	223.671	-.----	-.----	-.----	-.----	-.----	-.----
360.000	1086.961	1145.000	236.607	236.607	-.----	-.----	-.----	-.----	-.----	-.----
370.000	1095.454	1160.473	248.880	248.880	-.----	-.----	-.----	-.----	-.----	-.----
380.000	1103.284	1175.416	260.542	260.542	-.----	-.----	-.----	-.----	-.----	-.----
390.000	1110.513	1189.872	271.638	271.638	-.----	-.----	-.----	-.----	-.----	-.----
400.000	1117.199	1203.881	282.208	282.208	-.----	-.----	-.----	-.----	-.----	-.----
410.000	-.----	-.----	292.288	292.288	-.----	-.----	-.----	-.----	-.----	-.----
412.980	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
413.000	-.----	-.----	-.----	-.----	0.009	0.009	-.----	-.----	-.----	-.----
414.000	-.----	-.----	-.----	-.----	0.460	0.460	-.----	-.----	-.----	-.----
415.000	-.----	-.----	-.----	-.----	0.912	0.912	-.----	-.----	-.----	-.----
416.000	-.----	-.----	-.----	-.----	1.364	1.364	-.----	-.----	-.----	-.----
417.000	-.----	-.----	-.----	-.----	1.816	1.816	-.----	-.----	-.----	-.----
418.000	-.----	-.----	-.----	-.----	2.268	2.268	-.----	-.----	-.----	-.----
419.000	-.----	-.----	-.----	-.----	2.721	2.721	-.----	-.----	-.----	-.----
420.000	-.----	-.----	301.911	301.945	3.174	3.174	-.----	-.----	-.----	-.----
425.000	-.----	-.----	-.----	-.----	5.440	5.440	-.----	-.----	-.----	-.----
430.000	-.----	-.----	311.107	311.304	7.709	7.709	-.----	-.----	-.----	-.----
435.000	-.----	-.----	-.----	-.----	9.980	9.980	-.----	-.----	-.----	-.----
440.000	-.----	-.----	319.903	320.388	12.250	12.250	-.----	-.----	-.----	-.----
445.000	-.----	-.----	-.----	-.----	14.519	14.519	-.----	-.----	-.----	-.----
450.000	1144.013	1268.307	328.323	329.216	16.786	16.786	-.----	-.----	-.----	-.----
455.000	-.----	-.----	-.----	-.----	19.048	19.048	-.----	-.----	-.----	-.----
460.000	-.----	-.----	336.390	337.802	21.306	21.306	-.----	-.----	-.----	-.----
465.000	-.----	-.----	-.----	-.----	23.557	23.557	-.----	-.----	-.----	-.----
470.000	-.----	-.----	344.124	346.161	25.801	25.801	-.----	-.----	-.----	-.----
475.000	-.----	-.----	-.----	-.----	28.038	28.038	-.----	-.----	-.----	-.----
480.000	-.----	-.----	351.544	354.305	30.265	30.265	-.----	-.----	-.----	-.----
489.940	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
490.000	-.----	-.----	358.667	362.248	34.692	34.692	0.014	0.014	-.----	-.----

Ag, Silver

A = 107.868

Z = 47

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d			
Energy(eV)=		2.950	5.900		11.800	14.750		28.000			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
491.000	-.----	-.----	-.----	-.----	-.----	-.----	0.264	0.264	-.----	-.----	
492.000	-.----	-.----	-.----	-.----	-.----	-.----	0.515	0.515	-.----	-.----	
493.000	-.----	-.----	-.----	-.----	-.----	-.----	0.767	0.767	-.----	-.----	
494.000	-.----	-.----	-.----	-.----	-.----	-.----	1.019	1.019	-.----	-.----	
495.000	-.----	-.----	-.----	-.----	-.----	-.----	1.273	1.273	-.----	-.----	
496.000	-.----	-.----	-.----	-.----	-.----	-.----	1.527	1.527	-.----	-.----	
497.000	-.----	-.----	-.----	-.----	-.----	-.----	1.782	1.782	-.----	-.----	
498.000	-.----	-.----	-.----	-.----	-.----	-.----	2.037	2.037	-.----	-.----	
499.000	-.----	-.----	-.----	-.----	-.----	-.----	2.293	2.293	-.----	-.----	
500.000	1162.722	1325.481	365.511	370.000	39.075	39.075	2.550	2.550	-.----	-.----	
505.000	-.----	-.----	-.----	-.----	-.----	-.----	3.845	3.845	-.----	-.----	
510.000	-.----	-.----	372.089	377.571	43.410	43.410	5.155	5.155	-.----	-.----	
515.000	-.----	-.----	-.----	-.----	-.----	-.----	6.480	6.480	-.----	-.----	
520.000	-.----	-.----	378.415	384.971	47.693	47.693	7.816	7.816	-.----	-.----	
525.000	-.----	-.----	-.----	-.----	-.----	-.----	9.165	9.165	-.----	-.----	
530.000	-.----	-.----	384.503	392.208	51.922	51.922	10.523	10.523	-.----	-.----	
535.000	-.----	-.----	-.----	-.----	-.----	-.----	11.890	11.890	-.----	-.----	
540.000	-.----	-.----	390.364	399.290	56.093	56.093	13.264	13.264	-.----	-.----	
545.000	-.----	-.----	-.----	-.----	-.----	-.----	14.646	14.646	-.----	-.----	
550.000	1175.965	1377.363	396.009	406.226	60.205	60.205	16.033	16.033	-.----	-.----	
555.000	-.----	-.----	-.----	-.----	-.----	-.----	17.425	17.425	-.----	-.----	
560.000	-.----	-.----	401.449	413.022	64.255	64.255	18.821	18.821	-.----	-.----	
570.000	-.----	-.----	406.694	419.684	68.242	68.242	21.621	21.621	-.----	-.----	
580.000	-.----	-.----	411.753	426.218	72.166	72.166	24.427	24.427	-.----	-.----	
590.000	-.----	-.----	416.633	432.631	76.025	76.025	27.235	27.235	-.----	-.----	
600.000	1185.374	1425.200	421.345	438.928	79.820	79.820	30.038	30.038	-.----	-.----	
610.000	-.----	-.----	-.----	-.----	83.549	83.549	32.834	32.834	-.----	-.----	
620.000	-.----	-.----	-.----	-.----	87.213	87.213	35.619	35.619	-.----	-.----	
630.000	-.----	-.----	-.----	-.----	90.811	90.811	38.388	38.388	-.----	-.----	
640.000	-.----	-.----	-.----	-.----	94.345	94.345	41.140	41.140	-.----	-.----	
650.000	1192.010	1469.825	442.606	468.824	97.815	97.815	43.871	43.871	-.----	-.----	
660.000	-.----	-.----	-.----	-.----	101.220	101.220	46.580	46.580	-.----	-.----	
670.000	-.----	-.----	-.----	-.----	104.563	104.563	49.265	49.265	-.----	-.----	
680.000	-.----	-.----	-.----	-.----	107.842	107.842	51.923	51.923	-.----	-.----	
690.000	-.----	-.----	-.----	-.----	111.060	111.060	54.554	54.554	-.----	-.----	

Ag, Silver

A=107.868

Z=47

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	2.950	5.900	11.800	14.750	28.000					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
700.000	1196.589	1511.818	460.595	496.431	114.216	114.221	57.156	57.156	-.----	-.----
710.000	-.----	-.----	-.----	-.----	-.----	-.----	59.729	59.729	-.----	-.----
720.000	-.----	-.----	-.----	-.----	-.----	-.----	62.271	62.271	-.----	-.----
730.000	-.----	-.----	-.----	-.----	-.----	-.----	64.782	64.782	-.----	-.----
740.000	-.----	-.----	-.----	-.----	-.----	-.----	67.261	67.261	-.----	-.----
750.000	1199.616	1551.596	475.918	522.134	129.110	129.377	69.707	69.707	-.----	-.----
760.000	-.----	-.----	-.----	-.----	-.----	-.----	72.120	72.120	-.----	-.----
770.000	-.----	-.----	-.----	-.----	-.----	-.----	74.501	74.501	-.----	-.----
780.000	-.----	-.----	-.----	-.----	-.----	-.----	76.848	76.848	-.----	-.----
780.240	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
781.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.035	0.035
782.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.083	0.083
783.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.131	0.131
784.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.179	0.179
785.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.228	0.228
786.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.278	0.278
787.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.328	0.328
788.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.378	0.378
789.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.429	0.429
790.000	-.----	-.----	-.----	-.----	-.----	-.----	79.162	79.162	0.480	0.480
795.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.743	0.743
800.000	1201.452	1589.471	489.042	546.223	142.611	143.559	81.442	81.442	1.017	1.017
805.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.300	1.300
810.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.594	1.594
815.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.897	1.897
820.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.209	2.209
825.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.530	2.530
830.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.858	2.858
835.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.195	3.195
840.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.539	3.539
850.000	1202.363	1625.682	500.336	568.923	154.843	156.889	92.346	92.412	4.247	4.247
860.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.982	4.982
870.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	5.740	5.740
880.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.518	6.518
890.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	7.316	7.316

Ag, Silver

A = 107.868

Z = 47

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s	2T _s			4T _s	5T _s			T _d	
Energy(eV)=	2.950	5.900			11.800	14.750			28.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
900.000	1202.550	1660.417	510.093	590.413	165.925	169.472	102.435	102.785	8.131	8.131
910.000	-----	-----	-----	-----	-----	-----	-----	-----	8.960	8.960
920.000	-----	-----	-----	-----	-----	-----	-----	-----	9.804	9.804
930.000	-----	-----	-----	-----	-----	-----	-----	-----	10.659	10.659
940.000	-----	-----	-----	-----	-----	-----	-----	-----	11.524	11.524
950.000	1202.167	1693.828	518.548	610.838	175.971	181.390	111.747	112.626	12.399	12.399
960.000	-----	-----	-----	-----	-----	-----	-----	-----	13.281	13.281
970.000	-----	-----	-----	-----	-----	-----	-----	-----	14.170	14.170
980.000	-----	-----	-----	-----	-----	-----	-----	-----	15.064	15.064
990.000	-----	-----	-----	-----	-----	-----	-----	-----	15.963	15.963
1000.000	1201.330	1726.038	525.895	630.315	185.085	192.716	120.329	121.989	16.866	16.866
1010.000	-----	-----	-----	-----	-----	-----	-----	-----	17.771	17.771
1020.000	-----	-----	-----	-----	-----	-----	-----	-----	18.678	18.678
1030.000	-----	-----	-----	-----	-----	-----	-----	-----	19.586	19.586
1040.000	-----	-----	-----	-----	-----	-----	-----	-----	20.495	20.495
1050.000	1200.133	1757.149	532.291	648.942	193.361	203.507	128.233	130.917	21.403	21.403
1060.000	-----	-----	-----	-----	-----	-----	-----	-----	22.311	22.311
1070.000	-----	-----	-----	-----	-----	-----	-----	-----	23.217	23.217
1080.000	-----	-----	-----	-----	-----	-----	-----	-----	24.121	24.121
1090.000	-----	-----	-----	-----	-----	-----	-----	-----	25.023	25.023
1100.000	1198.650	1787.251	537.870	666.801	200.886	213.816	135.511	139.450	25.922	25.922
1150.000	1196.940	1816.418	542.741	683.962	207.734	223.686	142.211	147.623	30.362	30.362
1200.000	1195.052	1844.716	546.996	700.483	213.974	233.154	148.382	155.465	34.682	34.682
1250.000	1193.023	1872.204	550.715	716.418	219.666	242.254	154.068	163.002	38.856	38.857
1300.000	1190.886	1898.931	553.964	731.811	224.863	251.014	159.309	170.257	42.868	42.889
1350.000	1188.665	1924.942	556.801	746.702	229.615	259.461	164.145	177.251	46.709	46.793
1400.000	1186.382	1950.279	559.274	761.125	233.962	267.616	168.608	184.003	50.374	50.575
1450.000	1184.052	1974.976	561.427	775.113	237.944	275.500	172.731	190.528	53.865	54.242
1500.000	1181.692	1999.068	563.296	788.692	241.595	283.131	176.542	196.842	57.184	57.798

Cd, Cadmium

A=112.400

Z=48

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	1.160	2.320	4.640	5.800	19.880					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
56.290	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
57.000	193.409	193.409	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
58.000	452.902	452.902	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
59.000	695.095	695.095	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
60.000	921.367	921.367	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
65.000	1853.795	1853.795	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
70.000	2534.097	2534.097	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
75.000	3038.675	3038.675	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
80.000	3417.683	3417.683	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
85.000	3705.047	3705.047	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
90.000	3924.321	3924.321	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
95.000	4092.223	4092.223	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
100.000	4220.852	4220.852	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
105.000	4319.118	4319.118	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
107.490	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
108.000	-.----	-.----	19.175	19.175	-.----	-.----	-.----	-.----	-.----	-.----
109.000	-.----	-.----	55.986	55.986	-.----	-.----	-.----	-.----	-.----	-.----
110.000	4393.679	4394.839	91.623	91.623	-.----	-.----	-.----	-.----	-.----	-.----
115.000	4449.576	4459.023	253.838	253.838	-.----	-.----	-.----	-.----	-.----	-.----
120.000	4490.674	4514.618	393.109	393.109	-.----	-.----	-.----	-.----	-.----	-.----
125.000	-.----	-.----	513.543	513.543	-.----	-.----	-.----	-.----	-.----	-.----
130.000	4539.794	4605.271	618.369	618.369	-.----	-.----	-.----	-.----	-.----	-.----
135.000	-.----	-.----	710.150	710.150	-.----	-.----	-.----	-.----	-.----	-.----
140.000	4558.058	4675.091	790.944	790.944	-.----	-.----	-.----	-.----	-.----	-.----
145.000	-.----	-.----	862.417	862.417	-.----	-.----	-.----	-.----	-.----	-.----
150.000	4556.174	4729.783	925.931	925.931	-.----	-.----	-.----	-.----	-.----	-.----
155.000	-.----	-.----	982.608	982.608	-.----	-.----	-.----	-.----	-.----	-.----
160.000	4541.069	4773.350	1033.378	1033.378	-.----	-.----	-.----	-.----	-.----	-.----
170.000	4517.316	4808.653	1120.182	1120.182	-.----	-.----	-.----	-.----	-.----	-.----
180.000	4487.991	4837.769	1191.206	1191.206	-.----	-.----	-.----	-.----	-.----	-.----
190.000	4455.188	4862.224	1249.962	1249.962	-.----	-.----	-.----	-.----	-.----	-.----
198.880	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
199.000	-.----	-.----	-.----	-.----	0.599	0.599	-.----	-.----	-.----	-.----
200.000	4420.348	4883.152	1299.036	1299.056	5.950	5.950	-.----	-.----	-.----	-.----
205.000	-.----	-.----	-.----	-.----	31.691	31.691	-.----	-.----	-.----	-.----

Cd, Cadmium

A = 112.400

Z = 48

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	1.160		2.320		4.640		5.800		19.880	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
210.000	4384.470	4901.407	1340.370	1342.131	55.859	55.859	-.----	-.----	-.----	-.----
215.000	-.----	-.----	-.----	-.----	78.604	78.604	-.----	-.----	-.----	-.----
220.000	4348.245	4917.634	1375.440	1381.284	100.059	100.059	-.----	-.----	-.----	-.----
225.000	-.----	-.----	-.----	-.----	120.338	120.338	-.----	-.----	-.----	-.----
230.000	4312.153	4932.327	1405.391	1417.112	139.542	139.542	-.----	-.----	-.----	-.----
235.000	-.----	-.----	-.----	-.----	157.762	157.762	-.----	-.----	-.----	-.----
240.000	4276.524	4945.863	1431.116	1450.100	175.076	175.076	-.----	-.----	-.----	-.----
240.430	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
241.000	-.----	-.----	-.----	-.----	-.----	-.----	1.657	1.657	-.----	-.----
242.000	-.----	-.----	-.----	-.----	-.----	-.----	4.543	4.543	-.----	-.----
243.000	-.----	-.----	-.----	-.----	-.----	-.----	7.404	7.404	-.----	-.----
244.000	-.----	-.----	-.----	-.----	-.----	-.----	10.240	10.240	-.----	-.----
245.000	-.----	-.----	-.----	-.----	191.556	191.556	13.052	13.052	-.----	-.----
246.000	-.----	-.----	-.----	-.----	-.----	-.----	15.839	15.839	-.----	-.----
247.000	-.----	-.----	-.----	-.----	-.----	-.----	18.602	18.602	-.----	-.----
248.000	-.----	-.----	-.----	-.----	-.----	-.----	21.341	21.341	-.----	-.----
249.000	-.----	-.----	-.----	-.----	-.----	-.----	24.057	24.057	-.----	-.----
250.000	4241.581	4958.534	1453.323	1480.648	207.265	207.265	26.751	26.751	-.----	-.----
255.000	-.----	-.----	-.----	-.----	222.259	222.259	39.887	39.887	-.----	-.----
260.000	4207.472	4970.567	1472.580	1509.089	236.589	236.589	52.501	52.501	-.----	-.----
265.000	-.----	-.----	-.----	-.----	-.----	-.----	64.628	64.628	-.----	-.----
270.000	4174.291	4982.137	1489.344	1535.696	263.437	263.437	76.301	76.301	-.----	-.----
275.000	-.----	-.----	-.----	-.----	-.----	-.----	87.549	87.549	-.----	-.----
280.000	4142.093	4993.381	1503.988	1560.701	288.126	288.126	98.399	98.399	-.----	-.----
285.000	-.----	-.----	-.----	-.----	-.----	-.----	108.875	108.875	-.----	-.----
290.000	4110.903	5004.406	1516.819	1584.300	310.920	310.920	118.998	118.998	-.----	-.----
295.000	-.----	-.----	-.----	-.----	-.----	-.----	128.789	128.789	-.----	-.----
300.000	4080.729	5015.293	1528.089	1606.658	332.036	332.036	138.265	138.265	-.----	-.----
310.000	4051.562	5026.107	1538.011	1627.915	351.661	351.661	156.341	156.341	-.----	-.----
320.000	4023.385	5036.899	1546.761	1648.192	369.951	369.951	173.343	173.343	-.----	-.----
330.000	3996.174	5047.704	1554.488	1667.593	387.040	387.040	189.372	189.372	-.----	-.----
340.000	3969.899	5058.553	1561.319	1686.207	403.044	403.044	204.516	204.516	-.----	-.----
350.000	3944.528	5069.468	1567.362	1704.113	418.064	418.064	218.851	218.851	-.----	-.----
360.000	3920.029	5080.462	1572.710	1721.378	432.187	432.254	232.442	232.442	-.----	-.----
370.000	3896.366	5091.549	1577.441	1738.062	445.492	445.880	245.348	245.348	-.----	-.----

Cd, Cadmium

A = 112.400

Z = 48

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	1.160		2.320		4.640		5.800		19.880	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
380.000	3873.506	5102.736	1581.625	1754.216	458.045	459.001	257.620	257.620	-.----	-.----
390.000	3851.415	5114.027	1585.321	1769.887	469.906	471.655	269.304	269.304	-.----	-.----
400.000	3830.059	5125.425	1588.581	1785.114	481.131	483.875	280.442	280.442	-.----	-.----
410.000	-.----	-.----	-.----	-.----	491.766	495.695	291.070	291.070	-.----	-.----
420.000	-.----	-.----	-.----	-.----	501.855	507.140	301.222	301.222	-.----	-.----
430.000	-.----	-.----	-.----	-.----	511.437	518.238	310.928	310.986	-.----	-.----
440.000	-.----	-.----	-.----	-.----	520.546	529.011	320.216	320.461	-.----	-.----
450.000	3733.225	5183.991	1599.751	1855.723	529.215	539.479	329.110	329.666	-.----	-.----
460.000	-.----	-.----	-.----	-.----	537.473	549.662	337.635	338.617	-.----	-.----
470.000	-.----	-.----	-.----	-.----	545.345	559.578	345.810	347.329	-.----	-.----
480.000	-.----	-.----	-.----	-.----	552.856	569.242	353.657	355.816	-.----	-.----
490.000	-.----	-.----	-.----	-.----	560.028	578.669	361.192	364.090	-.----	-.----
500.000	3650.458	5244.902	1604.950	1919.255	566.881	587.871	368.432	372.163	-.----	-.----
510.000	-.----	-.----	-.----	-.----	-.----	-.----	375.394	380.046	-.----	-.----
520.000	-.----	-.----	-.----	-.----	-.----	-.----	382.090	387.749	-.----	-.----
530.000	-.----	-.----	-.----	-.----	-.----	-.----	388.535	395.280	-.----	-.----
540.000	-.----	-.----	-.----	-.----	-.----	-.----	394.741	402.649	-.----	-.----
550.000	3578.935	5307.604	1606.432	1977.653	596.969	630.926	400.719	409.862	-.----	-.----
560.000	-.----	-.----	-.----	-.----	-.----	-.----	406.481	416.929	-.----	-.----
570.000	-.----	-.----	-.----	-.----	-.----	-.----	412.037	423.855	-.----	-.----
580.000	-.----	-.----	-.----	-.----	-.----	-.----	417.396	430.646	-.----	-.----
590.000	-.----	-.----	-.----	-.----	-.----	-.----	422.566	437.310	-.----	-.----
600.000	3516.482	5371.530	1605.518	2032.125	621.362	669.880	427.558	443.850	-.----	-.----
629.820	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
630.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.019	0.019
631.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.128	0.128
632.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.238	0.238
633.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.349	0.349
634.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.460	0.460
635.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.572	0.572
636.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.685	0.685
637.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.799	0.799
638.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.913	0.913
639.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.028	1.028
640.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.144	1.144

Cd, Cadmium

A = 112.400

Z = 48

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		1.160	2.320		4.640	5.800				19.880	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
645.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.733	1.733	
650.000	3461.433	5436.188	1603.022	2083.462	641.362	705.584	450.086	474.884	2.338	2.338	
655.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.959	2.959	
660.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.594	3.594	
665.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.243	4.243	
670.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.905	4.905	
675.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	5.579	5.579	
680.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.264	6.264	
685.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.960	6.960	
690.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	7.666	7.666	
695.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	8.381	8.381	
700.000	3412.498	5501.175	1599.469	2132.206	657.907	738.643	469.147	503.510	9.105	9.105	
710.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	10.576	10.576	
720.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	12.076	12.076	
730.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	13.599	13.599	
740.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	15.142	15.142	
750.000	3368.664	5566.164	1595.204	2178.745	671.687	769.504	485.378	530.132	16.702	16.702	
760.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	18.276	18.276	
770.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	19.860	19.860	
780.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	21.453	21.453	
790.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	23.051	23.051	
800.000	3329.125	5630.895	1590.467	2223.363	683.225	798.502	499.275	555.057	24.653	24.653	
810.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	26.256	26.256	
820.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	27.860	27.860	
830.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	29.462	29.462	
840.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	31.060	31.060	
850.000	3293.239	5695.169	1585.419	2266.279	692.926	825.898	511.228	578.524	32.654	32.654	
860.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	34.242	34.242	
870.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	35.823	35.823	
880.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	37.397	37.397	
890.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	38.961	38.961	
900.000	3260.489	5758.836	1580.179	2307.665	701.105	851.895	521.546	600.722	40.516	40.516	
910.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	42.061	42.061	
920.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	43.595	43.595	
930.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	45.116	45.116	

Cd, Cadmium

A = 112.400

Z = 48

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$	$4T_s$	$5T_s$				T_d	
Energy(eV)=		1.160	2.320	4.640	5.800				19.880	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
940.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	46.626	46.626
950.000	3230.458	5821.786	1574.831	2347.659	708.014	876.659	530.481	621.803	48.123	48.123
960.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	49.608	49.608
970.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	51.078	51.078
980.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	52.535	52.535
990.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	53.978	53.978
1000.000	3202.802	5883.943	1569.435	2386.376	713.854	900.323	538.238	641.891	55.407	55.407
1050.000	3177.240	5945.251	1564.039	2423.914	718.790	922.998	544.986	661.091	62.331	62.345
1100.000	3153.530	6005.670	1558.674	2460.356	722.957	944.779	550.864	679.487	68.880	68.990
1150.000	3131.469	6065.175	1553.365	2495.772	726.466	965.744	555.991	697.155	75.052	75.367
1200.000	3110.880	6123.748	1548.130	2530.226	729.410	985.962	560.464	714.156	80.854	81.496
1250.000	3091.613	6181.378	1542.979	2563.773	731.867	1005.490	564.368	730.545	86.298	87.394
1300.000	3073.533	6238.060	1537.922	2596.461	733.904	1024.381	567.774	746.370	91.400	93.076
1350.000	3056.527	6293.796	1532.964	2628.337	735.575	1042.680	570.742	761.672	96.178	98.557
1400.000	3040.492	6348.591	1528.110	2659.441	736.928	1060.426	573.326	776.489	100.650	103.851
1450.000	3025.341	6402.455	1523.363	2689.811	738.004	1077.656	575.570	790.853	104.834	108.968
1500.000	3010.998	6455.400	1518.724	2719.484	738.838	1094.401	577.514	804.792	108.749	113.919

In, Indium

A = 114.820

Z = 49

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 2.520		2T _s 5.040		4T _s 10.080		5T _s 12.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
118.150	0.000	0.000	----	----	----	----	----	----	----	----
119.000	24.949	24.949	----	----	----	----	----	----	----	----
120.000	53.745	53.745	----	----	----	----	----	----	----	----
125.000	186.119	186.119	----	----	----	----	----	----	----	----
130.000	301.602	301.602	----	----	----	----	----	----	----	----
135.000	402.990	402.990	----	----	----	----	----	----	----	----
140.000	492.519	492.519	----	----	----	----	----	----	----	----
145.000	571.992	571.992	----	----	----	----	----	----	----	----
150.000	642.881	642.881	----	----	----	----	----	----	----	----
155.000	706.394	706.394	----	----	----	----	----	----	----	----
160.000	763.531	763.531	----	----	----	----	----	----	----	----
165.000	815.129	815.129	----	----	----	----	----	----	----	----
170.000	861.886	861.886	----	----	----	----	----	----	----	----
175.000	904.395	904.395	----	----	----	----	----	----	----	----
180.000	943.159	943.159	----	----	----	----	----	----	----	----
190.000	1011.108	1011.108	----	----	----	----	----	----	----	----
200.000	1068.502	1068.502	----	----	----	----	----	----	----	----
210.000	1117.415	1117.415	----	----	----	----	----	----	----	----
217.390	----	----	0.000	0.000	----	----	----	----	----	----
218.000	----	----	2.599	2.599	----	----	----	----	----	----
219.000	----	----	6.829	6.829	----	----	----	----	----	----
220.000	1159.431	1159.508	11.014	11.014	----	----	----	----	----	----
225.000	----	----	31.269	31.269	----	----	----	----	----	----
230.000	1195.776	1197.442	50.487	50.487	----	----	----	----	----	----
235.000	----	----	68.754	68.754	----	----	----	----	----	----
240.000	1227.413	1232.386	86.148	86.148	----	----	----	----	----	----
245.000	----	----	102.738	102.738	----	----	----	----	----	----
250.000	1255.105	1264.748	118.584	118.584	----	----	----	----	----	----
255.000	----	----	133.742	133.742	----	----	----	----	----	----
260.000	1279.465	1294.870	148.261	148.261	----	----	----	----	----	----
265.000	----	----	162.183	162.183	----	----	----	----	----	----
270.000	1300.991	1323.036	175.550	175.550	----	----	----	----	----	----
275.000	----	----	188.396	188.396	----	----	----	----	----	----
280.000	1320.089	1349.485	200.755	200.755	----	----	----	----	----	----
290.000	1337.094	1374.421	224.125	224.125	----	----	----	----	----	----

In, Indium

A = 114.820

Z = 49

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.520		5.040		10.080		12.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
300.000	1352.285	1398.016	245.869	245.869	-.----	-.----	-.----	-.----		
310.000	1365.896	1420.419	266.161	266.161	-.----	-.----	-.----	-.----		
320.000	1378.123	1441.757	285.149	285.149	-.----	-.----	-.----	-.----		
330.000	1389.133	1462.139	302.960	302.960	-.----	-.----	-.----	-.----		
340.000	1399.068	1481.660	319.704	319.704	-.----	-.----	-.----	-.----		
350.000	1408.049	1500.404	335.476	335.476	-.----	-.----	-.----	-.----		
360.000	1416.182	1518.444	350.359	350.359	-.----	-.----	-.----	-.----		
370.000	1423.557	1535.842	364.427	364.427	-.----	-.----	-.----	-.----		
380.000	1430.253	1552.654	377.744	377.744	-.----	-.----	-.----	-.----		
383.410	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
384.000	-.----	-.----	-.----	-.----	0.379	0.379	-.----	-.----		
385.000	-.----	-.----	-.----	-.----	1.030	1.030	-.----	-.----		
386.000	-.----	-.----	-.----	-.----	1.681	1.681	-.----	-.----		
387.000	-.----	-.----	-.----	-.----	2.332	2.332	-.----	-.----		
388.000	-.----	-.----	-.----	-.----	2.983	2.983	-.----	-.----		
389.000	-.----	-.----	-.----	-.----	3.633	3.633	-.----	-.----		
390.000	1436.338	1568.931	390.368	390.414	4.282	4.282	-.----	-.----		
395.000	-.----	-.----	-.----	-.----	7.526	7.526	-.----	-.----		
400.000	1441.874	1584.715	402.350	402.634	10.759	10.759	-.----	-.----		
405.000	-.----	-.----	-.----	-.----	13.980	13.980	-.----	-.----		
410.000	-.----	-.----	413.736	414.449	17.188	17.188	-.----	-.----		
415.000	-.----	-.----	-.----	-.----	20.381	20.381	-.----	-.----		
420.000	-.----	-.----	424.568	425.886	23.557	23.557	-.----	-.----		
425.000	-.----	-.----	-.----	-.----	26.717	26.717	-.----	-.----		
430.000	-.----	-.----	434.884	436.971	29.859	29.859	-.----	-.----		
435.000	-.----	-.----	-.----	-.----	32.982	32.982	-.----	-.----		
440.000	-.----	-.----	444.717	447.726	36.084	36.084	-.----	-.----		
450.000	1462.951	1657.482	454.099	458.172	42.227	42.227	-.----	-.----		
455.790	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
456.000	-.----	-.----	-.----	-.----	-.----	-.----	0.073	0.073		
457.000	-.----	-.----	-.----	-.----	-.----	-.----	0.433	0.433		
458.000	-.----	-.----	-.----	-.----	-.----	-.----	0.794	0.794		
459.000	-.----	-.----	-.----	-.----	-.----	-.----	1.156	1.156		
460.000	-.----	-.----	463.057	468.328	48.281	48.281	1.519	1.519		
465.000	-.----	-.----	-.----	-.----	-.----	-.----	3.345	3.345		

In, Indium

A = 114.820

Z = 49

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T_d	
	T_s		$2T_s$		$4T_s$		$5T_s$			
	2.520		5.040		10.080		12.600			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
470.000	-.----	-.----	471.619	478.213	54.242	54.242	5.188	5.188		
475.000	-.----	-.----	-.----	-.----	-.----	-.----	7.045	7.045		
480.000	-.----	-.----	479.806	487.841	60.107	60.107	8.916	8.916		
485.000	-.----	-.----	-.----	-.----	-.----	-.----	10.799	10.799		
490.000	-.----	-.----	487.642	497.227	65.872	65.872	12.691	12.691		
495.000	-.----	-.----	-.----	-.----	-.----	-.----	14.591	14.591		
500.000	1476.111	1722.336	495.146	506.385	71.536	71.536	16.498	16.498		
505.000	-.----	-.----	-.----	-.----	-.----	-.----	18.410	18.410		
510.000	-.----	-.----	-.----	-.----	77.098	77.098	20.326	20.326		
515.000	-.----	-.----	-.----	-.----	-.----	-.----	22.245	22.245		
520.000	-.----	-.----	-.----	-.----	82.556	82.556	24.165	24.165		
530.000	-.----	-.----	-.----	-.----	87.910	87.910	28.006	28.006		
540.000	-.----	-.----	-.----	-.----	93.159	93.159	31.841	31.841		
550.000	1484.102	1781.439	528.295	549.156	98.304	98.304	35.664	35.664		
560.000	-.----	-.----	-.----	-.----	103.346	103.346	39.467	39.467		
570.000	-.----	-.----	-.----	-.----	108.284	108.284	43.248	43.248		
580.000	-.----	-.----	-.----	-.----	113.121	113.121	46.999	46.999		
590.000	-.----	-.----	-.----	-.----	117.856	117.856	50.719	50.719		
600.000	1488.590	1836.153	555.430	587.737	122.492	122.492	54.403	54.403		
610.000	-.----	-.----	-.----	-.----	127.030	127.030	58.048	58.048		
620.000	-.----	-.----	-.----	-.----	131.471	131.471	61.652	61.652		
630.000	-.----	-.----	-.----	-.----	135.817	135.817	65.214	65.214		
640.000	-.----	-.----	-.----	-.----	140.069	140.069	68.731	68.731		
650.000	1490.632	1887.381	577.881	622.995	144.229	144.231	72.201	72.201		
660.000	-.----	-.----	-.----	-.----	148.299	148.321	75.624	75.624		
670.000	-.----	-.----	-.----	-.----	152.280	152.346	78.999	78.999		
680.000	-.----	-.----	-.----	-.----	156.175	156.308	82.325	82.325		
690.000	-.----	-.----	-.----	-.----	159.985	160.209	85.601	85.601		
700.000	1490.931	1935.745	596.611	655.548	163.711	164.051	88.828	88.828		
710.000	-.----	-.----	-.----	-.----	-.----	-.----	92.004	92.004		
720.000	-.----	-.----	-.----	-.----	-.----	-.----	95.130	95.130		
730.000	-.----	-.----	-.----	-.----	-.----	-.----	98.205	98.205		
740.000	-.----	-.----	-.----	-.----	-.----	-.----	101.231	101.231		
750.000	1489.969	1981.693	612.344	685.856	181.156	182.438	104.206	104.206		
760.000	-.----	-.----	-.----	-.----	-.----	-.----	107.132	107.132		

In, Indium

A = 114.820

Z = 49

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s			4T _s			5T _s		
Energy(eV)=	2.520	5.040			10.080			12.600		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
770.000	-.----	-.----	-.----	-.----	-.----	-.----	110.008	110.017		
780.000	-.----	-.----	-.----	-.----	-.----	-.----	112.836	112.866		
790.000	-.----	-.----	-.----	-.----	-.----	-.----	115.614	115.678		
800.000	1488.084	2025.558	625.629	714.263	196.780	199.597	118.345	118.454		
850.000	1485.518	2067.593	636.896	741.038	210.782	215.692	131.299	131.839		
900.000	1482.452	2107.998	646.483	766.393	223.345	230.856	143.142	144.465		
950.000	1479.018	2146.933	654.660	790.497	234.631	245.197	153.959	156.414		
1000.000	1475.317	2184.529	661.646	813.490	244.785	258.806	163.835	167.757		
1050.000	1471.426	2220.898	667.620	835.485	253.932	271.758	172.852	178.556		
1100.000	1467.405	2256.134	672.728	856.580	262.184	284.119	181.089	188.860		
1150.000	1463.302	2290.317	677.094	876.856	269.639	295.943	188.616	198.716		
1200.000	1459.151	2323.519	680.821	896.383	276.382	307.278	195.499	208.160		
1250.000	1454.980	2355.801	683.993	915.222	282.489	318.164	201.799	217.228		
1300.000	1450.812	2387.217	686.684	933.425	288.027	328.638	207.570	225.949		
1350.000	1446.663	2417.816	688.956	951.039	293.053	338.731	212.859	234.348		
1400.000	1442.546	2447.642	690.862	968.105	297.620	348.472	217.712	242.450		
1450.000	1438.471	2476.736	692.448	984.658	301.773	357.886	222.167	250.275		
1500.000	1434.447	2505.134	693.752	1000.733	305.552	366.994	226.260	257.842		

Sn, Tin

A = 118.690

Z = 50

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s 3.130		$2T_s$ 6.260		$4T_s$ 12.520		$5T_s$ 15.650			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
147.850	0.000	0.000	----	----	----	----	----	----		
148.000	2.289	2.289	----	----	----	----	----	----		
149.000	17.684	17.684	----	----	----	----	----	----		
150.000	32.755	32.755	----	----	----	----	----	----		
155.000	103.586	103.586	----	----	----	----	----	----		
160.000	167.642	167.642	----	----	----	----	----	----		
165.000	225.822	225.822	----	----	----	----	----	----		
170.000	278.877	278.877	----	----	----	----	----	----		
175.000	327.438	327.438	----	----	----	----	----	----		
180.000	372.037	372.037	----	----	----	----	----	----		
185.000	413.127	413.127	----	----	----	----	----	----		
190.000	451.096	451.096	----	----	----	----	----	----		
195.000	486.276	486.276	----	----	----	----	----	----		
200.000	518.956	518.956	----	----	----	----	----	----		
210.000	577.783	577.783	----	----	----	----	----	----		
220.000	629.219	629.219	----	----	----	----	----	----		
230.000	674.537	674.537	----	----	----	----	----	----		
240.000	714.731	714.731	----	----	----	----	----	----		
250.000	750.595	750.595	----	----	----	----	----	----		
260.000	782.764	782.764	----	----	----	----	----	----		
268.130	----	----	0.000	0.000	----	----	----	----		
269.000	----	----	1.967	1.967	----	----	----	----		
270.000	811.758	811.776	4.228	4.228	----	----	----	----		
275.000	----	----	15.315	15.315	----	----	----	----		
280.000	838.002	838.678	26.052	26.052	----	----	----	----		
285.000	----	----	36.459	36.459	----	----	----	----		
290.000	861.848	864.023	46.555	46.555	----	----	----	----		
295.000	----	----	56.357	56.357	----	----	----	----		
300.000	883.594	887.980	65.880	65.880	----	----	----	----		
305.000	----	----	75.139	75.139	----	----	----	----		
310.000	903.486	910.693	84.146	84.146	----	----	----	----		
315.000	----	----	92.913	92.913	----	----	----	----		
320.000	921.735	932.287	101.451	101.451	----	----	----	----		
330.000	938.524	952.872	117.879	117.879	----	----	----	----		
340.000	954.005	972.543	133.502	133.502	----	----	----	----		

Sn, Tin

A=118.690

Z=50

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.130		6.260		12.520		15.650			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
350.000	968.312	991.384	148.383	148.383	----	----	----	----		
360.000	981.563	1009.468	162.576	162.576	----	----	----	----		
370.000	993.858	1026.860	176.129	176.129	----	----	----	----		
380.000	1005.286	1043.618	189.086	189.086	----	----	----	----		
390.000	1015.926	1059.793	201.485	201.485	----	----	----	----		
400.000	1025.846	1075.431	213.361	213.361	----	----	----	----		
410.000	1035.109	1090.572	224.745	224.745	----	----	----	----		
420.000	1043.768	1105.254	235.666	235.666	----	----	----	----		
430.000	1051.872	1119.508	246.149	246.149	----	----	----	----		
440.000	1059.466	1133.365	256.220	256.220	----	----	----	----		
450.000	1066.588	1146.852	265.900	265.900	----	----	----	----		
460.000	1073.274	1159.992	275.210	275.210	----	----	----	----		
465.200	----	----	----	----	0.000	0.000	----	----		
466.000	----	----	----	----	0.281	0.281	----	----		
467.000	----	----	----	----	0.637	0.637	----	----		
468.000	----	----	----	----	0.994	0.994	----	----		
469.000	----	----	----	----	1.352	1.352	----	----		
470.000	1079.557	1172.809	284.168	284.180	1.711	1.711	----	----		
475.000	----	----	----	----	3.517	3.517	----	----		
480.000	1085.464	1185.321	292.793	292.900	5.343	5.343	----	----		
485.000	----	----	----	----	7.187	7.187	----	----		
490.000	1091.023	1197.547	301.100	301.399	9.046	9.046	----	----		
495.000	----	----	----	----	10.920	10.920	----	----		
500.000	1096.258	1209.504	309.106	309.687	12.805	12.805	----	----		
505.000	----	----	----	----	14.701	14.701	----	----		
510.000	----	----	316.824	317.775	16.605	16.605	----	----		
515.000	----	----	----	----	18.517	18.517	----	----		
520.000	----	----	324.268	325.674	20.434	20.434	----	----		
530.000	----	----	331.450	333.393	24.282	24.282	----	----		
540.000	----	----	338.382	340.941	28.138	28.138	----	----		
550.000	1118.266	1265.744	345.076	348.326	31.994	31.994	----	----		
550.100	----	----	----	----	----	----	0.000	0.000		
551.000	----	----	----	----	----	----	0.177	0.177		
552.000	----	----	----	----	----	----	0.375	0.375		
553.000	----	----	----	----	----	----	0.575	0.575		

Sn, Tin

A = 118.690

Z = 50

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.130		6.260		12.520		15.650			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
554.000	-.----	-.----	-.----	-.----	-.----	-.----	0.775	0.775		
555.000	-.----	-.----	-.----	-.----	-.----	-.----	0.977	0.977		
556.000	-.----	-.----	-.----	-.----	-.----	-.----	1.179	1.179		
557.000	-.----	-.----	-.----	-.----	-.----	-.----	1.383	1.383		
558.000	-.----	-.----	-.----	-.----	-.----	-.----	1.587	1.587		
559.000	-.----	-.----	-.----	-.----	-.----	-.----	1.792	1.792		
560.000	-.----	-.----	351.542	355.555	35.842	35.842	1.999	1.999		
565.000	-.----	-.----	-.----	-.----	-.----	-.----	3.043	3.043		
570.000	-.----	-.----	357.789	362.637	39.677	39.677	4.110	4.110		
575.000	-.----	-.----	-.----	-.----	-.----	-.----	5.196	5.196		
580.000	-.----	-.----	363.828	369.577	43.493	43.493	6.300	6.300		
585.000	-.----	-.----	-.----	-.----	-.----	-.----	7.421	7.421		
590.000	-.----	-.----	369.666	376.382	47.284	47.284	8.558	8.558		
595.000	-.----	-.----	-.----	-.----	-.----	-.----	9.710	9.710		
600.000	1134.777	1317.092	375.313	383.057	51.047	51.047	10.874	10.874		
605.000	-.----	-.----	-.----	-.----	-.----	-.----	12.051	12.051		
610.000	-.----	-.----	-.----	-.----	54.777	54.777	13.238	13.238		
615.000	-.----	-.----	-.----	-.----	-.----	-.----	14.436	14.436		
620.000	-.----	-.----	-.----	-.----	58.472	58.472	15.643	15.643		
630.000	-.----	-.----	-.----	-.----	62.128	62.128	18.080	18.080		
640.000	-.----	-.----	-.----	-.----	65.743	65.743	20.543	20.543		
650.000	1147.227	1364.574	400.929	414.669	69.316	69.316	23.025	23.025		
660.000	-.----	-.----	-.----	-.----	72.844	72.844	25.522	25.522		
670.000	-.----	-.----	-.----	-.----	76.326	76.326	28.029	28.029		
680.000	-.----	-.----	-.----	-.----	79.762	79.762	30.540	30.540		
690.000	-.----	-.----	-.----	-.----	83.149	83.149	33.053	33.053		
700.000	1156.610	1408.909	422.773	443.736	86.488	86.488	35.564	35.564		
710.000	-.----	-.----	-.----	-.----	89.778	89.778	38.068	38.068		
720.000	-.----	-.----	-.----	-.----	93.018	93.018	40.565	40.565		
730.000	-.----	-.----	-.----	-.----	96.209	96.209	43.050	43.050		
740.000	-.----	-.----	-.----	-.----	99.349	99.349	45.522	45.522		
750.000	1163.635	1450.620	441.504	470.685	102.440	102.440	47.979	47.979		
760.000	-.----	-.----	-.----	-.----	105.481	105.481	50.418	50.418		
770.000	-.----	-.----	-.----	-.----	108.472	108.472	52.839	52.839		
780.000	-.----	-.----	-.----	-.----	111.414	111.418	55.240	55.240		

Sn, Tin

A = 118.690

Z = 50

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.130		6.260		12.520		15.650			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
790.000	-.----	-.----	-.----	-.----	114.307	114.326	57.620	57.620		
800.000	1168.818	1490.095	457.643	495.842	117.151	117.197	59.978	59.978		
810.000	-.----	-.----	-.----	-.----	-.----	-.----	62.312	62.312		
820.000	-.----	-.----	-.----	-.----	-.----	-.----	64.622	64.622		
830.000	-.----	-.----	-.----	-.----	-.----	-.----	66.907	66.907		
840.000	-.----	-.----	-.----	-.----	-.----	-.----	69.166	69.166		
850.000	1172.547	1527.635	471.603	519.461	130.658	131.033	71.400	71.400		
860.000	-.----	-.----	-.----	-.----	-.----	-.----	73.608	73.608		
870.000	-.----	-.----	-.----	-.----	-.----	-.----	75.788	75.788		
880.000	-.----	-.----	-.----	-.----	-.----	-.----	77.942	77.942		
890.000	-.----	-.----	-.----	-.----	-.----	-.----	80.069	80.069		
900.000	1175.115	1563.475	483.721	541.744	143.028	144.075	82.168	82.168		
950.000	1176.751	1597.802	494.271	562.854	154.339	156.411	92.253	92.329		
1000.000	1177.632	1630.771	503.478	582.924	164.675	168.116	101.656	101.988		
1050.000	1177.900	1662.509	511.530	602.064	174.119	179.251	110.400	111.193		
1100.000	1177.667	1693.124	518.583	620.368	182.748	189.871	118.514	119.981		
1150.000	1177.024	1722.707	524.770	637.913	190.637	200.023	126.035	128.389		
1200.000	1176.046	1751.336	530.200	654.767	197.853	209.746	133.002	136.448		
1250.000	1174.793	1779.082	534.970	670.988	204.457	219.076	139.452	144.184		
1300.000	1173.317	1806.003	539.161	686.627	210.506	228.045	145.423	151.622		
1350.000	1171.658	1832.155	542.840	701.727	216.050	236.680	150.952	158.784		
1400.000	1169.851	1857.585	546.070	716.328	221.135	245.006	156.072	165.689		
1450.000	1167.926	1882.336	548.902	730.465	225.802	253.043	160.816	172.356		
1500.000	1165.905	1906.445	551.381	744.169	230.090	260.812	165.211	178.799		

Sb, Antimony

A = 121.750

Z = 51

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		2.740		5.480		10.960		13.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
134.320	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	15.064	15.064	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
136.000	36.804	36.804	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
137.000	58.022	58.022	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
138.000	78.736	78.736	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
139.000	98.963	98.963	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	118.718	118.718	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	210.937	210.937	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	293.418	293.418	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	367.550	367.550	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	434.477	434.477	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	495.147	495.147	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	550.355	550.355	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	600.769	600.769	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	646.954	646.954	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	689.394	689.394	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	728.501	728.501	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	764.632	764.632	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	798.093	798.093	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	858.048	858.048	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	910.129	910.129	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	955.703	955.703	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	995.842	995.842	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
245.140	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
246.000	-.----	-.----	2.757	2.757	-.----	-.----	-.----	-.----	-.----	-.----	
247.000	-.----	-.----	5.960	5.960	-.----	-.----	-.----	-.----	-.----	-.----	
248.000	-.----	-.----	9.137	9.137	-.----	-.----	-.----	-.----	-.----	-.----	
249.000	-.----	-.----	12.287	12.287	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	1031.399	1031.578	15.412	15.412	-.----	-.----	-.----	-.----	-.----	-.----	
255.000	-.----	-.----	30.657	30.657	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	1063.059	1064.637	45.310	45.310	-.----	-.----	-.----	-.----	-.----	-.----	
265.000	-.----	-.----	59.410	59.410	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	1091.380	1095.536	72.995	72.995	-.----	-.----	-.----	-.----	-.----	-.----	
275.000	-.----	-.----	86.097	86.097	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	1116.821	1124.531	98.745	98.745	-.----	-.----	-.----	-.----	-.----	-.----	

Sb, Antimony

A=121.750

Z=51

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d	
Displacement	T _s	2T _s	4T _s	5T _s							
Energy(eV)=	2.740	5.480	10.960	13.700							
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
285.000	----	----	110.968	110.968	----	----	----	----			
290.000	1139.761	1151.838	122.789	122.789	----	----	----	----			
295.000	----	----	134.230	134.230	----	----	----	----			
300.000	1160.517	1177.645	145.312	145.312	----	----	----	----			
310.000	1179.354	1202.111	166.473	166.473	----	----	----	----			
320.000	1196.499	1225.374	186.401	186.401	----	----	----	----			
330.000	1212.144	1247.555	205.212	205.212	----	----	----	----			
340.000	1226.454	1268.758	223.001	223.001	----	----	----	----			
350.000	1239.570	1289.074	239.853	239.853	----	----	----	----			
360.000	1251.615	1308.584	255.842	255.842	----	----	----	----			
370.000	1262.697	1327.359	271.034	271.034	----	----	----	----			
380.000	1272.909	1345.460	285.487	285.487	----	----	----	----			
390.000	1282.333	1362.943	299.253	299.253	----	----	----	----			
400.000	1291.042	1379.858	312.378	312.378	----	----	----	----			
410.000	1299.099	1396.249	324.904	324.904	----	----	----	----			
420.000	1306.562	1412.154	336.871	336.871	----	----	----	----			
428.350	----	----	----	----	0.000	0.000	----	----			
429.000	----	----	----	----	0.321	0.321	----	----			
430.000	1313.480	1427.610	348.311	348.313	0.821	0.821	----	----			
435.000	----	----	----	----	3.330	3.330	----	----			
440.000	1319.900	1442.648	359.258	359.358	5.855	5.855	----	----			
445.000	----	----	----	----	8.393	8.393	----	----			
450.000	1325.861	1457.296	369.739	370.079	10.942	10.942	----	----			
455.000	----	----	----	----	13.499	13.499	----	----			
460.000	1331.401	1471.581	379.783	380.497	16.063	16.063	----	----			
465.000	----	----	----	----	18.631	18.631	----	----			
470.000	1336.551	1485.526	389.412	390.629	21.201	21.201	----	----			
475.000	----	----	----	----	23.773	23.773	----	----			
480.000	1341.341	1499.152	398.651	400.492	26.343	26.343	----	----			
490.000	1345.799	1512.479	407.520	410.100	31.477	31.477	----	----			
500.000	1349.948	1525.523	416.038	419.468	36.591	36.591	----	----			
507.670	----	----	----	----	----	----	0.000	0.000			
508.000	----	----	----	----	----	----	0.089	0.089			
509.000	----	----	----	----	----	----	0.366	0.366			
510.000	----	----	424.223	428.609	41.676	41.676	0.645	0.645			

Sb, Antimony

A = 121.750

Z = 51

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	2.740		5.480		10.960		13.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
515.000	-.----	-.----	-.----	-.----	-.----	-.----	2.054	2.054		
520.000	-.----	-.----	432.094	437.534	46.724	46.724	3.489	3.489		
525.000	-.----	-.----	-.----	-.----	-.----	-.----	4.947	4.947		
530.000	-.----	-.----	439.664	446.254	51.730	51.730	6.428	6.428		
535.000	-.----	-.----	-.----	-.----	-.----	-.----	7.928	7.928		
540.000	-.----	-.----	446.949	454.779	56.686	56.686	9.446	9.446		
545.000	-.----	-.----	-.----	-.----	-.----	-.----	10.981	10.981		
550.000	1366.775	1587.041	453.963	463.120	61.587	61.587	12.530	12.530		
555.000	-.----	-.----	-.----	-.----	-.----	-.----	14.092	14.092		
560.000	-.----	-.----	460.718	471.285	66.430	66.430	15.667	15.667		
570.000	-.----	-.----	467.227	479.281	71.212	71.212	18.845	18.845		
580.000	-.----	-.----	473.501	487.118	75.928	75.928	22.056	22.056		
590.000	-.----	-.----	479.550	494.801	80.578	80.578	25.290	25.290		
600.000	1378.506	1643.449	485.384	502.338	85.158	85.158	28.539	28.539		
610.000	-.----	-.----	-.----	-.----	89.668	89.668	31.796	31.796		
620.000	-.----	-.----	-.----	-.----	94.106	94.106	35.055	35.055		
630.000	-.----	-.----	-.----	-.----	98.471	98.471	38.311	38.311		
640.000	-.----	-.----	-.----	-.----	102.764	102.764	41.559	41.559		
650.000	1386.557	1695.818	511.654	538.033	106.983	106.983	44.794	44.794		
660.000	-.----	-.----	-.----	-.----	111.128	111.128	48.012	48.012		
670.000	-.----	-.----	-.----	-.----	115.200	115.200	51.210	51.210		
680.000	-.----	-.----	-.----	-.----	119.199	119.199	54.386	54.386		
690.000	-.----	-.----	-.----	-.----	123.125	123.125	57.535	57.535		
700.000	1391.891	1744.894	533.778	570.861	126.980	126.980	60.658	60.658		
710.000	-.----	-.----	-.----	-.----	-.----	-.----	63.750	63.750		
720.000	-.----	-.----	-.----	-.----	-.----	-.----	66.811	66.811		
730.000	-.----	-.----	-.----	-.----	-.----	-.----	69.839	69.839		
740.000	-.----	-.----	-.----	-.----	-.----	-.----	72.832	72.832		
750.000	1395.182	1791.216	552.523	601.310	145.191	145.293	75.790	75.790		
760.000	-.----	-.----	-.----	-.----	-.----	-.----	78.712	78.712		
770.000	-.----	-.----	-.----	-.----	-.----	-.----	81.597	81.597		
780.000	-.----	-.----	-.----	-.----	-.----	-.----	84.445	84.445		
790.000	-.----	-.----	-.----	-.----	-.----	-.----	87.254	87.254		
800.000	1396.916	1835.186	568.486	629.750	161.721	162.355	90.025	90.025		
850.000	1397.453	1877.112	582.135	656.467	176.697	178.344	103.298	103.306		

Sb, Antimony

A = 121.750

Z = 51

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	2.740	5.480	10.960	13.700						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
900.000	1397.060	1917.234	593.844	681.689	190.256	193.390	115.604	115.789		
950.000	1395.942	1955.747	603.916	705.599	202.530	207.603	126.971	127.599		
1000.000	1394.256	1992.808	612.598	728.346	213.645	221.072	137.448	138.805		
1050.000	1392.125	2028.547	620.091	750.053	223.717	233.875	147.090	149.464		
1100.000	1389.647	2063.076	626.566	770.824	232.850	246.077	155.958	159.627		
1150.000	1386.899	2096.489	632.161	790.747	241.140	257.733	164.111	169.339		
1200.000	1383.943	2128.869	636.995	809.897	248.670	268.892	171.606	178.637		
1250.000	1380.830	2160.287	641.168	828.337	255.517	279.596	178.498	187.556		
1300.000	1377.600	2190.807	644.765	846.126	261.749	289.881	184.837	196.125		
1350.000	1374.285	2220.485	647.858	863.311	267.425	299.782	190.671	204.371		
1400.000	1370.911	2249.369	650.510	879.937	272.599	309.325	196.042	212.317		
1450.000	1367.501	2277.505	652.773	896.042	277.320	318.537	200.989	219.984		
1500.000	1364.071	2304.933	654.695	911.660	281.630	327.441	205.549	227.392		

Te, Tellurium

A = 127.600

Z = 52

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		2.040	4.080		8.160	10.200					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
107.310	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
108.000	32.360	32.360	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
109.000	78.444	78.444	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
110.000	123.040	123.040	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
115.000	325.807	325.807	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
120.000	499.601	499.601	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
125.000	649.679	649.679	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
130.000	780.150	780.150	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	894.270	894.270	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	994.640	994.640	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	1083.362	1083.362	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	1162.148	1162.148	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	1232.406	1232.406	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	1295.300	1295.300	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	1402.728	1402.728	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	1490.504	1490.504	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	1563.001	1563.001	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
198.580	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
199.000	-.----	-.----	2.814	2.814	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	1623.438	1623.478	9.526	9.526	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	-.----	-.----	41.806	41.806	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	1674.227	1676.565	72.113	72.113	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	-.----	-.----	100.638	100.638	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	1717.206	1724.767	127.547	127.547	-.----	-.----	-.----	-.----	-.----	-.----	
225.000	-.----	-.----	152.983	152.983	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	1753.795	1768.823	177.074	177.074	-.----	-.----	-.----	-.----	-.----	-.----	
235.000	-.----	-.----	199.932	199.932	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	1785.108	1809.336	221.656	221.656	-.----	-.----	-.----	-.----	-.----	-.----	
245.000	-.----	-.----	242.334	242.334	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	1812.025	1846.804	262.046	262.046	-.----	-.----	-.----	-.----	-.----	-.----	
255.000	-.----	-.----	280.861	280.861	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	1835.253	1881.638	298.843	298.843	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	1855.364	1914.182	332.531	332.531	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	1872.822	1944.724	363.505	363.505	-.----	-.----	-.----	-.----	-.----	-.----	
290.000	1888.010	1973.508	392.090	392.090	-.----	-.----	-.----	-.----	-.----	-.----	

Te, Tellurium

A = 127.600

Z = 52

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Displacement		T _s	2T _s		4T _s	5T _s					
Energy(eV)=		2.040	4.080		8.160	10.200					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
300.000	1901.247	2000.739	418.560	418.560	-.----	-.----	-.----	-.----			
310.000	1912.795	2026.595	443.145	443.145	-.----	-.----	-.----	-.----			
320.000	1922.878	2051.226	466.040	466.040	-.----	-.----	-.----	-.----			
330.000	1931.682	2074.762	487.414	487.414	-.----	-.----	-.----	-.----			
340.000	1939.367	2097.316	507.411	507.411	-.----	-.----	-.----	-.----			
350.000	1946.068	2118.985	526.158	526.158	-.----	-.----	-.----	-.----			
352.650	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----			
353.000	-.----	-.----	-.----	-.----	0.354	0.354	-.----	-.----			
354.000	-.----	-.----	-.----	-.----	1.376	1.376	-.----	-.----			
355.000	-.----	-.----	-.----	-.----	2.397	2.397	-.----	-.----			
356.000	-.----	-.----	-.----	-.----	3.415	3.415	-.----	-.----			
357.000	-.----	-.----	-.----	-.----	4.432	4.432	-.----	-.----			
358.000	-.----	-.----	-.----	-.----	5.448	5.448	-.----	-.----			
359.000	-.----	-.----	-.----	-.----	6.461	6.461	-.----	-.----			
360.000	1951.902	2139.853	543.764	543.860	7.473	7.473	-.----	-.----			
365.000	-.----	-.----	-.----	-.----	12.507	12.507	-.----	-.----			
370.000	1956.969	2159.997	560.327	560.846	17.498	17.498	-.----	-.----			
375.000	-.----	-.----	-.----	-.----	22.445	22.445	-.----	-.----			
380.000	1961.355	2179.479	575.933	577.184	27.347	27.347	-.----	-.----			
385.000	-.----	-.----	-.----	-.----	32.203	32.203	-.----	-.----			
390.000	1965.135	2198.359	590.658	592.922	37.013	37.013	-.----	-.----			
395.000	-.----	-.----	-.----	-.----	41.775	41.775	-.----	-.----			
400.000	1968.376	2216.686	604.570	608.106	46.491	46.491	-.----	-.----			
405.000	-.----	-.----	-.----	-.----	51.158	51.158	-.----	-.----			
410.000	-.----	-.----	617.730	622.774	55.778	55.778	-.----	-.----			
415.000	-.----	-.----	-.----	-.----	60.349	60.349	-.----	-.----			
420.000	-.----	-.----	630.192	636.964	64.871	64.871	-.----	-.----			
420.170	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
421.000	-.----	-.----	-.----	-.----	-.----	-.----	0.464	0.464			
422.000	-.----	-.----	-.----	-.----	-.----	-.----	1.028	1.028			
423.000	-.----	-.----	-.----	-.----	-.----	-.----	1.594	1.594			
424.000	-.----	-.----	-.----	-.----	-.----	-.----	2.159	2.159			
425.000	-.----	-.----	-.----	-.----	-.----	-.----	2.726	2.726			
426.000	-.----	-.----	-.----	-.----	-.----	-.----	3.293	3.293			
427.000	-.----	-.----	-.----	-.----	-.----	-.----	3.861	3.861			

Te, Tellurium

A = 127.600

Z = 52

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		2.040	4.080		8.160	10.200					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
428.000	-.----	-.----	-.----	-.----	-.----	-.----	4.429	4.429			
429.000	-.----	-.----	-.----	-.----	-.----	-.----	4.998	4.998			
430.000	-.----	-.----	642.006	650.709	73.768	73.768	5.567	5.567			
435.000	-.----	-.----	-.----	-.----	-.----	-.----	8.421	8.421			
440.000	-.----	-.----	653.217	664.036	82.470	82.470	11.286	11.286			
445.000	-.----	-.----	-.----	-.----	-.----	-.----	14.157	14.157			
450.000	1978.257	2301.446	663.866	676.974	90.975	90.975	17.035	17.035			
455.000	-.----	-.----	-.----	-.----	-.----	-.----	19.915	19.915			
460.000	-.----	-.----	673.989	689.548	99.285	99.285	22.796	22.796			
465.000	-.----	-.----	-.----	-.----	-.----	-.----	25.677	25.677			
470.000	-.----	-.----	683.621	701.778	107.402	107.402	28.555	28.555			
475.000	-.----	-.----	-.----	-.----	-.----	-.----	31.428	31.428			
480.000	-.----	-.----	692.791	713.687	115.326	115.326	34.296	34.296			
490.000	-.----	-.----	701.529	725.292	123.061	123.061	40.010	40.010			
500.000	1980.862	2377.424	709.860	736.612	130.608	130.608	45.685	45.685			
510.000	-.----	-.----	-.----	-.----	137.971	137.971	51.312	51.312			
520.000	-.----	-.----	-.----	-.----	145.154	145.154	56.886	56.886			
530.000	-.----	-.----	-.----	-.----	152.158	152.158	62.398	62.398			
540.000	-.----	-.----	-.----	-.----	158.989	158.989	67.845	67.845			
550.000	1979.032	2447.057	746.197	789.432	165.649	165.649	73.221	73.221			
560.000	-.----	-.----	-.----	-.----	172.143	172.143	78.523	78.523			
570.000	-.----	-.----	-.----	-.----	178.473	178.473	83.749	83.749			
580.000	-.----	-.----	-.----	-.----	184.644	184.644	88.894	88.894			
590.000	-.----	-.----	-.----	-.----	190.660	190.660	93.959	93.959			
600.000	1974.428	2511.863	775.299	837.030	196.524	196.524	98.940	98.940			
610.000	-.----	-.----	-.----	-.----	202.240	202.265	103.838	103.838			
620.000	-.----	-.----	-.----	-.----	207.812	207.900	108.652	108.652			
630.000	-.----	-.----	-.----	-.----	213.243	213.433	113.381	113.381			
640.000	-.----	-.----	-.----	-.----	218.538	218.868	118.024	118.024			
650.000	1968.065	2572.830	798.848	880.503	223.700	224.208	122.583	122.583			
660.000	-.----	-.----	-.----	-.----	228.732	229.456	127.058	127.058			
670.000	-.----	-.----	-.----	-.----	233.637	234.617	131.448	131.448			
680.000	-.----	-.----	-.----	-.----	238.420	239.692	135.755	135.755			
690.000	-.----	-.----	-.----	-.----	243.083	244.686	139.979	139.979			
700.000	1960.591	2630.637	818.052	920.631	247.630	249.600	144.122	144.122			

Tc, Tellurium

A = 127.600

Z = 52

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.040		4.080		8.160		10.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
750.000	1952.429	2685.765	833.802	957.989	268.728	273.071	163.643	163.861		
800.000	1943.862	2738.570	846.769	993.007	287.359	294.907	181.286	182.245		
850.000	1935.083	2789.323	857.471	1026.020	303.841	315.336	197.211	199.453		
900.000	1926.226	2838.235	866.312	1057.289	318.450	334.540	211.579	215.631		
950.000	1917.382	2885.478	873.609	1087.024	331.422	352.667	224.544	230.899		
1000.000	1908.619	2931.192	879.619	1115.396	342.962	369.840	236.249	245.358		
1050.000	1899.983	2975.497	884.549	1142.547	353.245	386.161	246.824	259.093		
1100.000	1891.504	3018.494	888.567	1168.595	362.422	401.718	256.386	272.174		
1150.000	1883.205	3060.270	891.813	1193.640	370.624	416.582	265.042	284.664		
1200.000	1875.098	3100.900	894.401	1217.767	377.964	430.818	272.883	296.615		
1250.000	1867.190	3140.451	896.429	1241.052	384.539	444.479	279.993	308.074		
1300.000	1859.485	3178.983	897.975	1263.559	390.436	457.612	286.447	319.082		
1350.000	1851.985	3216.549	899.109	1285.343	395.727	470.261	292.309	329.672		
1400.000	1844.688	3253.201	899.887	1306.455	400.480	482.460	297.639	339.878		
1450.000	1837.594	3288.984	900.360	1326.939	404.750	494.243	302.487	349.727		
1500.000	1830.699	3323.939	900.569	1346.836	408.588	505.638	306.902	359.243		

I, Iodine

A=126.904

Z=53

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s 1.110		$2T_s$ 2.220		$4T_s$ 4.440		$5T_s$ 5.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
60.580	0.000	0.000	----	----	----	----	----	----	----	----
61.000	122.949	122.949	----	----	----	----	----	----	----	----
62.000	403.550	403.550	----	----	----	----	----	----	----	----
63.000	666.433	666.433	----	----	----	----	----	----	----	----
64.000	912.951	912.951	----	----	----	----	----	----	----	----
65.000	1144.334	1144.334	----	----	----	----	----	----	----	----
66.000	1361.700	1361.700	----	----	----	----	----	----	----	----
67.000	1566.070	1566.070	----	----	----	----	----	----	----	----
68.000	1758.374	1758.374	----	----	----	----	----	----	----	----
69.000	1939.463	1939.463	----	----	----	----	----	----	----	----
70.000	2110.117	2110.117	----	----	----	----	----	----	----	----
75.000	2829.911	2829.911	----	----	----	----	----	----	----	----
80.000	3374.760	3374.760	----	----	----	----	----	----	----	----
85.000	3792.292	3792.292	----	----	----	----	----	----	----	----
90.000	4115.330	4115.330	----	----	----	----	----	----	----	----
95.000	4367.039	4367.039	----	----	----	----	----	----	----	----
100.000	4564.117	4564.117	----	----	----	----	----	----	----	----
105.000	4718.818	4718.818	----	----	----	----	----	----	----	----
110.000	4840.285	4840.285	----	----	----	----	----	----	----	----
115.000	4935.437	4935.437	----	----	----	----	----	----	----	----
115.330	----	----	0.000	0.000	----	----	----	----	----	----
116.000	----	----	26.776	26.776	----	----	----	----	----	----
117.000	----	----	65.789	65.789	----	----	----	----	----	----
118.000	----	----	103.648	103.648	----	----	----	----	----	----
119.000	----	----	140.400	140.400	----	----	----	----	----	----
120.000	5009.577	5013.441	176.088	176.088	----	----	----	----	----	----
125.000	----	----	339.942	339.942	----	----	----	----	----	----
130.000	5110.378	5142.548	482.616	482.616	----	----	----	----	----	----
135.000	----	----	607.655	607.655	----	----	----	----	----	----
140.000	5166.133	5244.044	717.883	717.883	----	----	----	----	----	----
145.000	----	----	815.573	815.573	----	----	----	----	----	----
150.000	5191.688	5325.151	902.575	902.575	----	----	----	----	----	----
155.000	----	----	980.404	980.404	----	----	----	----	----	----
160.000	5196.731	5391.002	1050.313	1050.313	----	----	----	----	----	----
165.000	----	----	1113.343	1113.343	----	----	----	----	----	----

I, Iodine

A = 126.904

Z = 53

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.110		2.220		4.440		5.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
170.000	5187.735	5445.312	1170.368	1170.368	-.----	-.----	-.----	-.----		
175.000	-.----	-.----	1222.127	1222.127	-.----	-.----	-.----	-.----		
180.000	5169.116	5490.805	1269.245	1269.245	-.----	-.----	-.----	-.----		
190.000	5143.936	5529.508	1351.617	1351.617	-.----	-.----	-.----	-.----		
200.000	5114.344	5562.946	1420.922	1420.922	-.----	-.----	-.----	-.----		
210.000	5081.868	5592.280	1479.736	1479.736	-.----	-.----	-.----	-.----		
212.500	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
213.000	-.----	-.----	-.----	-.----	2.850	2.850	-.----	-.----		
214.000	-.----	-.----	-.----	-.----	8.551	8.551	-.----	-.----		
215.000	-.----	-.----	-.----	-.----	14.187	14.187	-.----	-.----		
216.000	-.----	-.----	-.----	-.----	19.758	19.758	-.----	-.----		
217.000	-.----	-.----	-.----	-.----	25.267	25.267	-.----	-.----		
218.000	-.----	-.----	-.----	-.----	30.715	30.715	-.----	-.----		
219.000	-.----	-.----	-.----	-.----	36.101	36.101	-.----	-.----		
220.000	5047.601	5618.398	1530.021	1530.861	41.429	41.429	-.----	-.----		
225.000	-.----	-.----	-.----	-.----	67.214	67.214	-.----	-.----		
230.000	5012.328	5641.989	1573.299	1577.527	91.670	91.670	-.----	-.----		
235.000	-.----	-.----	-.----	-.----	114.910	114.910	-.----	-.----		
240.000	4976.617	5663.590	1610.760	1620.455	137.031	137.031	-.----	-.----		
245.000	-.----	-.----	-.----	-.----	158.122	158.122	-.----	-.----		
250.000	4940.877	5683.621	1643.352	1660.157	178.260	178.260	-.----	-.----		
255.000	-.----	-.----	-.----	-.----	197.515	197.515	-.----	-.----		
256.490	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
257.000	-.----	-.----	-.----	-.----	-.----	-.----	1.585	1.585		
258.000	-.----	-.----	-.----	-.----	-.----	-.----	4.683	4.683		
259.000	-.----	-.----	-.----	-.----	-.----	-.----	7.759	7.759		
260.000	4905.403	5702.412	1671.834	1697.060	215.949	215.949	10.811	10.811		
265.000	-.----	-.----	-.----	-.----	233.618	233.618	25.744	25.744		
270.000	4870.403	5720.228	1696.823	1731.521	250.573	250.573	40.156	40.156		
275.000	-.----	-.----	-.----	-.----	266.859	266.859	54.080	54.080		
280.000	4836.026	5737.275	1718.823	1763.840	282.517	282.517	67.545	67.545		
285.000	-.----	-.----	-.----	-.----	-.----	-.----	80.579	80.579		
290.000	4802.372	5753.722	1738.251	1794.272	312.101	312.101	93.206	93.206		
295.000	-.----	-.----	-.----	-.----	-.----	-.----	105.448	105.448		
300.000	4769.509	5769.699	1755.452	1823.034	339.589	339.589	117.325	117.325		

I, Iodine

A = 126.904

Z = 53

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T_d	
	T_s 1.110	$2T_s$ 2.220	$4T_s$ 4.440	$5T_s$ 5.550						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
305.000	-----	-----	-----	-----	-----	-----	128.855	128.855		
310.000	4737.478	5785.316	1770.715	1850.311	365.203	365.203	140.055	140.055		
315.000	-----	-----	-----	-----	-----	-----	150.941	150.941		
320.000	4706.300	5800.655	1784.286	1876.262	389.134	389.134	161.528	161.528		
330.000	4675.984	5815.787	1796.369	1901.026	411.544	411.544	181.854	181.854		
340.000	4646.528	5830.766	1807.143	1924.722	432.575	432.575	201.128	201.128		
350.000	4617.922	5845.636	1816.757	1947.453	452.347	452.347	219.433	219.433		
360.000	4590.151	5860.432	1825.342	1969.310	470.969	470.969	236.842	236.842		
370.000	4563.195	5875.182	1833.011	1990.373	488.536	488.536	253.420	253.420		
380.000	4537.032	5889.907	1839.860	2010.712	505.130	505.160	269.223	269.223		
390.000	4511.639	5904.626	1845.976	2030.388	520.827	521.127	284.304	284.304		
400.000	4486.990	5919.351	1851.433	2049.457	535.693	536.527	298.708	298.708		
410.000	-----	-----	-----	-----	549.788	551.398	312.478	312.478		
420.000	-----	-----	-----	-----	563.167	565.779	325.652	325.652		
430.000	-----	-----	-----	-----	575.878	579.701	338.265	338.265		
440.000	-----	-----	-----	-----	587.965	593.196	350.349	350.349		
450.000	4374.032	5993.342	1870.869	2137.220	599.470	606.290	361.934	361.943		
460.000	-----	-----	-----	-----	610.429	619.008	373.047	373.172		
470.000	-----	-----	-----	-----	620.875	631.373	383.714	384.087		
480.000	-----	-----	-----	-----	630.841	643.406	393.956	394.707		
490.000	-----	-----	-----	-----	640.354	655.127	403.798	405.048		
500.000	4276.003	6068.199	1881.028	2215.271	649.440	666.552	413.258	415.124		
510.000	-----	-----	-----	-----	-----	-----	422.356	424.950		
520.000	-----	-----	-----	-----	-----	-----	431.109	434.539		
530.000	-----	-----	-----	-----	-----	-----	439.533	443.903		
540.000	-----	-----	-----	-----	-----	-----	447.646	453.053		
550.000	4190.244	6143.838	1885.279	2286.295	689.270	719.781	455.460	461.999		
560.000	-----	-----	-----	-----	-----	-----	462.990	470.752		
570.000	-----	-----	-----	-----	-----	-----	470.248	479.320		
580.000	-----	-----	-----	-----	-----	-----	477.247	487.712		
590.000	-----	-----	-----	-----	-----	-----	483.998	495.936		
600.000	4114.587	6219.959	1885.643	2351.980	721.428	767.613	490.512	503.998		
650.000	4047.313	6296.235	1883.394	2413.438	747.650	811.181	519.862	542.121		
700.000	3987.057	6372.365	1879.361	2471.436	769.195	851.294	544.603	577.093		
750.000	3932.730	6448.097	1874.104	2526.523	787.001	888.547	565.573	609.454		

I, Iodine

A = 126.904

Z = 53

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	1.110		2.220		4.440		5.550			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
800.000	3883.451	6523.223	1868.011	2579.102	801.778	923.390	583.430	639.612		
850.000	3838.506	6597.576	1861.354	2629.484	814.078	956.169	598.693	667.886		
900.000	3797.310	6671.032	1854.328	2677.909	824.334	987.157	611.779	694.527		
950.000	3759.384	6743.499	1847.074	2724.572	832.889	1016.574	623.026	719.738		
1000.000	3724.334	6814.915	1839.697	2769.632	840.020	1044.598	632.710	743.684		
1050.000	3691.829	6885.240	1832.273	2813.221	845.952	1071.376	641.060	766.502		
1100.000	3661.594	6954.452	1824.862	2855.455	850.867	1097.031	648.264	788.306		
1150.000	3633.391	7022.537	1817.504	2896.429	854.918	1121.668	654.480	809.194		
1200.000	3607.014	7089.489	1810.232	2936.228	858.232	1145.375	659.841	829.247		
1250.000	3582.284	7155.310	1803.068	2974.926	860.914	1168.229	664.461	848.537		
1300.000	3559.044	7220.004	1796.027	3012.588	863.052	1190.297	668.434	867.127		
1350.000	3537.155	7283.578	1789.121	3049.272	864.722	1211.638	671.842	885.069		
1400.000	3516.494	7346.046	1782.357	3085.031	865.988	1232.302	674.755	902.411		
1450.000	3496.954	7407.422	1775.741	3119.913	866.904	1252.336	677.234	919.197		
1500.000	3478.439	7467.724	1769.276	3153.963	867.516	1271.781	679.330	935.463		

Ba, Barium

A = 137.340

Z = 56

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s		4T _s		5T _s				
Energy(eV)=	1.840	3.680		7.360		9.200				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
104.450	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
105.000	35.406	35.406	-.----	-.----	-.----	-.----	-.----	-.----		
106.000	98.026	98.026	-.----	-.----	-.----	-.----	-.----	-.----		
107.000	158.520	158.520	-.----	-.----	-.----	-.----	-.----	-.----		
108.000	216.983	216.983	-.----	-.----	-.----	-.----	-.----	-.----		
109.000	273.504	273.504	-.----	-.----	-.----	-.----	-.----	-.----		
110.000	328.169	328.169	-.----	-.----	-.----	-.----	-.----	-.----		
115.000	576.301	576.301	-.----	-.----	-.----	-.----	-.----	-.----		
120.000	788.404	788.404	-.----	-.----	-.----	-.----	-.----	-.----		
125.000	971.092	971.092	-.----	-.----	-.----	-.----	-.----	-.----		
130.000	1129.524	1129.524	-.----	-.----	-.----	-.----	-.----	-.----		
135.000	1267.767	1267.767	-.----	-.----	-.----	-.----	-.----	-.----		
140.000	1389.063	1389.063	-.----	-.----	-.----	-.----	-.----	-.----		
145.000	1496.025	1496.025	-.----	-.----	-.----	-.----	-.----	-.----		
150.000	1590.779	1590.779	-.----	-.----	-.----	-.----	-.----	-.----		
155.000	1675.065	1675.065	-.----	-.----	-.----	-.----	-.----	-.----		
160.000	1750.324	1750.324	-.----	-.----	-.----	-.----	-.----	-.----		
170.000	1878.362	1878.362	-.----	-.----	-.----	-.----	-.----	-.----		
180.000	1982.371	1982.371	-.----	-.----	-.----	-.----	-.----	-.----		
190.000	2067.729	2067.729	-.----	-.----	-.----	-.----	-.----	-.----		
193.580	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
194.000	-.----	-.----	3.836	3.836	-.----	-.----	-.----	-.----		
195.000	-.----	-.----	12.907	12.907	-.----	-.----	-.----	-.----		
196.000	-.----	-.----	21.854	21.854	-.----	-.----	-.----	-.----		
197.000	-.----	-.----	30.678	30.678	-.----	-.----	-.----	-.----		
198.000	-.----	-.----	39.384	39.384	-.----	-.----	-.----	-.----		
199.000	-.----	-.----	47.973	47.973	-.----	-.----	-.----	-.----		
200.000	2138.385	2139.451	56.447	56.447	-.----	-.----	-.----	-.----		
205.000	-.----	-.----	97.192	97.192	-.----	-.----	-.----	-.----		
210.000	2197.297	2203.670	135.422	135.422	-.----	-.----	-.----	-.----		
215.000	-.----	-.----	171.382	171.382	-.----	-.----	-.----	-.----		
220.000	2246.715	2261.877	205.281	205.281	-.----	-.----	-.----	-.----		
225.000	-.----	-.----	237.305	237.305	-.----	-.----	-.----	-.----		
230.000	2288.380	2314.984	267.615	267.615	-.----	-.----	-.----	-.----		
235.000	-.----	-.----	296.354	296.354	-.----	-.----	-.----	-.----		

Ba, Barium

A = 137.340

Z = 56

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.840		3.680		7.360		9.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
240.000	2323.653	2363.735	323.648	323.648	-.----	-.----	-.----	-.----		
245.000	-.----	-.----	349.609	349.609	-.----	-.----	-.----	-.----		
250.000	2353.612	2408.747	374.337	374.337	-.----	-.----	-.----	-.----		
255.000	-.----	-.----	397.922	397.922	-.----	-.----	-.----	-.----		
260.000	2379.121	2450.527	420.443	420.443	-.----	-.----	-.----	-.----		
270.000	2400.877	2489.501	462.580	462.580	-.----	-.----	-.----	-.----		
280.000	2419.449	2526.025	501.250	501.250	-.----	-.----	-.----	-.----		
290.000	2435.305	2560.399	536.868	536.868	-.----	-.----	-.----	-.----		
300.000	2448.831	2592.878	569.782	569.782	-.----	-.----	-.----	-.----		
310.000	2460.350	2623.681	600.283	600.283	-.----	-.----	-.----	-.----		
320.000	2470.132	2652.993	628.623	628.623	-.----	-.----	-.----	-.----		
330.000	2478.407	2680.974	655.016	655.016	-.----	-.----	-.----	-.----		
340.000	2485.366	2707.763	679.647	679.647	-.----	-.----	-.----	-.----		
344.420	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
345.000	-.----	-.----	-.----	-.----	0.797	0.797	-.----	-.----		
346.000	-.----	-.----	-.----	-.----	2.175	2.175	-.----	-.----		
347.000	-.----	-.----	-.----	-.----	3.549	3.549	-.----	-.----		
348.000	-.----	-.----	-.----	-.----	4.921	4.921	-.----	-.----		
349.000	-.----	-.----	-.----	-.----	6.291	6.291	-.----	-.----		
350.000	2491.175	2733.479	702.678	702.755	7.658	7.658	-.----	-.----		
355.000	-.----	-.----	-.----	-.----	14.455	14.455	-.----	-.----		
360.000	2495.975	2758.227	724.251	724.828	21.188	21.188	-.----	-.----		
365.000	-.----	-.----	-.----	-.----	27.855	27.855	-.----	-.----		
370.000	2499.888	2782.099	744.489	745.997	34.455	34.455	-.----	-.----		
375.000	-.----	-.----	-.----	-.----	40.988	40.988	-.----	-.----		
380.000	2503.017	2805.174	763.504	766.333	47.452	47.452	-.----	-.----		
385.000	-.----	-.----	-.----	-.----	53.848	53.848	-.----	-.----		
390.000	2505.454	2827.523	781.394	785.900	60.174	60.174	-.----	-.----		
395.000	-.----	-.----	-.----	-.----	66.430	66.430	-.----	-.----		
400.000	2507.278	2849.207	798.246	804.755	72.616	72.616	-.----	-.----		
410.000	-.----	-.----	814.140	822.950	84.776	84.776	-.----	-.----		
410.630	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
411.000	-.----	-.----	-.----	-.----	-.----	-.----	0.281	0.281		
412.000	-.----	-.----	-.----	-.----	-.----	-.----	1.041	1.041		
413.000	-.----	-.----	-.----	-.----	-.----	-.----	1.802	1.802		

Ba, Barium

A = 137.340

Z = 56

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=	1.840	3.680			7.360	9.200				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
414.000	-.----	-.----	-.----	-.----	-.----	-.----	2.563	2.563		
415.000	-.----	-.----	-.----	-.----	-.----	-.----	3.326	3.326		
416.000	-.----	-.----	-.----	-.----	-.----	-.----	4.089	4.089		
417.000	-.----	-.----	-.----	-.----	-.----	-.----	4.853	4.853		
418.000	-.----	-.----	-.----	-.----	-.----	-.----	5.617	5.617		
419.000	-.----	-.----	-.----	-.----	-.----	-.----	6.383	6.383		
420.000	-.----	-.----	829.144	840.532	96.652	96.652	7.149	7.149		
425.000	-.----	-.----	-.----	-.----	-.----	-.----	10.987	10.987		
430.000	-.----	-.----	843.324	857.542	108.244	108.244	14.838	14.838		
435.000	-.----	-.----	-.----	-.----	-.----	-.----	18.696	18.696		
440.000	-.----	-.----	856.738	874.020	119.554	119.554	22.559	22.559		
445.000	-.----	-.----	-.----	-.----	-.----	-.----	26.425	26.425		
450.000	2509.332	2949.388	869.437	890.001	130.583	130.583	30.289	30.289		
455.000	-.----	-.----	-.----	-.----	-.----	-.----	34.149	34.149		
460.000	-.----	-.----	881.470	905.515	141.333	141.333	38.004	38.004		
465.000	-.----	-.----	-.----	-.----	-.----	-.----	41.850	41.850		
470.000	-.----	-.----	892.880	920.592	151.809	151.809	45.686	45.686		
475.000	-.----	-.----	-.----	-.----	-.----	-.----	49.510	49.510		
480.000	-.----	-.----	903.707	935.259	162.014	162.014	53.319	53.319		
490.000	-.----	-.----	913.988	949.539	171.953	171.953	60.890	60.890		
500.000	2503.498	3039.093	923.756	963.455	181.630	181.630	68.386	68.386		
510.000	-.----	-.----	-.----	-.----	191.051	191.051	75.798	75.798		
520.000	-.----	-.----	-.----	-.----	200.220	200.220	83.117	83.117		
530.000	-.----	-.----	-.----	-.----	209.144	209.144	90.337	90.337		
540.000	-.----	-.----	-.----	-.----	217.828	217.828	97.451	97.451		
550.000	2493.125	3121.280	965.913	1028.239	226.278	226.278	104.456	104.456		
560.000	-.----	-.----	-.----	-.----	234.500	234.500	111.348	111.348		
570.000	-.----	-.----	-.----	-.----	242.498	242.498	118.123	118.123		
580.000	-.----	-.----	-.----	-.----	250.280	250.280	124.781	124.781		
590.000	-.----	-.----	-.----	-.----	257.851	257.856	131.318	131.318		
600.000	2480.133	3197.772	999.032	1086.410	265.216	265.270	137.734	137.734		
610.000	-.----	-.----	-.----	-.----	272.382	272.537	144.029	144.029		
620.000	-.----	-.----	-.----	-.----	279.353	279.661	150.202	150.202		
630.000	-.----	-.----	-.----	-.----	286.135	286.650	156.255	156.255		
640.000	-.----	-.----	-.----	-.----	292.734	293.507	162.186	162.186		

Ba, Barium

A = 137.340

Z = 56

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.840		3.680		7.360		9.200			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
650.000	2465.671	3269.756	1025.277	1139.378	299.155	300.239	167.998	167.998		
660.000	-----	-----	-----	-----	305.402	306.848	173.691	173.691		
670.000	-----	-----	-----	-----	311.480	313.341	179.266	179.266		
680.000	-----	-----	-----	-----	317.396	319.722	184.724	184.724		
690.000	-----	-----	-----	-----	323.153	325.993	190.069	190.069		
700.000	2450.448	3338.037	1046.194	1188.147	328.755	332.160	195.299	195.318		
750.000	2434.910	3403.187	1062.917	1233.449	354.608	361.540	219.819	220.337		
800.000	2419.345	3465.623	1076.297	1275.836	377.228	388.771	241.788	243.535		
850.000	2403.934	3525.662	1086.984	1315.731	397.054	414.159	261.452	265.161		
900.000	2388.798	3583.551	1095.481	1353.468	414.465	437.951	279.050	285.419		
950.000	2374.012	3639.490	1102.184	1389.310	429.782	460.349	294.802	304.474		
1000.000	2359.621	3693.643	1107.408	1423.474	443.279	481.515	308.912	322.466		
1050.000	2345.654	3746.149	1111.406	1456.138	455.189	501.586	321.559	339.509		
1100.000	2332.122	3797.123	1114.382	1487.450	465.713	520.677	332.905	355.701		
1150.000	2319.028	3846.665	1116.504	1517.535	475.023	538.886	343.092	371.127		
1200.000	2306.368	3894.864	1117.910	1546.501	483.265	556.294	352.247	385.856		
1250.000	2294.132	3941.796	1118.712	1574.439	490.567	572.975	360.480	399.953		
1300.000	2282.311	3987.531	1119.006	1601.429	497.040	588.988	367.891	413.469		
1350.000	2270.890	4032.132	1118.872	1627.542	502.778	604.390	374.564	426.453		
1400.000	2259.859	4075.657	1118.375	1652.840	507.864	619.227	380.577	438.947		
1450.000	2249.203	4118.160	1117.573	1677.376	512.372	633.542	385.998	450.986		
1500.000	2238.911	4159.690	1116.512	1701.202	516.364	647.372	390.885	462.604		

La, Lanthanum

A = 138.906

Z = 57

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$					T_d
Energy(eV)=		4.335	8.670		17.340	21.675					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
224.850	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
225.000	0.882	0.882	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
226.000	6.815	6.815	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
227.000	12.687	12.687	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
228.000	18.500	18.500	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
229.000	24.254	24.254	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	29.951	29.951	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
235.000	57.606	57.606	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	83.966	83.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
245.000	109.133	109.133	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	133.198	133.198	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
255.000	156.242	156.242	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	178.337	178.337	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
265.000	199.547	199.547	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	219.931	219.931	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
275.000	239.541	239.541	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	258.424	258.424	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
290.000	294.176	294.176	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
300.000	327.488	327.488	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
310.000	358.611	358.611	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
320.000	387.761	387.761	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
330.000	415.120	415.120	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
340.000	440.848	440.848	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
350.000	465.082	465.082	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
360.000	487.946	487.946	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
370.000	509.546	509.546	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
380.000	529.979	529.979	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
390.000	549.329	549.329	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
395.550	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
396.000	-.----	-.----	0.410	0.410	-.----	-.----	-.----	-.----	-.----	-.----	
397.000	-.----	-.----	1.321	1.321	-.----	-.----	-.----	-.----	-.----	-.----	
398.000	-.----	-.----	2.233	2.233	-.----	-.----	-.----	-.----	-.----	-.----	
399.000	-.----	-.----	3.145	3.145	-.----	-.----	-.----	-.----	-.----	-.----	
400.000	567.675	567.704	4.058	4.058	-.----	-.----	-.----	-.----	-.----	-.----	
405.000	-.----	-.----	8.628	8.628	-.----	-.----	-.----	-.----	-.----	-.----	

La, Lanthanum

A=138.906

Z=57

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->					T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	4.335		8.670		17.340		21.675			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
410.000	585.085	585.383	13.205	13.205	-.---	-.---	-.---	-.---		
415.000	-.---	-.---	17.785	17.785	-.---	-.---	-.---	-.---		
420.000	601.623	602.457	22.363	22.363	-.---	-.---	-.---	-.---		
425.000	-.---	-.---	26.937	26.937	-.---	-.---	-.---	-.---		
430.000	617.346	618.966	31.504	31.504	-.---	-.---	-.---	-.---		
435.000	-.---	-.---	36.060	36.060	-.---	-.---	-.---	-.---		
440.000	632.305	634.948	40.603	40.603	-.---	-.---	-.---	-.---		
445.000	-.---	-.---	45.131	45.131	-.---	-.---	-.---	-.---		
450.000	646.549	650.435	49.641	49.641	-.---	-.---	-.---	-.---		
455.000	-.---	-.---	54.130	54.130	-.---	-.---	-.---	-.---		
460.000	660.121	665.459	58.598	58.598	-.---	-.---	-.---	-.---		
470.000	673.062	680.047	67.461	67.461	-.---	-.---	-.---	-.---		
480.000	685.408	694.225	76.217	76.217	-.---	-.---	-.---	-.---		
490.000	697.194	708.018	84.856	84.856	-.---	-.---	-.---	-.---		
500.000	708.452	721.446	93.369	93.369	-.---	-.---	-.---	-.---		
510.000	-.---	-.---	101.748	101.748	-.---	-.---	-.---	-.---		
520.000	-.---	-.---	109.989	109.989	-.---	-.---	-.---	-.---		
530.000	-.---	-.---	118.087	118.087	-.---	-.---	-.---	-.---		
540.000	-.---	-.---	126.038	126.038	-.---	-.---	-.---	-.---		
550.000	757.766	783.777	133.841	133.841	-.---	-.---	-.---	-.---		
560.000	-.---	-.---	141.494	141.494	-.---	-.---	-.---	-.---		
570.000	-.---	-.---	148.995	148.995	-.---	-.---	-.---	-.---		
580.000	-.---	-.---	156.345	156.345	-.---	-.---	-.---	-.---		
590.000	-.---	-.---	163.543	163.543	-.---	-.---	-.---	-.---		
600.000	797.497	839.459	170.591	170.591	-.---	-.---	-.---	-.---		
610.000	-.---	-.---	177.489	177.489	-.---	-.---	-.---	-.---		
620.000	-.---	-.---	184.238	184.238	-.---	-.---	-.---	-.---		
630.000	-.---	-.---	190.840	190.840	-.---	-.---	-.---	-.---		
640.000	-.---	-.---	197.298	197.298	-.---	-.---	-.---	-.---		
650.000	829.782	889.902	203.612	203.612	-.---	-.---	-.---	-.---		
660.000	-.---	-.---	209.785	209.785	-.---	-.---	-.---	-.---		
664.810	-.---	-.---	-.---	-.---	0.000	0.000	-.---	-.---		
665.000	-.---	-.---	-.---	-.---	0.027	0.027	-.---	-.---		
666.000	-.---	-.---	-.---	-.---	0.175	0.175	-.---	-.---		
667.000	-.---	-.---	-.---	-.---	0.324	0.324	-.---	-.---		

La, Lanthanum

A = 138.906

Z = 57

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	4.335		8.670		17.340		21.675			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
668.000	-.----	-.----	-.----	-.----	0.474	0.474	-.----	-.----		
669.000	-.----	-.----	-.----	-.----	0.626	0.626	-.----	-.----		
670.000	-.----	-.----	215.819	215.823	0.778	0.778	-.----	-.----		
675.000	-.----	-.----	-.----	-.----	1.561	1.561	-.----	-.----		
680.000	-.----	-.----	221.717	221.753	2.374	2.374	-.----	-.----		
685.000	-.----	-.----	-.----	-.----	3.215	3.215	-.----	-.----		
690.000	-.----	-.----	227.481	227.582	4.083	4.083	-.----	-.----		
695.000	-.----	-.----	-.----	-.----	4.976	4.976	-.----	-.----		
700.000	856.189	936.112	233.113	233.312	5.893	5.893	-.----	-.----		
705.000	-.----	-.----	-.----	-.----	6.833	6.833	-.----	-.----		
710.000	-.----	-.----	-.----	-.----	7.793	7.793	-.----	-.----		
715.000	-.----	-.----	-.----	-.----	8.774	8.774	-.----	-.----		
720.000	-.----	-.----	-.----	-.----	9.773	9.773	-.----	-.----		
730.000	-.----	-.----	-.----	-.----	11.823	11.823	-.----	-.----		
740.000	-.----	-.----	-.----	-.----	13.934	13.934	-.----	-.----		
750.000	877.893	978.834	259.394	260.603	16.099	16.099	-.----	-.----		
760.000	-.----	-.----	-.----	-.----	18.311	18.311	-.----	-.----		
770.000	-.----	-.----	-.----	-.----	20.562	20.562	-.----	-.----		
778.530	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
779.000	-.----	-.----	-.----	-.----	-.----	-.----	0.039	0.039		
780.000	-.----	-.----	-.----	-.----	22.848	22.848	0.122	0.122		
785.000	-.----	-.----	-.----	-.----	-.----	-.----	0.552	0.552		
790.000	-.----	-.----	-.----	-.----	25.161	25.161	1.005	1.005		
795.000	-.----	-.----	-.----	-.----	-.----	-.----	1.480	1.480		
800.000	895.791	1018.628	282.774	285.873	27.499	27.499	1.975	1.975		
805.000	-.----	-.----	-.----	-.----	-.----	-.----	2.491	2.491		
810.000	-.----	-.----	-.----	-.----	29.855	29.855	3.025	3.025		
815.000	-.----	-.----	-.----	-.----	-.----	-.----	3.578	3.578		
820.000	-.----	-.----	-.----	-.----	32.225	32.225	4.148	4.148		
825.000	-.----	-.----	-.----	-.----	-.----	-.----	4.734	4.734		
830.000	-.----	-.----	-.----	-.----	34.607	34.607	5.336	5.336		
835.000	-.----	-.----	-.----	-.----	-.----	-.----	5.953	5.953		
840.000	-.----	-.----	-.----	-.----	36.995	36.995	6.583	6.583		
850.000	910.580	1055.926	303.570	309.405	39.388	39.388	7.885	7.885		
860.000	-.----	-.----	-.----	-.----	41.781	41.781	9.234	9.234		

La, Lanthanum

A = 138.906

Z = 57

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	4.335		8.670		17.340		21.675			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
870.000	-.----	-.----	-.----	-.----	44.174	44.174	10.627	10.627		
880.000	-.----	-.----	-.----	-.----	46.562	46.562	12.059	12.059		
890.000	-.----	-.----	-.----	-.----	48.944	48.944	13.526	13.526		
900.000	922.807	1091.069	322.071	331.426	51.317	51.317	15.024	15.024		
910.000	-.----	-.----	-.----	-.----	53.681	53.681	16.548	16.548		
920.000	-.----	-.----	-.----	-.----	56.033	56.033	18.097	18.097		
930.000	-.----	-.----	-.----	-.----	58.372	58.372	19.666	19.666		
940.000	-.----	-.----	-.----	-.----	60.697	60.697	21.253	21.253		
950.000	932.909	1124.328	338.543	352.124	63.006	63.006	22.856	22.856		
960.000	-.----	-.----	-.----	-.----	65.297	65.297	24.471	24.471		
970.000	-.----	-.----	-.----	-.----	67.572	67.572	26.096	26.096		
980.000	-.----	-.----	-.----	-.----	69.827	69.827	27.730	27.730		
990.000	-.----	-.----	-.----	-.----	72.063	72.063	29.370	29.370		
1000.000	941.236	1155.925	353.219	371.654	74.279	74.279	31.014	31.014		
1010.000	-.----	-.----	-.----	-.----	-.----	-.----	32.662	32.662		
1020.000	-.----	-.----	-.----	-.----	-.----	-.----	34.310	34.310		
1030.000	-.----	-.----	-.----	-.----	-.----	-.----	35.959	35.959		
1040.000	-.----	-.----	-.----	-.----	-.----	-.----	37.606	37.606		
1050.000	948.073	1186.041	366.309	390.144	85.038	85.038	39.250	39.250		
1060.000	-.----	-.----	-.----	-.----	-.----	-.----	40.891	40.891		
1070.000	-.----	-.----	-.----	-.----	-.----	-.----	42.527	42.527		
1080.000	-.----	-.----	-.----	-.----	-.----	-.----	44.157	44.157		
1090.000	-.----	-.----	-.----	-.----	-.----	-.----	45.780	45.780		
1100.000	953.652	1214.829	377.994	407.703	95.229	95.245	47.396	47.396		
1150.000	958.167	1242.415	388.436	424.424	104.831	104.972	55.341	55.341		
1200.000	961.776	1268.911	397.773	440.385	113.843	114.265	63.012	63.012		
1250.000	964.613	1294.408	406.129	455.655	122.280	123.158	70.365	70.366		
1300.000	966.789	1318.990	413.613	470.294	130.161	131.679	77.377	77.419		
1350.000	968.399	1342.725	420.318	484.353	137.512	139.858	84.036	84.199		
1400.000	969.522	1365.678	426.327	497.878	144.363	147.719	90.341	90.724		
1450.000	970.226	1387.902	431.715	510.911	150.742	155.283	96.298	97.009		
1500.000	970.569	1409.447	436.545	523.485	156.680	162.572	101.914	103.071		

Ce, Cerium

A = 140.120

Z = 58

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.380		8.760		17.520		21.900			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
228.500	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
229.000	2.966	2.966	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	8.889	8.889	-.----	-.----	-.----	-.----	-.----	-.----		
235.000	37.648	37.648	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	65.069	65.069	-.----	-.----	-.----	-.----	-.----	-.----		
245.000	91.259	91.259	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	116.313	116.313	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	140.314	140.314	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	163.338	163.338	-.----	-.----	-.----	-.----	-.----	-.----		
265.000	185.450	185.450	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	206.710	206.710	-.----	-.----	-.----	-.----	-.----	-.----		
275.000	227.172	227.172	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	246.884	246.884	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	284.232	284.232	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	319.062	319.062	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	351.631	351.631	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	382.158	382.158	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	410.832	410.832	-.----	-.----	-.----	-.----	-.----	-.----		
340.000	437.814	437.814	-.----	-.----	-.----	-.----	-.----	-.----		
350.000	463.246	463.246	-.----	-.----	-.----	-.----	-.----	-.----		
360.000	487.254	487.254	-.----	-.----	-.----	-.----	-.----	-.----		
370.000	509.947	509.947	-.----	-.----	-.----	-.----	-.----	-.----		
380.000	531.423	531.423	-.----	-.----	-.----	-.----	-.----	-.----		
390.000	551.771	551.771	-.----	-.----	-.----	-.----	-.----	-.----		
400.000	571.071	571.071	-.----	-.----	-.----	-.----	-.----	-.----		
401.470	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
402.000	-.----	-.----	0.482	0.482	-.----	-.----	-.----	-.----		
403.000	-.----	-.----	1.397	1.397	-.----	-.----	-.----	-.----		
404.000	-.----	-.----	2.312	2.312	-.----	-.----	-.----	-.----		
405.000	-.----	-.----	3.229	3.229	-.----	-.----	-.----	-.----		
406.000	-.----	-.----	4.145	4.145	-.----	-.----	-.----	-.----		
407.000	-.----	-.----	5.063	5.063	-.----	-.----	-.----	-.----		
408.000	-.----	-.----	5.981	5.981	-.----	-.----	-.----	-.----		
409.000	-.----	-.----	6.900	6.900	-.----	-.----	-.----	-.----		
410.000	589.393	589.497	7.819	7.819	-.----	-.----	-.----	-.----		

Ce, Cerium

A=140.120

Z=58

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	4.380		8.760		17.520		21.900			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
415.000	-.----	-.----	12.424	12.424	-.----	-.----	-.----	-.----		
420.000	606.802	607.283	17.038	17.038	-.----	-.----	-.----	-.----		
425.000	-.----	-.----	21.657	21.657	-.----	-.----	-.----	-.----		
430.000	623.357	624.476	26.277	26.277	-.----	-.----	-.----	-.----		
435.000	-.----	-.----	30.896	30.896	-.----	-.----	-.----	-.----		
440.000	639.113	641.114	35.508	35.508	-.----	-.----	-.----	-.----		
445.000	-.----	-.----	40.112	40.112	-.----	-.----	-.----	-.----		
450.000	654.119	657.231	44.705	44.705	-.----	-.----	-.----	-.----		
455.000	-.----	-.----	49.284	49.284	-.----	-.----	-.----	-.----		
460.000	668.419	672.861	53.847	53.847	-.----	-.----	-.----	-.----		
470.000	682.057	688.033	62.914	62.914	-.----	-.----	-.----	-.----		
480.000	695.069	702.774	71.891	71.891	-.----	-.----	-.----	-.----		
490.000	707.493	717.109	80.766	80.766	-.----	-.----	-.----	-.----		
500.000	719.361	731.060	89.526	89.526	-.----	-.----	-.----	-.----		
510.000	-.----	-.----	98.164	98.164	-.----	-.----	-.----	-.----		
520.000	-.----	-.----	106.670	106.670	-.----	-.----	-.----	-.----		
530.000	-.----	-.----	115.040	115.040	-.----	-.----	-.----	-.----		
540.000	-.----	-.----	123.268	123.268	-.----	-.----	-.----	-.----		
550.000	771.353	795.757	131.351	131.351	-.----	-.----	-.----	-.----		
560.000	-.----	-.----	139.286	139.286	-.----	-.----	-.----	-.----		
570.000	-.----	-.----	147.071	147.071	-.----	-.----	-.----	-.----		
580.000	-.----	-.----	154.705	154.705	-.----	-.----	-.----	-.----		
590.000	-.----	-.----	162.187	162.187	-.----	-.----	-.----	-.----		
600.000	813.238	853.462	169.517	169.517	-.----	-.----	-.----	-.----		
610.000	-.----	-.----	176.696	176.696	-.----	-.----	-.----	-.----		
620.000	-.----	-.----	183.724	183.724	-.----	-.----	-.----	-.----		
630.000	-.----	-.----	190.603	190.603	-.----	-.----	-.----	-.----		
640.000	-.----	-.----	197.334	197.334	-.----	-.----	-.----	-.----		
650.000	847.257	905.659	203.918	203.918	-.----	-.----	-.----	-.----		
660.000	-.----	-.----	210.358	210.358	-.----	-.----	-.----	-.----		
670.000	-.----	-.----	216.655	216.655	-.----	-.----	-.----	-.----		
673.940	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
674.000	-.----	-.----	-.----	-.----	0.009	0.009	-.----	-.----		
675.000	-.----	-.----	-.----	-.----	0.157	0.157	-.----	-.----		
676.000	-.----	-.----	-.----	-.----	0.306	0.306	-.----	-.----		

Ce, Cerium

A = 140.120

Z = 58

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.380		8.760		17.520		21.900			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
677.000	-.----	-.----	-.----	-.----	0.457	0.457	-.----	-.----		
678.000	-.----	-.----	-.----	-.----	0.609	0.609	-.----	-.----		
679.000	-.----	-.----	-.----	-.----	0.763	0.763	-.----	-.----		
680.000	-.----	-.----	222.812	222.817	0.918	0.918	-.----	-.----		
685.000	-.----	-.----	-.----	-.----	1.712	1.712	-.----	-.----		
690.000	-.----	-.----	228.831	228.871	2.536	2.536	-.----	-.----		
695.000	-.----	-.----	-.----	-.----	3.390	3.390	-.----	-.----		
700.000	875.063	953.412	234.714	234.821	4.272	4.272	-.----	-.----		
705.000	-.----	-.----	-.----	-.----	5.180	5.180	-.----	-.----		
710.000	-.----	-.----	-.----	-.----	6.112	6.112	-.----	-.----		
715.000	-.----	-.----	-.----	-.----	7.068	7.068	-.----	-.----		
720.000	-.----	-.----	-.----	-.----	8.046	8.046	-.----	-.----		
725.000	-.----	-.----	-.----	-.----	9.044	9.044	-.----	-.----		
730.000	-.----	-.----	-.----	-.----	10.062	10.062	-.----	-.----		
735.000	-.----	-.----	-.----	-.----	11.098	11.098	-.----	-.----		
740.000	-.----	-.----	-.----	-.----	12.151	12.151	-.----	-.----		
750.000	897.894	997.506	262.181	263.142	14.304	14.304	-.----	-.----		
760.000	-.----	-.----	-.----	-.----	16.513	16.513	-.----	-.----		
770.000	-.----	-.----	-.----	-.----	18.771	18.771	-.----	-.----		
780.000	-.----	-.----	-.----	-.----	21.070	21.070	-.----	-.----		
788.930	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
789.000	-.----	-.----	-.----	-.----	-.----	-.----	0.006	0.006		
790.000	-.----	-.----	-.----	-.----	23.406	23.406	0.089	0.089		
795.000	-.----	-.----	-.----	-.----	-.----	-.----	0.520	0.520		
800.000	916.700	1038.532	286.636	289.337	25.771	25.771	0.974	0.974		
805.000	-.----	-.----	-.----	-.----	-.----	-.----	1.451	1.451		
810.000	-.----	-.----	-.----	-.----	28.161	28.161	1.950	1.950		
815.000	-.----	-.----	-.----	-.----	-.----	-.----	2.470	2.470		
820.000	-.----	-.----	-.----	-.----	30.571	30.571	3.010	3.010		
825.000	-.----	-.----	-.----	-.----	-.----	-.----	3.568	3.568		
830.000	-.----	-.----	-.----	-.----	32.997	32.997	4.144	4.144		
835.000	-.----	-.----	-.----	-.----	-.----	-.----	4.738	4.738		
840.000	-.----	-.----	-.----	-.----	35.435	35.435	5.347	5.347		
850.000	932.216	1076.945	308.395	313.705	37.881	37.881	6.612	6.612		
860.000	-.----	-.----	-.----	-.----	40.331	40.331	7.934	7.934		

Ce, Cerium

A = 140.120

Z = 58

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	4.380		8.760		17.520		21.900			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
870.000	----	----	----	----	42.784	42.784	9.306	9.306		
880.000	----	----	----	----	45.235	45.235	10.724	10.724		
890.000	----	----	----	----	47.683	47.683	12.182	12.182		
900.000	945.023	1113.105	327.756	336.488	50.125	50.125	13.678	13.678		
910.000	----	----	----	----	52.559	52.559	15.205	15.205		
920.000	----	----	----	----	54.983	54.983	16.762	16.762		
930.000	----	----	----	----	57.396	57.396	18.343	18.343		
940.000	----	----	----	----	59.796	59.796	19.947	19.947		
950.000	955.583	1147.298	344.991	357.883	62.182	62.182	21.570	21.570		
960.000	----	----	----	----	64.551	64.551	23.209	23.209		
970.000	----	----	----	----	66.904	66.904	24.862	24.862		
980.000	----	----	----	----	69.239	69.239	26.526	26.526		
990.000	----	----	----	----	71.555	71.555	28.199	28.199		
1000.000	964.269	1179.758	360.345	378.053	73.851	73.851	29.879	29.879		
1010.000	----	----	----	----	----	----	31.564	31.564		
1020.000	----	----	----	----	----	----	33.253	33.253		
1030.000	----	----	----	----	----	----	34.944	34.944		
1040.000	----	----	----	----	----	----	36.635	36.635		
1050.000	971.381	1210.674	374.032	397.134	85.014	85.014	38.324	38.324		
1060.000	----	----	----	----	----	----	40.012	40.012		
1070.000	----	----	----	----	----	----	41.696	41.696		
1080.000	----	----	----	----	----	----	43.375	43.375		
1090.000	----	----	----	----	----	----	45.049	45.049		
1100.000	977.167	1240.209	386.245	415.241	95.607	95.612	46.717	46.717		
1150.000	981.830	1268.495	397.151	432.471	105.601	105.695	54.929	54.929		
1200.000	985.539	1295.647	406.896	448.908	114.990	115.321	62.877	62.877		
1250.000	988.435	1321.765	415.612	464.624	123.785	124.526	70.511	70.511		
1300.000	990.637	1346.932	423.410	479.682	132.004	133.342	77.799	77.822		
1350.000	992.244	1371.223	430.390	494.135	139.673	141.799	84.729	84.845		
1400.000	993.340	1394.704	436.640	508.033	146.820	149.921	91.294	91.600		
1450.000	993.998	1417.433	442.237	521.417	153.476	157.733	97.500	98.104		
1500.000	994.278	1439.459	447.248	534.326	159.671	165.256	103.354	104.373		

Pr, Praeseodymium

A = 140.908

Z = 59

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	3.689		7.378		14.756		18.445			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
198.320	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
199.000	6.738	6.738	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	16.572	16.572	-.----	-.----	-.----	-.----	-.----	-.----		
205.000	63.854	63.854	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	108.216	108.216	-.----	-.----	-.----	-.----	-.----	-.----		
215.000	149.947	149.947	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	189.295	189.295	-.----	-.----	-.----	-.----	-.----	-.----		
225.000	226.475	226.475	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	261.676	261.676	-.----	-.----	-.----	-.----	-.----	-.----		
235.000	295.064	295.064	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	326.785	326.785	-.----	-.----	-.----	-.----	-.----	-.----		
245.000	356.969	356.969	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	385.731	385.731	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	413.175	413.175	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	439.392	439.392	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	488.472	488.472	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	533.548	533.548	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	575.094	575.094	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	613.507	613.507	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	649.122	649.122	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	682.225	682.225	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	713.062	713.062	-.----	-.----	-.----	-.----	-.----	-.----		
340.000	741.845	741.845	-.----	-.----	-.----	-.----	-.----	-.----		
350.000	768.759	768.759	-.----	-.----	-.----	-.----	-.----	-.----		
352.220	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
353.000	-.----	-.----	1.168	1.168	-.----	-.----	-.----	-.----		
354.000	-.----	-.----	2.670	2.670	-.----	-.----	-.----	-.----		
355.000	-.----	-.----	4.170	4.170	-.----	-.----	-.----	-.----		
356.000	-.----	-.----	5.668	5.668	-.----	-.----	-.----	-.----		
357.000	-.----	-.----	7.163	7.163	-.----	-.----	-.----	-.----		
358.000	-.----	-.----	8.657	8.657	-.----	-.----	-.----	-.----		
359.000	-.----	-.----	10.149	10.149	-.----	-.----	-.----	-.----		
360.000	793.967	794.126	11.638	11.638	-.----	-.----	-.----	-.----		
365.000	-.----	-.----	19.054	19.054	-.----	-.----	-.----	-.----		
370.000	817.614	818.416	26.415	26.415	-.----	-.----	-.----	-.----		

Pr, Praeseodymium

A = 140.908

Z = 59

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.689		7.378		14.756		18.445			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
375.000	----	----	33.718	33.718	----	----	----	----		
380.000	839.825	841.726	40.961	40.961	----	----	----	----		
385.000	----	----	48.142	48.142	----	----	----	----		
390.000	860.715	864.131	55.259	55.259	----	----	----	----		
395.000	----	----	62.310	62.310	----	----	----	----		
400.000	880.386	885.698	69.295	69.295	----	----	----	----		
405.000	----	----	76.211	76.211	----	----	----	----		
410.000	898.928	906.489	83.058	83.058	----	----	----	----		
415.000	----	----	89.834	89.834	----	----	----	----		
420.000	916.423	926.559	96.539	96.539	----	----	----	----		
430.000	932.946	945.956	109.732	109.732	----	----	----	----		
440.000	948.565	964.727	122.631	122.631	----	----	----	----		
450.000	963.341	982.912	135.236	135.236	----	----	----	----		
460.000	977.329	1000.549	147.544	147.544	----	----	----	----		
470.000	990.581	1017.672	159.556	159.556	----	----	----	----		
480.000	1003.145	1034.312	171.272	171.272	----	----	----	----		
490.000	1015.062	1050.499	182.696	182.696	----	----	----	----		
500.000	1026.372	1066.258	193.831	193.831	----	----	----	----		
510.000	----	----	204.680	204.680	----	----	----	----		
520.000	----	----	215.247	215.247	----	----	----	----		
530.000	----	----	225.538	225.538	----	----	----	----		
540.000	----	----	235.557	235.557	----	----	----	----		
550.000	1075.016	1139.422	245.310	245.310	----	----	----	----		
560.000	----	----	254.802	254.802	----	----	----	----		
570.000	----	----	264.040	264.040	----	----	----	----		
580.000	----	----	273.029	273.029	----	----	----	----		
590.000	----	----	281.775	281.775	----	----	----	----		
597.680	----	----	----	----	0.000	0.000	----	----		
598.000	----	----	----	----	0.076	0.076	----	----		
599.000	----	----	----	----	0.317	0.317	----	----		
600.000	1112.966	1204.840	290.284	290.286	0.560	0.560	----	----		
605.000	----	----	----	----	1.801	1.801	----	----		
610.000	----	----	298.563	298.605	3.083	3.083	----	----		
615.000	----	----	----	----	4.405	4.405	----	----		
620.000	----	----	306.616	306.755	5.763	5.763	----	----		

Pr, Praeseodymium

A = 140.908

Z = 59

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		3.689		7.378		14.756		18.445			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
625.000	-.----	-.----	-.----	-.----	7.155	7.155	-.----	-.----			
630.000	-.----	-.----	314.450	314.743	8.578	8.578	-.----	-.----			
635.000	-.----	-.----	-.----	-.----	10.032	10.032	-.----	-.----			
640.000	-.----	-.----	322.071	322.575	11.512	11.512	-.----	-.----			
645.000	-.----	-.----	-.----	-.----	13.019	13.019	-.----	-.----			
650.000	1142.791	1264.183	329.485	330.258	14.549	14.549	-.----	-.----			
655.000	-.----	-.----	-.----	-.----	16.101	16.101	-.----	-.----			
660.000	-.----	-.----	336.697	337.797	17.673	17.673	-.----	-.----			
670.000	-.----	-.----	343.712	345.197	20.872	20.872	-.----	-.----			
680.000	-.----	-.----	350.537	352.463	24.135	24.135	-.----	-.----			
690.000	-.----	-.----	357.177	359.601	27.449	27.449	-.----	-.----			
700.000	1166.332	1318.636	363.637	366.614	30.806	30.806	-.----	-.----			
701.920	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
702.000	-.----	-.----	-.----	-.----	-.----	-.----	0.010	0.010			
703.000	-.----	-.----	-.----	-.----	-.----	-.----	0.144	0.144			
704.000	-.----	-.----	-.----	-.----	-.----	-.----	0.281	0.281			
705.000	-.----	-.----	-.----	-.----	-.----	-.----	0.418	0.418			
706.000	-.----	-.----	-.----	-.----	-.----	-.----	0.557	0.557			
707.000	-.----	-.----	-.----	-.----	-.----	-.----	0.697	0.697			
708.000	-.----	-.----	-.----	-.----	-.----	-.----	0.839	0.839			
709.000	-.----	-.----	-.----	-.----	-.----	-.----	0.982	0.982			
710.000	-.----	-.----	-.----	-.----	34.197	34.197	1.126	1.126			
715.000	-.----	-.----	-.----	-.----	-.----	-.----	1.865	1.865			
720.000	-.----	-.----	-.----	-.----	37.613	37.613	2.634	2.634			
725.000	-.----	-.----	-.----	-.----	-.----	-.----	3.432	3.432			
730.000	-.----	-.----	-.----	-.----	41.049	41.049	4.256	4.256			
735.000	-.----	-.----	-.----	-.----	-.----	-.----	5.107	5.107			
740.000	-.----	-.----	-.----	-.----	44.496	44.496	5.981	5.981			
745.000	-.----	-.----	-.----	-.----	-.----	-.----	6.878	6.878			
750.000	1184.939	1369.069	393.407	399.960	47.949	47.949	7.797	7.797			
755.000	-.----	-.----	-.----	-.----	-.----	-.----	8.736	8.736			
760.000	-.----	-.----	-.----	-.----	51.404	51.404	9.695	9.695			
770.000	-.----	-.----	-.----	-.----	54.855	54.855	11.665	11.665			
780.000	-.----	-.----	-.----	-.----	58.298	58.298	13.700	13.700			
790.000	-.----	-.----	-.----	-.----	61.728	61.728	15.791	15.791			

Pr, Praeseodymium

A = 140.908

Z = 59

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->											
Displacement	T _s		2T _s		4T _s		5T _s			T _d	
Energy(eV)=	3.689		7.378		14.756		18.445				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
800.000	1199.627	1416.130	419.386	430.768	65.144	65.144	17.931	17.931			
810.000	-----	-----	-----	-----	68.541	68.541	20.115	20.115			
820.000	-----	-----	-----	-----	71.917	71.917	22.335	22.335			
830.000	-----	-----	-----	-----	75.269	75.269	24.587	24.587			
840.000	-----	-----	-----	-----	78.596	78.596	26.866	26.866			
850.000	1211.171	1460.322	442.089	459.407	81.894	81.894	29.167	29.167			
860.000	-----	-----	-----	-----	85.163	85.163	31.485	31.485			
870.000	-----	-----	-----	-----	88.402	88.402	33.818	33.818			
880.000	-----	-----	-----	-----	91.607	91.607	36.161	36.161			
890.000	-----	-----	-----	-----	94.779	94.779	38.511	38.511			
900.000	1220.169	1502.034	461.957	486.174	97.917	97.917	40.866	40.866			
910.000	-----	-----	-----	-----	-----	-----	43.222	43.222			
920.000	-----	-----	-----	-----	-----	-----	45.577	45.577			
930.000	-----	-----	-----	-----	-----	-----	47.928	47.928			
940.000	-----	-----	-----	-----	-----	-----	50.275	50.275			
950.000	1227.091	1541.578	479.369	511.308	113.061	113.061	52.614	52.614			
960.000	-----	-----	-----	-----	-----	-----	54.944	54.944			
970.000	-----	-----	-----	-----	-----	-----	57.263	57.263			
980.000	-----	-----	-----	-----	-----	-----	59.570	59.570			
990.000	-----	-----	-----	-----	-----	-----	61.864	61.864			
1000.000	1232.311	1579.209	494.649	535.006	127.260	127.288	64.144	64.144			
1050.000	1236.126	1615.133	508.073	557.430	140.498	140.739	75.290	75.290			
1100.000	1238.780	1649.525	519.879	578.718	152.794	153.500	85.953	85.953			
1150.000	1240.468	1682.529	530.268	598.984	164.183	165.633	96.077	96.087			
1200.000	1241.352	1714.270	539.417	618.328	174.713	177.193	105.639	105.750			
1250.000	1241.564	1744.854	547.475	636.833	184.436	188.230	114.635	114.986			
1300.000	1241.214	1774.375	554.573	654.574	193.407	198.786	123.072	123.829			
1350.000	1240.396	1802.912	560.823	671.614	201.678	208.900	130.970	132.307			
1400.000	1239.184	1830.538	566.323	688.009	209.303	218.605	138.351	140.446			
1450.000	1237.645	1857.314	571.158	703.808	216.330	227.932	145.241	148.270			
1500.000	1235.833	1883.297	575.403	719.056	222.806	236.909	151.667	155.802			

Nd, Neodymium

A = 144.240

Z = 60

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d
Displacement		T _s	2T _s		4T _s	5T _s				
Energy(eV)=		3.325	6.650		13.300	16.625				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	
185.000	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
186.000	13.079	13.079	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
187.000	25.966	25.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
188.000	38.659	38.659	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
189.000	51.164	51.164	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
190.000	63.484	63.484	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
195.000	122.470	122.470	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
200.000	177.445	177.445	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
205.000	228.827	228.827	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
210.000	276.979	276.979	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
215.000	322.212	322.212	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
220.000	364.797	364.797	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
225.000	404.971	404.971	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
230.000	442.940	442.940	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
235.000	478.888	478.888	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
240.000	512.977	512.977	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
250.000	576.138	576.138	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
260.000	633.401	633.401	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
270.000	685.555	685.555	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
280.000	733.249	733.249	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
290.000	777.017	777.017	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
300.000	817.309	817.309	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
310.000	854.504	854.504	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
320.000	888.924	888.924	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
330.000	920.850	920.850	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
330.250	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
331.000	-.----	-.----	1.467	1.467	-.----	-.----	-.----	-.----	-.----	-.----
332.000	-.----	-.----	3.432	3.432	-.----	-.----	-.----	-.----	-.----	-.----
333.000	-.----	-.----	5.393	5.393	-.----	-.----	-.----	-.----	-.----	-.----
334.000	-.----	-.----	7.349	7.349	-.----	-.----	-.----	-.----	-.----	-.----
335.000	-.----	-.----	9.300	9.300	-.----	-.----	-.----	-.----	-.----	-.----
336.000	-.----	-.----	11.246	11.246	-.----	-.----	-.----	-.----	-.----	-.----
337.000	-.----	-.----	13.187	13.187	-.----	-.----	-.----	-.----	-.----	-.----
338.000	-.----	-.----	15.124	15.124	-.----	-.----	-.----	-.----	-.----	-.----
339.000	-.----	-.----	17.056	17.056	-.----	-.----	-.----	-.----	-.----	-.----
340.000	950.520	950.860	18.983	18.983	-.----	-.----	-.----	-.----	-.----	-.----

Nd, Neodymium

A = 144.240

Z = 60

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.325		6.650		13.300		16.625			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
345.000	-.----	-.----	28.547	28.547	-.----	-.----	-.----	-.----	-.----	
350.000	978.146	979.493	37.993	37.993	-.----	-.----	-.----	-.----	-.----	
355.000	-.----	-.----	47.320	47.320	-.----	-.----	-.----	-.----	-.----	
360.000	1003.911	1006.864	56.529	56.529	-.----	-.----	-.----	-.----	-.----	
365.000	-.----	-.----	65.619	65.619	-.----	-.----	-.----	-.----	-.----	
370.000	1027.976	1033.078	74.591	74.591	-.----	-.----	-.----	-.----	-.----	
375.000	-.----	-.----	83.446	83.446	-.----	-.----	-.----	-.----	-.----	
380.000	1050.486	1058.227	92.183	92.183	-.----	-.----	-.----	-.----	-.----	
385.000	-.----	-.----	100.804	100.804	-.----	-.----	-.----	-.----	-.----	
390.000	1071.568	1082.394	109.307	109.307	-.----	-.----	-.----	-.----	-.----	
395.000	-.----	-.----	117.695	117.695	-.----	-.----	-.----	-.----	-.----	
400.000	1091.336	1105.654	125.968	125.968	-.----	-.----	-.----	-.----	-.----	
410.000	1109.892	1128.073	142.169	142.169	-.----	-.----	-.----	-.----	-.----	
420.000	1127.327	1149.712	157.919	157.919	-.----	-.----	-.----	-.----	-.----	
430.000	1143.725	1170.626	173.222	173.222	-.----	-.----	-.----	-.----	-.----	
440.000	1159.160	1190.864	188.088	188.088	-.----	-.----	-.----	-.----	-.----	
450.000	1173.701	1210.472	202.525	202.525	-.----	-.----	-.----	-.----	-.----	
460.000	1187.409	1229.490	216.541	216.541	-.----	-.----	-.----	-.----	-.----	
470.000	1200.341	1247.955	230.146	230.146	-.----	-.----	-.----	-.----	-.----	
480.000	1212.548	1265.902	243.350	243.350	-.----	-.----	-.----	-.----	-.----	
490.000	1224.078	1283.362	256.163	256.163	-.----	-.----	-.----	-.----	-.----	
500.000	1234.973	1300.364	268.594	268.594	-.----	-.----	-.----	-.----	-.----	
510.000	-.----	-.----	280.654	280.654	-.----	-.----	-.----	-.----	-.----	
520.000	-.----	-.----	292.353	292.353	-.----	-.----	-.----	-.----	-.----	
530.000	-.----	-.----	303.702	303.702	-.----	-.----	-.----	-.----	-.----	
540.000	-.----	-.----	314.710	314.710	-.----	-.----	-.----	-.----	-.----	
550.000	1281.228	1379.347	325.387	325.387	-.----	-.----	-.----	-.----	-.----	
560.000	-.----	-.----	335.744	335.744	-.----	-.----	-.----	-.----	-.----	
563.380	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	
564.000	-.----	-.----	-.----	-.----	0.194	0.194	-.----	-.----	-.----	
565.000	-.----	-.----	-.----	-.----	0.508	0.508	-.----	-.----	-.----	
566.000	-.----	-.----	-.----	-.----	0.825	0.825	-.----	-.----	-.----	
567.000	-.----	-.----	-.----	-.----	1.143	1.143	-.----	-.----	-.----	
568.000	-.----	-.----	-.----	-.----	1.464	1.464	-.----	-.----	-.----	
569.000	-.----	-.----	-.----	-.----	1.787	1.787	-.----	-.----	-.----	
570.000	-.----	-.----	345.790	345.806	2.111	2.111	-.----	-.----	-.----	

Nd, Neodymium

A = 144.240

Z = 60

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 3.325		2T _s 6.650		4T _s 13.300		5T _s 16.625			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
575.000	-----	-----	-----	-----	3.762	3.762	-----	-----		
580.000	-----	-----	355.534	355.638	5.458	5.458	-----	-----		
585.000	-----	-----	-----	-----	7.195	7.195	-----	-----		
590.000	-----	-----	364.986	365.254	8.970	8.970	-----	-----		
595.000	-----	-----	-----	-----	10.781	10.781	-----	-----		
600.000	1316.471	1450.055	374.155	374.663	12.625	12.625	-----	-----		
605.000	-----	-----	-----	-----	14.499	14.499	-----	-----		
610.000	-----	-----	383.049	383.875	16.401	16.401	-----	-----		
615.000	-----	-----	-----	-----	18.329	18.329	-----	-----		
620.000	-----	-----	391.678	392.896	20.280	20.280	-----	-----		
630.000	-----	-----	400.050	401.735	24.245	24.245	-----	-----		
640.000	-----	-----	408.173	410.399	28.280	28.280	-----	-----		
650.000	1343.452	1514.288	416.054	418.895	32.372	32.372	-----	-----		
660.000	-----	-----	423.702	427.229	36.509	36.509	-----	-----		
662.700	-----	-----	-----	-----	-----	-----	0.000	0.000		
663.000	-----	-----	-----	-----	-----	-----	0.051	0.051		
664.000	-----	-----	-----	-----	-----	-----	0.227	0.227		
665.000	-----	-----	-----	-----	-----	-----	0.404	0.404		
666.000	-----	-----	-----	-----	-----	-----	0.583	0.583		
667.000	-----	-----	-----	-----	-----	-----	0.763	0.763		
668.000	-----	-----	-----	-----	-----	-----	0.945	0.945		
669.000	-----	-----	-----	-----	-----	-----	1.129	1.129		
670.000	-----	-----	431.124	435.408	40.679	40.679	1.314	1.314		
675.000	-----	-----	-----	-----	-----	-----	2.262	2.262		
680.000	-----	-----	438.327	443.438	44.872	44.872	3.245	3.245		
685.000	-----	-----	-----	-----	-----	-----	4.263	4.263		
690.000	-----	-----	445.318	451.323	49.080	49.080	5.312	5.312		
695.000	-----	-----	-----	-----	-----	-----	6.391	6.391		
700.000	1364.118	1573.318	452.104	459.069	53.295	53.295	7.498	7.498		
705.000	-----	-----	-----	-----	-----	-----	8.632	8.632		
710.000	-----	-----	-----	-----	57.509	57.509	9.791	9.791		
715.000	-----	-----	-----	-----	-----	-----	10.974	10.974		
720.000	-----	-----	-----	-----	61.716	61.716	12.178	12.178		
730.000	-----	-----	-----	-----	65.910	65.910	14.647	14.647		
740.000	-----	-----	-----	-----	70.087	70.087	17.188	17.188		
750.000	1379.886	1628.071	483.179	495.883	74.241	74.241	19.792	19.792		

Nd, Neodymium

A = 144.240

Z = 60

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		3.325	6.650		13.300	16.625					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
760.000	----	----	----	----	78.369	78.369	22.449	22.449			
770.000	----	----	----	----	82.467	82.467	25.152	25.152			
780.000	----	----	----	----	86.532	86.532	27.894	27.894			
790.000	----	----	----	----	90.561	90.561	30.668	30.668			
800.000	1391.807	1679.240	510.017	529.871	94.552	94.552	33.467	33.467			
810.000	----	----	----	----	98.503	98.503	36.286	36.286			
820.000	----	----	----	----	102.411	102.411	39.121	39.121			
830.000	----	----	----	----	106.275	106.275	41.967	41.967			
840.000	----	----	----	----	110.095	110.095	44.819	44.819			
850.000	1400.678	1727.356	533.241	561.452	113.867	113.867	47.673	47.673			
860.000	----	----	----	----	117.593	117.593	50.527	50.527			
870.000	----	----	----	----	121.270	121.270	53.376	53.376			
880.000	----	----	----	----	124.899	124.899	56.219	56.219			
890.000	----	----	----	----	128.478	128.478	59.052	59.052			
900.000	1407.108	1772.833	553.373	590.960	132.007	132.007	61.874	61.874			
910.000	----	----	----	----	----	----	64.681	64.681			
920.000	----	----	----	----	----	----	67.473	67.473			
930.000	----	----	----	----	----	----	70.247	70.247			
940.000	----	----	----	----	----	----	73.001	73.001			
950.000	1411.574	1816.002	570.852	618.665	148.903	148.945	75.735	75.735			
960.000	----	----	----	----	----	----	78.447	78.447			
970.000	----	----	----	----	----	----	81.136	81.136			
980.000	----	----	----	----	----	----	83.801	83.801			
990.000	----	----	----	----	----	----	86.442	86.442			
1000.000	1414.448	1857.131	586.048	644.785	164.554	164.887	89.056	89.056			
1050.000	1416.027	1896.439	599.271	669.502	178.995	179.947	101.723	101.723			
1100.000	1416.551	1934.109	610.787	692.969	192.286	194.214	113.679	113.702			
1150.000	1416.211	1970.295	620.819	715.312	204.498	207.763	124.903	125.089			
1200.000	1415.163	2005.127	629.558	736.642	215.705	220.660	135.402	135.937			
1250.000	1413.536	2038.720	637.168	757.052	225.983	232.961	145.195	146.292			
1300.000	1411.436	2071.169	643.789	776.623	235.405	244.717	154.311	156.193			
1350.000	1408.948	2102.561	649.543	795.425	244.039	255.974	162.785	165.676			
1400.000	1406.146	2132.972	654.533	813.519	251.952	266.770	170.653	174.771			
1450.000	1403.090	2162.467	658.849	830.961	259.203	277.140	177.955	183.507			
1500.000	1399.830	2191.107	662.572	847.798	265.848	287.117	184.726	191.910			

Sm, Samarium

A = 150.350

Z = 62

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	2.140		4.280		8.560		10.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
130.030	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
131.000	42.916	42.916	-.----	-.----	-.----	-.----	-.----	-.----		
132.000	86.175	86.175	-.----	-.----	-.----	-.----	-.----	-.----		
133.000	128.308	128.308	-.----	-.----	-.----	-.----	-.----	-.----		
134.000	169.355	169.355	-.----	-.----	-.----	-.----	-.----	-.----		
135.000	209.355	209.355	-.----	-.----	-.----	-.----	-.----	-.----		
136.000	248.346	248.346	-.----	-.----	-.----	-.----	-.----	-.----		
137.000	286.363	286.363	-.----	-.----	-.----	-.----	-.----	-.----		
138.000	323.440	323.440	-.----	-.----	-.----	-.----	-.----	-.----		
139.000	359.609	359.609	-.----	-.----	-.----	-.----	-.----	-.----		
140.000	394.902	394.902	-.----	-.----	-.----	-.----	-.----	-.----		
145.000	559.213	559.213	-.----	-.----	-.----	-.----	-.----	-.----		
150.000	705.560	705.560	-.----	-.----	-.----	-.----	-.----	-.----		
155.000	836.589	836.589	-.----	-.----	-.----	-.----	-.----	-.----		
160.000	954.461	954.461	-.----	-.----	-.----	-.----	-.----	-.----		
165.000	1060.955	1060.955	-.----	-.----	-.----	-.----	-.----	-.----		
170.000	1157.549	1157.549	-.----	-.----	-.----	-.----	-.----	-.----		
175.000	1245.477	1245.477	-.----	-.----	-.----	-.----	-.----	-.----		
180.000	1325.780	1325.780	-.----	-.----	-.----	-.----	-.----	-.----		
185.000	1399.341	1399.341	-.----	-.----	-.----	-.----	-.----	-.----		
190.000	1466.912	1466.912	-.----	-.----	-.----	-.----	-.----	-.----		
195.000	1529.138	1529.138	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	1586.578	1586.578	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	1688.968	1688.968	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	1777.256	1777.256	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	1853.894	1853.894	-.----	-.----	-.----	-.----	-.----	-.----		
237.810	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
238.000	-.----	-.----	1.192	1.192	-.----	-.----	-.----	-.----		
239.000	-.----	-.----	7.654	7.654	-.----	-.----	-.----	-.----		
240.000	1920.803	1920.879	14.057	14.057	-.----	-.----	-.----	-.----		
245.000	-.----	-.----	45.228	45.228	-.----	-.----	-.----	-.----		
250.000	1979.511	1981.727	75.076	75.076	-.----	-.----	-.----	-.----		
255.000	-.----	-.----	103.698	103.698	-.----	-.----	-.----	-.----		
260.000	2031.246	2038.132	131.183	131.183	-.----	-.----	-.----	-.----		
265.000	-.----	-.----	157.609	157.609	-.----	-.----	-.----	-.----		

Sm, Samarium

A = 150.350

Z = 62

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.140		4.280		8.560		10.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
270.000	2077.010	2090.636	183.045	183.045	-.----	-.----	-.----	-.----		
275.000	-.----	-.----	207.553	207.553	-.----	-.----	-.----	-.----		
280.000	2117.625	2139.702	231.191	231.191	-.----	-.----	-.----	-.----		
285.000	-.----	-.----	254.007	254.007	-.----	-.----	-.----	-.----		
290.000	2153.773	2185.724	276.048	276.048	-.----	-.----	-.----	-.----		
295.000	-.----	-.----	297.356	297.356	-.----	-.----	-.----	-.----		
300.000	2186.025	2229.040	317.969	317.969	-.----	-.----	-.----	-.----		
310.000	2214.861	2269.941	357.247	357.247	-.----	-.----	-.----	-.----		
320.000	2240.689	2308.679	394.130	394.130	-.----	-.----	-.----	-.----		
330.000	2263.856	2345.474	428.830	428.830	-.----	-.----	-.----	-.----		
340.000	2284.663	2380.516	461.531	461.531	-.----	-.----	-.----	-.----		
350.000	2303.366	2413.972	492.394	492.394	-.----	-.----	-.----	-.----		
360.000	2320.188	2445.988	521.561	521.561	-.----	-.----	-.----	-.----		
370.000	2335.325	2476.694	549.158	549.158	-.----	-.----	-.----	-.----		
380.000	2348.947	2506.203	575.296	575.296	-.----	-.----	-.----	-.----		
390.000	2361.202	2534.618	600.077	600.077	-.----	-.----	-.----	-.----		
400.000	2372.224	2562.027	623.592	623.592	-.----	-.----	-.----	-.----		
410.000	2382.128	2588.511	645.925	645.925	-.----	-.----	-.----	-.----		
416.530	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
417.000	-.----	-.----	-.----	-.----	0.460	0.460	-.----	-.----		
418.000	-.----	-.----	-.----	-.----	1.459	1.459	-.----	-.----		
419.000	-.----	-.----	-.----	-.----	2.460	2.460	-.----	-.----		
420.000	2391.017	2614.141	667.150	667.169	3.462	3.462	-.----	-.----		
425.000	-.----	-.----	-.----	-.----	8.497	8.497	-.----	-.----		
430.000	2398.984	2638.982	687.338	687.611	13.565	13.565	-.----	-.----		
435.000	-.----	-.----	-.----	-.----	18.661	18.661	-.----	-.----		
440.000	2406.112	2663.091	706.550	707.366	23.779	23.779	-.----	-.----		
445.000	-.----	-.----	-.----	-.----	28.913	28.913	-.----	-.----		
450.000	2412.472	2686.520	724.846	726.477	34.059	34.059	-.----	-.----		
455.000	-.----	-.----	-.----	-.----	39.211	39.211	-.----	-.----		
460.000	2418.132	2709.317	742.279	744.985	44.366	44.366	-.----	-.----		
465.000	-.----	-.----	-.----	-.----	49.520	49.520	-.----	-.----		
470.000	2423.150	2731.523	758.899	762.925	54.669	54.669	-.----	-.----		
475.000	-.----	-.----	-.----	-.----	59.809	59.809	-.----	-.----		
480.000	2427.580	2753.177	774.752	780.332	64.937	64.937	-.----	-.----		

Sm, Samarium

A = 150.350

Z = 62

Displacement		Surface Sputtering Regime				Bulk Displacement Regime				T _d
Energy(eV)=		T _s	2T _s		4T _s		5T _s			
		2.140	4.280		8.560		10.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
490.000	2431.470	2774.314	789.880	797.237	75.148	75.148	-.----	-.----		
494.050	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
495.000	-.----	-.----	-.----	-.----	-.----	-.----	0.525	0.525		
496.000	-.----	-.----	-.----	-.----	-.----	-.----	1.080	1.080		
497.000	-.----	-.----	-.----	-.----	-.----	-.----	1.638	1.638		
498.000	-.----	-.----	-.----	-.----	-.----	-.----	2.199	2.199		
499.000	-.----	-.----	-.----	-.----	-.----	-.----	2.762	2.762		
500.000	2434.864	2794.966	804.323	813.668	85.279	85.279	3.327	3.327		
505.000	-.----	-.----	-.----	-.----	-.----	-.----	6.189	6.189		
510.000	-.----	-.----	818.118	829.652	95.313	95.313	9.103	9.103		
515.000	-.----	-.----	-.----	-.----	-.----	-.----	12.066	12.066		
520.000	-.----	-.----	831.299	845.212	105.236	105.236	15.073	15.073		
525.000	-.----	-.----	-.----	-.----	-.----	-.----	18.118	18.118		
530.000	-.----	-.----	843.899	860.372	115.034	115.034	21.200	21.200		
535.000	-.----	-.----	-.----	-.----	-.----	-.----	24.312	24.312		
540.000	-.----	-.----	855.947	875.153	124.697	124.697	27.453	27.453		
545.000	-.----	-.----	-.----	-.----	-.----	-.----	30.618	30.618		
550.000	2445.661	2891.882	867.472	889.573	134.216	134.216	33.804	33.804		
555.000	-.----	-.----	-.----	-.----	-.----	-.----	37.008	37.008		
560.000	-.----	-.----	878.499	903.650	143.585	143.585	40.228	40.228		
570.000	-.----	-.----	889.054	917.403	152.797	152.797	46.704	46.704		
580.000	-.----	-.----	899.160	930.845	161.848	161.848	53.212	53.212		
590.000	-.----	-.----	908.838	943.992	170.734	170.734	59.734	59.734		
600.000	2448.711	2980.135	918.109	956.858	179.455	179.455	66.257	66.257		
610.000	-.----	-.----	-.----	-.----	188.007	188.007	72.765	72.765		
620.000	-.----	-.----	-.----	-.----	196.389	196.389	79.249	79.249		
630.000	-.----	-.----	-.----	-.----	204.603	204.603	85.698	85.698		
640.000	-.----	-.----	-.----	-.----	212.647	212.647	92.102	92.102		
650.000	2446.489	3061.629	958.993	1017.379	220.522	220.522	98.454	98.454		
660.000	-.----	-.----	-.----	-.----	228.230	228.230	104.748	104.748		
670.000	-.----	-.----	-.----	-.----	235.773	235.773	110.977	110.977		
680.000	-.----	-.----	-.----	-.----	243.150	243.150	117.137	117.137		
690.000	-.----	-.----	-.----	-.----	250.365	250.365	123.223	123.223		
700.000	2440.633	3137.678	992.169	1072.465	257.420	257.422	129.231	129.231		
710.000	-.----	-.----	-.----	-.----	-.----	-.----	135.159	135.159		

Sm, Samarium

A=150.350

Z=62

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s	2T _s		4T _s		5T _s				
Energy(eV)=	2.140	4.280		8.560		10.700				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
720.000	----	----	----	----	----	----	141.005	141.005		
730.000	----	----	----	----	----	----	146.765	146.765		
740.000	----	----	----	----	----	----	152.439	152.439		
750.000	2432.264	3209.224	1019.181	1123.095	290.376	290.870	158.025	158.025		
760.000	----	----	----	----	----	----	163.521	163.521		
770.000	----	----	----	----	----	----	168.929	168.929		
780.000	----	----	----	----	----	----	174.246	174.246		
790.000	----	----	----	----	----	----	179.474	179.474		
800.000	2422.163	3276.959	1041.216	1170.006	319.713	321.664	184.611	184.611		
850.000	2410.886	3341.411	1059.196	1213.766	345.783	350.185	208.959	209.065		
900.000	2398.831	3402.988	1073.847	1254.820	368.931	376.742	231.140	231.830		
950.000	2386.288	3462.014	1085.749	1293.524	389.480	401.586	251.278	253.129		
1000.000	2373.472	3518.753	1095.367	1330.164	407.726	424.925	269.523	273.132		
1050.000	2360.539	3573.421	1103.078	1364.977	423.932	446.931	286.032	291.982		
1100.000	2347.608	3626.199	1109.188	1398.158	438.331	467.750	300.958	309.802		
1150.000	2334.765	3677.243	1113.952	1429.873	451.132	487.505	314.449	326.696		
1200.000	2322.074	3726.685	1117.579	1460.260	462.515	506.301	326.640	342.753		
1250.000	2309.582	3774.640	1120.243	1489.439	472.641	524.227	337.656	358.051		
1300.000	2297.323	3821.208	1122.090	1517.513	481.649	541.363	347.613	372.658		
1350.000	2285.319	3866.477	1123.242	1544.572	489.664	557.777	356.612	386.632		
1400.000	2273.585	3910.527	1123.802	1570.695	496.794	573.528	364.747	400.026		
1450.000	2262.131	3953.426	1123.858	1595.949	503.135	588.668	372.102	412.886		
1500.000	2250.964	3995.240	1123.485	1620.398	508.770	603.245	378.751	425.253		

Eu, Europium

A = 151.960

Z = 63

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d
Displacement		T _s	2T _s		4T _s	5T _s				
Energy(eV)=		1.890	3.780		7.560	9.450				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
117.360	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
118.000	41.247	41.247	-.----	-.----	-.----	-.----	-.----	-.----		
119.000	104.419	104.419	-.----	-.----	-.----	-.----	-.----	-.----		
120.000	165.686	165.686	-.----	-.----	-.----	-.----	-.----	-.----		
125.000	446.044	446.044	-.----	-.----	-.----	-.----	-.----	-.----		
130.000	688.936	688.936	-.----	-.----	-.----	-.----	-.----	-.----		
135.000	900.901	900.901	-.----	-.----	-.----	-.----	-.----	-.----		
140.000	1087.085	1087.085	-.----	-.----	-.----	-.----	-.----	-.----		
145.000	1251.587	1251.587	-.----	-.----	-.----	-.----	-.----	-.----		
150.000	1397.702	1397.702	-.----	-.----	-.----	-.----	-.----	-.----		
155.000	1528.109	1528.109	-.----	-.----	-.----	-.----	-.----	-.----		
160.000	1645.003	1645.003	-.----	-.----	-.----	-.----	-.----	-.----		
165.000	1750.198	1750.198	-.----	-.----	-.----	-.----	-.----	-.----		
170.000	1845.204	1845.204	-.----	-.----	-.----	-.----	-.----	-.----		
175.000	1931.290	1931.290	-.----	-.----	-.----	-.----	-.----	-.----		
180.000	2009.526	2009.526	-.----	-.----	-.----	-.----	-.----	-.----		
190.000	2145.957	2145.957	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	2260.327	2260.327	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	2356.986	2356.986	-.----	-.----	-.----	-.----	-.----	-.----		
216.020	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
217.000	-.----	-.----	9.128	9.128	-.----	-.----	-.----	-.----		
218.000	-.----	-.----	18.345	18.345	-.----	-.----	-.----	-.----		
219.000	-.----	-.----	27.459	27.459	-.----	-.----	-.----	-.----		
220.000	2439.236	2439.627	36.471	36.471	-.----	-.----	-.----	-.----		
225.000	-.----	-.----	80.076	80.076	-.----	-.----	-.----	-.----		
230.000	2509.633	2514.086	121.416	121.416	-.----	-.----	-.----	-.----		
235.000	-.----	-.----	160.687	160.687	-.----	-.----	-.----	-.----		
240.000	2570.180	2582.340	198.063	198.063	-.----	-.----	-.----	-.----		
245.000	-.----	-.----	233.692	233.692	-.----	-.----	-.----	-.----		
250.000	2622.466	2645.227	267.709	267.709	-.----	-.----	-.----	-.----		
255.000	-.----	-.----	300.232	300.232	-.----	-.----	-.----	-.----		
260.000	2667.772	2703.448	331.366	331.366	-.----	-.----	-.----	-.----		
265.000	-.----	-.----	361.204	361.204	-.----	-.----	-.----	-.----		
270.000	2707.138	2757.591	389.833	389.833	-.----	-.----	-.----	-.----		
275.000	-.----	-.----	417.327	417.327	-.----	-.----	-.----	-.----		

Eu, Europium

A = 151.960

Z = 63

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T_s	$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		1.890	3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
280.000	2741.414	2808.156	443.755	443.755	-.----	-.----	-.----	-.----		
290.000	2771.307	2855.566	493.663	493.663	-.----	-.----	-.----	-.----		
300.000	2797.404	2900.183	539.994	539.994	-.----	-.----	-.----	-.----		
310.000	2820.197	2942.317	583.119	583.119	-.----	-.----	-.----	-.----		
320.000	2840.104	2982.236	623.352	623.352	-.----	-.----	-.----	-.----		
330.000	2857.479	3020.171	660.963	660.963	-.----	-.----	-.----	-.----		
340.000	2872.624	3056.323	696.186	696.186	-.----	-.----	-.----	-.----		
350.000	2885.798	3090.867	729.226	729.226	-.----	-.----	-.----	-.----		
360.000	2897.227	3123.956	760.264	760.264	-.----	-.----	-.----	-.----		
370.000	2907.105	3155.724	789.459	789.459	-.----	-.----	-.----	-.----		
380.000	2915.599	3186.291	816.953	816.953	-.----	-.----	-.----	-.----		
381.180	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
382.000	-.----	-.----	-.----	-.----	1.160	1.160	-.----	-.----		
383.000	-.----	-.----	-.----	-.----	2.585	2.585	-.----	-.----		
384.000	-.----	-.----	-.----	-.----	4.010	4.010	-.----	-.----		
385.000	-.----	-.----	-.----	-.----	5.435	5.435	-.----	-.----		
386.000	-.----	-.----	-.----	-.----	6.860	6.860	-.----	-.----		
387.000	-.----	-.----	-.----	-.----	8.286	8.286	-.----	-.----		
388.000	-.----	-.----	-.----	-.----	9.712	9.712	-.----	-.----		
389.000	-.----	-.----	-.----	-.----	11.137	11.137	-.----	-.----		
390.000	2922.860	3215.759	842.874	843.054	12.563	12.563	-.----	-.----		
395.000	-.----	-.----	-.----	-.----	19.689	19.689	-.----	-.----		
400.000	2929.015	3244.223	867.336	868.139	26.808	26.808	-.----	-.----		
405.000	-.----	-.----	-.----	-.----	33.914	33.914	-.----	-.----		
410.000	-.----	-.----	890.443	892.283	41.001	41.001	-.----	-.----		
415.000	-.----	-.----	-.----	-.----	48.066	48.066	-.----	-.----		
420.000	-.----	-.----	912.288	915.552	55.102	55.102	-.----	-.----		
425.000	-.----	-.----	-.----	-.----	62.108	62.108	-.----	-.----		
430.000	-.----	-.----	932.957	938.006	69.077	69.077	-.----	-.----		
435.000	-.----	-.----	-.----	-.----	76.008	76.008	-.----	-.----		
440.000	-.----	-.----	952.528	959.700	82.898	82.898	-.----	-.----		
450.000	2946.765	3374.053	971.071	980.682	96.540	96.540	-.----	-.----		
453.210	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
454.000	-.----	-.----	-.----	-.----	-.----	-.----	0.617	0.617		
455.000	-.----	-.----	-.----	-.----	-.----	-.----	1.406	1.406		

Eu, Europium

A = 151.960

Z = 63

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	1.890		3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
456.000	-.----	-.----	-.----	-.----	-.----	-.----	2.198	2.198		
457.000	-.----	-.----	-.----	-.----	-.----	-.----	2.993	2.993		
458.000	-.----	-.----	-.----	-.----	-.----	-.----	3.789	3.789		
459.000	-.----	-.----	-.----	-.----	-.----	-.----	4.588	4.588		
460.000	-.----	-.----	988.651	1000.998	109.983	109.983	5.389	5.389		
465.000	-.----	-.----	-.----	-.----	-.----	-.----	9.428	9.428		
470.000	-.----	-.----	1005.329	1020.690	123.212	123.212	13.516	13.516		
475.000	-.----	-.----	-.----	-.----	-.----	-.----	17.648	17.648		
480.000	-.----	-.----	1021.160	1039.795	136.213	136.213	21.817	21.817		
485.000	-.----	-.----	-.----	-.----	-.----	-.----	26.019	26.019		
490.000	-.----	-.----	1036.194	1058.348	148.977	148.977	30.250	30.250		
495.000	-.----	-.----	-.----	-.----	-.----	-.----	34.503	34.503		
500.000	2949.419	3488.018	1050.479	1076.382	161.494	161.494	38.775	38.775		
505.000	-.----	-.----	-.----	-.----	-.----	-.----	43.062	43.062		
510.000	-.----	-.----	-.----	-.----	173.759	173.759	47.361	47.361		
515.000	-.----	-.----	-.----	-.----	-.----	-.----	51.667	51.667		
520.000	-.----	-.----	-.----	-.----	185.769	185.769	55.978	55.978		
530.000	-.----	-.----	-.----	-.----	197.519	197.519	64.602	64.602		
540.000	-.----	-.----	-.----	-.----	209.009	209.009	73.210	73.210		
550.000	2942.837	3590.653	1112.073	1159.714	220.239	220.239	81.783	81.783		
560.000	-.----	-.----	-.----	-.----	231.209	231.209	90.305	90.305		
570.000	-.----	-.----	-.----	-.----	241.922	241.922	98.761	98.761		
580.000	-.----	-.----	-.----	-.----	252.378	252.378	107.141	107.141		
590.000	-.----	-.----	-.----	-.----	262.581	262.581	115.432	115.432		
600.000	2930.512	3684.800	1160.296	1233.652	272.534	272.534	123.626	123.626		
610.000	-.----	-.----	-.----	-.----	282.241	282.241	131.716	131.716		
620.000	-.----	-.----	-.----	-.----	291.706	291.706	139.696	139.696		
630.000	-.----	-.----	-.----	-.----	300.932	300.932	147.559	147.559		
640.000	-.----	-.----	-.----	-.----	309.925	309.925	155.303	155.303		
650.000	2914.610	3772.322	1198.284	1300.246	318.690	318.703	162.923	162.923		
660.000	-.----	-.----	-.----	-.----	327.230	327.306	170.417	170.417		
670.000	-.----	-.----	-.----	-.----	335.550	335.741	177.783	177.783		
680.000	-.----	-.----	-.----	-.----	343.656	344.016	185.019	185.019		
690.000	-.----	-.----	-.----	-.----	351.552	352.135	192.125	192.125		
700.000	2896.520	3854.494	1228.315	1360.956	359.244	360.106	199.099	199.099		

Eu, Europium

A=151.960

Z=63

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	1.890		3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
710.000	-.----	-.----	-.----	-.----	-.----	-.----	205.942	205.942		
720.000	-.----	-.----	-.----	-.----	-.----	-.----	212.654	212.654		
730.000	-.----	-.----	-.----	-.----	-.----	-.----	219.236	219.236		
740.000	-.----	-.----	-.----	-.----	-.----	-.----	225.688	225.688		
750.000	2877.154	3932.222	1252.077	1416.850	394.798	397.889	232.011	232.011		
760.000	-.----	-.----	-.----	-.----	-.----	-.----	238.206	238.212		
770.000	-.----	-.----	-.----	-.----	-.----	-.----	244.275	244.310		
780.000	-.----	-.----	-.----	-.----	-.----	-.----	250.219	250.311		
790.000	-.----	-.----	-.----	-.----	-.----	-.----	256.040	256.217		
800.000	2857.120	4006.168	1270.848	1468.729	425.944	432.626	261.739	262.031		
850.000	2836.830	4076.834	1285.608	1517.208	453.225	464.769	288.475	289.808		
900.000	2816.564	4144.608	1297.120	1562.767	477.132	494.678	312.457	315.644		
950.000	2796.513	4209.797	1305.982	1605.789	498.093	522.647	333.936	339.785		
1000.000	2776.807	4272.653	1312.672	1646.581	516.483	548.917	353.158	362.434		
1050.000	2757.532	4333.384	1317.573	1685.398	532.627	573.684	370.354	383.762		
1100.000	2738.747	4392.162	1320.994	1722.450	546.807	597.117	385.737	403.913		
1150.000	2720.484	4449.137	1323.187	1757.911	559.266	619.355	399.499	423.009		
1200.000	2702.762	4504.436	1324.358	1791.932	570.214	640.518	411.812	441.155		
1250.000	2685.589	4558.170	1324.678	1824.641	579.834	660.708	422.831	458.440		
1300.000	2668.962	4610.436	1324.288	1856.148	588.284	680.013	432.694	474.942		
1350.000	2652.875	4661.322	1323.306	1886.548	595.700	698.510	441.522	490.731		
1400.000	2637.316	4710.904	1321.829	1915.926	602.204	716.267	449.424	505.864		
1450.000	2622.274	4759.254	1319.942	1944.356	607.898	733.342	456.496	520.395		
1500.000	2607.733	4806.436	1317.712	1971.903	612.875	749.789	462.823	534.370		

Gd, Gadolinium

A = 157.250

Z = 64

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Displacement		T _s	2T _s		4T _s	5T _s					
Energy(eV)=		2.241	4.482		8.964	11.205					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
141.060	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
142.000	35.586	35.586	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
143.000	72.922	72.922	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
144.000	109.382	109.382	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	144.996	144.996	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
146.000	179.793	179.793	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
147.000	213.799	213.799	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
148.000	247.039	247.039	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
149.000	279.540	279.540	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	311.323	311.323	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	460.249	460.249	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	594.291	594.291	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	715.508	715.508	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	825.599	825.599	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	925.976	925.976	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	1017.822	1017.822	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	1102.137	1102.137	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	1179.769	1179.769	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	1251.443	1251.443	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	1317.782	1317.782	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	1436.539	1436.539	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	1539.570	1539.570	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	1629.587	1629.587	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	1708.710	1708.710	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	1778.621	1778.621	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
256.630	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
257.000	-.----	-.----	2.048	2.048	-.----	-.----	-.----	-.----	-.----	-.----	
258.000	-.----	-.----	7.643	7.643	-.----	-.----	-.----	-.----	-.----	-.----	
259.000	-.----	-.----	13.197	13.197	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	1840.675	1840.821	18.711	18.711	-.----	-.----	-.----	-.----	-.----	-.----	
265.000	-.----	-.----	45.686	45.686	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	1895.973	1898.142	71.722	71.722	-.----	-.----	-.----	-.----	-.----	-.----	
275.000	-.----	-.----	96.880	96.880	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	1945.423	1951.683	121.212	121.212	-.----	-.----	-.----	-.----	-.----	-.----	
285.000	-.----	-.----	144.767	144.767	-.----	-.----	-.----	-.----	-.----	-.----	

Gd, Gadolinium

A=157.250

Z=64

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.241		4.482		8.964		11.205			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
290.000	1989.777	2001.866	167.586	167.586	-.----	-.----	-.----	-.----		
295.000	-.----	-.----	189.709	189.709	-.----	-.----	-.----	-.----		
300.000	2029.667	2049.055	211.169	211.169	-.----	-.----	-.----	-.----		
305.000	-.----	-.----	232.001	232.001	-.----	-.----	-.----	-.----		
310.000	2065.626	2093.567	252.231	252.231	-.----	-.----	-.----	-.----		
315.000	-.----	-.----	271.888	271.888	-.----	-.----	-.----	-.----		
320.000	2098.108	2135.674	290.996	290.996	-.----	-.----	-.----	-.----		
330.000	2127.500	2175.616	327.653	327.653	-.----	-.----	-.----	-.----		
340.000	2154.137	2213.600	362.370	362.370	-.----	-.----	-.----	-.----		
350.000	2178.309	2249.810	395.288	395.288	-.----	-.----	-.----	-.----		
360.000	2200.267	2284.408	426.534	426.534	-.----	-.----	-.----	-.----		
370.000	2220.231	2317.535	456.223	456.223	-.----	-.----	-.----	-.----		
380.000	2238.396	2349.318	484.455	484.455	-.----	-.----	-.----	-.----		
390.000	2254.930	2379.869	511.323	511.323	-.----	-.----	-.----	-.----		
400.000	2269.985	2409.287	536.910	536.910	-.----	-.----	-.----	-.----		
410.000	2283.695	2437.663	561.292	561.292	-.----	-.----	-.----	-.----		
420.000	2296.178	2465.075	584.540	584.540	-.----	-.----	-.----	-.----		
430.000	2307.541	2491.597	606.719	606.719	-.----	-.----	-.----	-.----		
440.000	2317.880	2517.291	627.888	627.888	-.----	-.----	-.----	-.----		
446.810	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
447.000	-.----	-.----	-.----	-.----	0.163	0.163	-.----	-.----		
448.000	-.----	-.----	-.----	-.----	1.035	1.035	-.----	-.----		
449.000	-.----	-.----	-.----	-.----	1.911	1.911	-.----	-.----		
450.000	2327.279	2542.218	648.103	648.115	2.788	2.788	-.----	-.----		
455.000	-.----	-.----	-.----	-.----	7.213	7.213	-.----	-.----		
460.000	2335.816	2566.428	667.415	667.632	11.694	11.694	-.----	-.----		
465.000	-.----	-.----	-.----	-.----	16.224	16.224	-.----	-.----		
470.000	2343.560	2589.971	685.873	686.537	20.797	20.797	-.----	-.----		
475.000	-.----	-.----	-.----	-.----	25.406	25.406	-.----	-.----		
480.000	2350.575	2612.890	703.521	704.866	30.046	30.046	-.----	-.----		
485.000	-.----	-.----	-.----	-.----	34.712	34.712	-.----	-.----		
490.000	2356.916	2635.224	720.401	722.651	39.400	39.400	-.----	-.----		
495.000	-.----	-.----	-.----	-.----	44.103	44.103	-.----	-.----		
500.000	2362.637	2657.009	736.553	739.923	48.819	48.819	-.----	-.----		
510.000	-.----	-.----	752.012	756.712	58.272	58.272	-.----	-.----		

Gd, Gadolinium

A = 157.250

Z = 64

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T _s		2T _s		4T _s		5T _s		T _d
Energy(eV)=		2.241		4.482		8.964		11.205		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
520.000	----	----	766.814	773.042	67.730	67.730	----	----		
528.940	----	----	----	----	----	----	0.000	0.000		
529.000	----	----	----	----	----	----	0.029	0.029		
530.000	----	----	780.991	788.938	77.167	77.167	0.513	0.513		
535.000	----	----	----	----	----	----	2.978	2.978		
540.000	----	----	794.573	804.423	86.564	86.564	5.508	5.508		
545.000	----	----	----	----	----	----	8.099	8.099		
550.000	2383.436	2758.762	807.589	819.518	95.900	95.900	10.745	10.745		
555.000	----	----	----	----	----	----	13.443	13.443		
560.000	----	----	820.066	834.242	105.161	105.161	16.188	16.188		
565.000	----	----	----	----	----	----	18.975	18.975		
570.000	----	----	832.028	848.613	114.332	114.332	21.802	21.802		
575.000	----	----	----	----	----	----	24.663	24.663		
580.000	----	----	843.501	862.648	123.402	123.402	27.556	27.556		
590.000	----	----	854.506	876.363	132.361	132.361	33.425	33.425		
600.000	2394.289	2850.737	865.065	889.773	141.200	141.200	39.384	39.384		
610.000	----	----	----	----	149.914	149.914	45.412	45.412		
620.000	----	----	----	----	158.496	158.496	51.490	51.490		
630.000	----	----	----	----	166.942	166.942	57.600	57.600		
640.000	----	----	----	----	175.247	175.247	63.729	63.729		
650.000	2398.206	2935.109	911.840	952.698	183.410	183.410	69.862	69.862		
660.000	----	----	----	----	191.428	191.428	75.987	75.987		
670.000	----	----	----	----	199.299	199.299	82.095	82.095		
680.000	----	----	----	----	207.024	207.024	88.175	88.175		
690.000	----	----	----	----	214.600	214.600	94.221	94.221		
700.000	2397.213	3013.386	950.074	1009.741	222.029	222.029	100.224	100.224		
710.000	----	----	----	----	229.311	229.311	106.178	106.178		
720.000	----	----	----	----	236.447	236.447	112.078	112.078		
730.000	----	----	----	----	243.437	243.437	117.920	117.920		
740.000	----	----	----	----	250.282	250.282	123.698	123.698		
750.000	2392.715	3086.652	981.425	1061.968	256.985	256.991	129.409	129.409		
760.000	----	----	----	----	263.547	263.585	135.051	135.051		
770.000	----	----	----	----	269.969	270.070	140.620	140.620		
780.000	----	----	----	----	276.254	276.449	146.115	146.115		
790.000	----	----	----	----	282.403	282.726	151.534	151.534		

Gd, Gadolinium

A = 157.250

Z = 64

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	2.241		4.482		8.964		11.205			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
800.000	2385.704	3155.704	1007.181	1110.186	288.419	288.902	156.875	156.875		
850.000	2376.897	3221.151	1028.354	1155.015	316.576	318.391	182.381	182.381		
900.000	2366.815	3283.461	1045.749	1196.943	341.737	345.786	205.867	205.943		
950.000	2355.846	3343.007	1060.011	1236.357	364.193	371.356	227.370	227.926		
1000.000	2344.278	3400.089	1071.659	1273.573	384.220	395.324	246.984	248.532		
1050.000	2332.329	3454.955	1081.117	1308.847	402.076	417.876	264.830	267.914		
1100.000	2320.163	3507.810	1088.735	1342.393	417.996	439.167	281.041	286.202		
1150.000	2307.906	3558.829	1094.797	1374.390	432.190	459.330	295.750	303.509		
1200.000	2295.652	3608.160	1099.543	1404.989	444.847	478.478	309.087	319.929		
1250.000	2283.473	3655.931	1103.170	1434.320	456.134	496.709	321.176	335.547		
1300.000	2271.425	3702.255	1105.845	1462.494	466.201	514.106	332.131	350.435		
1350.000	2259.549	3747.230	1107.709	1489.609	475.178	530.743	342.056	364.655		
1400.000	2247.873	3790.942	1108.880	1515.748	483.182	546.683	351.047	378.265		
1450.000	2236.420	3833.468	1109.457	1540.986	490.315	561.984	359.193	391.313		
1500.000	2225.205	3874.879	1109.528	1565.389	496.670	576.694	366.572	403.842		

Tb, Terbium

A = 158.925

Z = 65

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 3.121		2T _s 6.242		4T _s 12.484		5T _s 15.605			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
190.460	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
191.000	8.309	8.309	-.----	-.----	-.----	-.----	-.----	-.----		
192.000	23.710	23.710	-.----	-.----	-.----	-.----	-.----	-.----		
193.000	38.888	38.888	-.----	-.----	-.----	-.----	-.----	-.----		
194.000	53.846	53.846	-.----	-.----	-.----	-.----	-.----	-.----		
195.000	68.591	68.591	-.----	-.----	-.----	-.----	-.----	-.----		
196.000	83.127	83.127	-.----	-.----	-.----	-.----	-.----	-.----		
197.000	97.458	97.458	-.----	-.----	-.----	-.----	-.----	-.----		
198.000	111.590	111.590	-.----	-.----	-.----	-.----	-.----	-.----		
199.000	125.527	125.527	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	139.274	139.274	-.----	-.----	-.----	-.----	-.----	-.----		
205.000	205.292	205.292	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	267.126	267.126	-.----	-.----	-.----	-.----	-.----	-.----		
215.000	325.190	325.190	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	379.842	379.842	-.----	-.----	-.----	-.----	-.----	-.----		
225.000	431.392	431.392	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	480.111	480.111	-.----	-.----	-.----	-.----	-.----	-.----		
235.000	526.237	526.237	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	569.978	569.978	-.----	-.----	-.----	-.----	-.----	-.----		
245.000	611.522	611.522	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	651.033	651.033	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	688.658	688.658	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	724.529	724.529	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	791.478	791.478	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	852.702	852.702	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	908.882	908.882	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	960.587	960.587	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	1008.299	1008.299	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	1052.429	1052.429	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	1093.330	1093.330	-.----	-.----	-.----	-.----	-.----	-.----		
339.280	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
340.000	1131.309	1131.311	1.673	1.673	-.----	-.----	-.----	-.----		
341.000	-.----	-.----	4.015	4.015	-.----	-.----	-.----	-.----		
342.000	-.----	-.----	6.353	6.353	-.----	-.----	-.----	-.----		
343.000	-.----	-.----	8.687	8.687	-.----	-.----	-.----	-.----		

Tb, Terbium**A = 158.925****Z = 65**

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->						
Displacement		T_s	$2T_s$		$4T_s$		$5T_s$		T_d		
Energy(eV)=		3.121	6.242		12.484		15.605				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
344.000	-.----	-.----	11.016	11.016	-.----	-.----	-.----	-.----	-.----	-.----	
345.000	-.----	-.----	13.341	13.341	-.----	-.----	-.----	-.----	-.----	-.----	
346.000	-.----	-.----	15.662	15.662	-.----	-.----	-.----	-.----	-.----	-.----	
347.000	-.----	-.----	17.978	17.978	-.----	-.----	-.----	-.----	-.----	-.----	
348.000	-.----	-.----	20.290	20.290	-.----	-.----	-.----	-.----	-.----	-.----	
349.000	-.----	-.----	22.598	22.598	-.----	-.----	-.----	-.----	-.----	-.----	
350.000	1166.633	1167.111	24.901	24.901	-.----	-.----	-.----	-.----	-.----	-.----	
355.000	-.----	-.----	36.348	36.348	-.----	-.----	-.----	-.----	-.----	-.----	
360.000	1199.538	1201.267	47.680	47.680	-.----	-.----	-.----	-.----	-.----	-.----	
365.000	-.----	-.----	58.896	58.896	-.----	-.----	-.----	-.----	-.----	-.----	
370.000	1230.232	1233.914	69.992	69.992	-.----	-.----	-.----	-.----	-.----	-.----	
375.000	-.----	-.----	80.967	80.967	-.----	-.----	-.----	-.----	-.----	-.----	
380.000	1258.897	1265.172	91.819	91.819	-.----	-.----	-.----	-.----	-.----	-.----	
385.000	-.----	-.----	102.546	102.546	-.----	-.----	-.----	-.----	-.----	-.----	
390.000	1285.700	1295.151	113.147	113.147	-.----	-.----	-.----	-.----	-.----	-.----	
395.000	-.----	-.----	123.621	123.621	-.----	-.----	-.----	-.----	-.----	-.----	
400.000	1310.787	1323.946	133.967	133.967	-.----	-.----	-.----	-.----	-.----	-.----	
410.000	1334.290	1351.647	154.273	154.273	-.----	-.----	-.----	-.----	-.----	-.----	
420.000	1356.327	1378.333	174.061	174.061	-.----	-.----	-.----	-.----	-.----	-.----	
430.000	1377.007	1404.075	193.330	193.330	-.----	-.----	-.----	-.----	-.----	-.----	
440.000	1396.428	1428.938	212.080	212.080	-.----	-.----	-.----	-.----	-.----	-.----	
450.000	1414.677	1452.981	230.317	230.317	-.----	-.----	-.----	-.----	-.----	-.----	
460.000	1431.836	1476.259	248.043	248.043	-.----	-.----	-.----	-.----	-.----	-.----	
470.000	1447.979	1498.820	265.267	265.267	-.----	-.----	-.----	-.----	-.----	-.----	
480.000	1463.173	1520.709	281.996	281.996	-.----	-.----	-.----	-.----	-.----	-.----	
490.000	1477.481	1541.968	298.238	298.238	-.----	-.----	-.----	-.----	-.----	-.----	
500.000	1490.959	1562.633	314.003	314.003	-.----	-.----	-.----	-.----	-.----	-.----	
510.000	-.----	-.----	329.301	329.301	-.----	-.----	-.----	-.----	-.----	-.----	
520.000	-.----	-.----	344.143	344.143	-.----	-.----	-.----	-.----	-.----	-.----	
530.000	-.----	-.----	358.540	358.540	-.----	-.----	-.----	-.----	-.----	-.----	
540.000	-.----	-.----	372.502	372.502	-.----	-.----	-.----	-.----	-.----	-.----	
550.000	1547.605	1658.186	386.041	386.041	-.----	-.----	-.----	-.----	-.----	-.----	
560.000	-.----	-.----	399.168	399.168	-.----	-.----	-.----	-.----	-.----	-.----	
570.000	-.----	-.----	411.895	411.895	-.----	-.----	-.----	-.----	-.----	-.----	
577.500	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	

Tb, Terbium

A = 158.925

Z = 65

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.121		6.242		12.484		15.605			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
578.000	-.----	-.----	-.----	-.----	0.184	0.184	-.----	-.----		
579.000	-.----	-.----	-.----	-.----	0.559	0.559	-.----	-.----		
580.000	-.----	-.----	424.234	424.236	0.938	0.938	-.----	-.----		
585.000	-.----	-.----	-.----	-.----	2.870	2.870	-.----	-.----		
590.000	-.----	-.----	436.194	436.264	4.866	4.866	-.----	-.----		
595.000	-.----	-.----	-.----	-.----	6.921	6.921	-.----	-.----		
600.000	1589.901	1743.104	447.789	448.014	9.031	9.031	-.----	-.----		
605.000	-.----	-.----	-.----	-.----	11.192	11.192	-.----	-.----		
610.000	-.----	-.----	459.027	459.500	13.401	13.401	-.----	-.----		
615.000	-.----	-.----	-.----	-.----	15.654	15.654	-.----	-.----		
620.000	-.----	-.----	469.921	470.732	17.947	17.947	-.----	-.----		
625.000	-.----	-.----	-.----	-.----	20.278	20.278	-.----	-.----		
630.000	-.----	-.----	480.480	481.721	22.643	22.643	-.----	-.----		
635.000	-.----	-.----	-.----	-.----	25.039	25.039	-.----	-.----		
640.000	-.----	-.----	490.715	492.477	27.464	27.464	-.----	-.----		
650.000	1621.487	1819.753	500.636	503.009	32.391	32.391	-.----	-.----		
660.000	-.----	-.----	510.252	513.327	37.403	37.403	-.----	-.----		
670.000	-.----	-.----	519.574	523.438	42.484	42.484	-.----	-.----		
678.860	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
679.000	-.----	-.----	-.----	-.----	-.----	-.----	0.028	0.028		
680.000	-.----	-.----	528.611	533.351	47.619	47.619	0.238	0.238		
685.000	-.----	-.----	-.----	-.----	-.----	-.----	1.318	1.318		
690.000	-.----	-.----	537.371	543.073	52.793	52.793	2.448	2.448		
695.000	-.----	-.----	-.----	-.----	-.----	-.----	3.626	3.626		
700.000	1644.943	1889.798	545.863	552.611	57.994	57.994	4.848	4.848		
705.000	-.----	-.----	-.----	-.----	-.----	-.----	6.114	6.114		
710.000	-.----	-.----	-.----	-.----	63.210	63.210	7.419	7.419		
715.000	-.----	-.----	-.----	-.----	-.----	-.----	8.762	8.762		
720.000	-.----	-.----	-.----	-.----	68.433	68.433	10.141	10.141		
725.000	-.----	-.----	-.----	-.----	-.----	-.----	11.552	11.552		
730.000	-.----	-.----	-.----	-.----	73.653	73.653	12.995	12.995		
735.000	-.----	-.----	-.----	-.----	-.----	-.----	14.468	14.468		
740.000	-.----	-.----	-.----	-.----	78.861	78.861	15.968	15.968		
750.000	1662.143	1954.452	584.596	597.772	84.052	84.052	19.044	19.044		
760.000	-.----	-.----	-.----	-.----	89.217	89.217	22.209	22.209		

Tb, Terbium

A=158.925

Z=65

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		3.121		6.242		12.484		15.605			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)
770.000	----	----	----	----	94.353	94.353	25.452	25.452			
780.000	----	----	----	----	99.453	99.453	28.762	28.762			
790.000	----	----	----	----	104.514	104.514	32.129	32.129			
800.000	1674.478	2014.618	617.802	639.222	109.531	109.531	35.543	35.543			
810.000	----	----	----	----	114.501	114.501	38.996	38.996			
820.000	----	----	----	----	119.421	119.421	42.481	42.481			
830.000	----	----	----	----	124.289	124.289	45.990	45.990			
840.000	----	----	----	----	129.101	129.101	49.516	49.516			
850.000	1682.991	2070.984	646.302	677.532	133.856	133.856	53.055	53.055			
860.000	----	----	----	----	138.553	138.553	56.601	56.601			
870.000	----	----	----	----	143.190	143.190	60.149	60.149			
880.000	----	----	----	----	147.765	147.765	63.694	63.694			
890.000	----	----	----	----	152.279	152.279	67.233	67.233			
900.000	1688.484	2124.086	670.785	713.151	156.729	156.729	70.761	70.761			
910.000	----	----	----	----	----	----	74.277	74.277			
920.000	----	----	----	----	----	----	77.776	77.776			
930.000	----	----	----	----	----	----	81.256	81.256			
940.000	----	----	----	----	----	----	84.715	84.715			
950.000	1691.575	2174.349	691.836	746.444	178.022	178.026	88.151	88.151			
960.000	----	----	----	----	----	----	91.560	91.560			
970.000	----	----	----	----	----	----	94.943	94.943			
980.000	----	----	----	----	----	----	98.297	98.297			
990.000	----	----	----	----	----	----	101.620	101.620			
1000.000	1692.748	2222.117	709.943	777.706	197.711	197.917	104.912	104.912			
1050.000	1692.385	2267.668	725.521	807.179	215.832	216.612	120.865	120.865			
1100.000	1690.790	2311.235	738.918	835.065	232.457	234.238	135.916	135.918			
1150.000	1688.207	2353.013	750.430	861.535	247.673	250.902	150.028	150.132			
1200.000	1684.833	2393.167	760.311	886.731	261.579	266.697	163.200	163.612			
1250.000	1680.828	2431.836	768.773	910.778	274.274	281.704	175.453	176.424			
1300.000	1676.321	2469.143	776.001	933.780	285.855	295.995	186.824	188.624			
1350.000	1671.418	2505.195	782.152	955.829	296.413	309.631	197.357	200.264			
1400.000	1666.209	2540.084	787.361	977.006	306.036	322.667	207.102	211.388			
1450.000	1660.764	2573.892	791.747	997.380	314.804	335.152	216.107	222.038			
1500.000	1655.144	2606.693	795.409	1017.013	322.791	347.129	224.423	232.248			

Dy, Dysprosium

A=162.500

Z=66

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$			T_d
Energy(eV)=	3.087		6.174		12.348		15.435			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
192.330	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
193.000	10.594	10.594	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
194.000	26.295	26.295	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
195.000	41.771	41.771	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
196.000	57.027	57.027	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
197.000	72.068	72.068	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
198.000	86.899	86.899	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
199.000	101.525	101.525	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
200.000	115.950	115.950	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
205.000	185.220	185.220	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
210.000	250.094	250.094	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
215.000	311.009	311.009	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
220.000	368.343	368.343	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
225.000	422.424	422.424	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
230.000	473.537	473.537	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
235.000	521.933	521.933	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
240.000	567.832	567.832	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
245.000	611.428	611.428	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
250.000	652.895	652.895	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
255.000	692.388	692.388	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
260.000	730.045	730.045	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
270.000	800.337	800.337	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
280.000	864.633	864.633	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
290.000	923.645	923.645	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
300.000	977.966	977.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
310.000	1028.100	1028.100	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
320.000	1074.475	1074.475	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
330.000	1117.461	1117.461	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
340.000	1157.379	1157.379	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
342.360	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
343.000	-.----	-.----	1.522	1.522	-.----	-.----	-.----	-.----	-.----	-.----
344.000	-.----	-.----	3.918	3.918	-.----	-.----	-.----	-.----	-.----	-.----
345.000	-.----	-.----	6.310	6.310	-.----	-.----	-.----	-.----	-.----	-.----
346.000	-.----	-.----	8.698	8.698	-.----	-.----	-.----	-.----	-.----	-.----
347.000	-.----	-.----	11.082	11.082	-.----	-.----	-.----	-.----	-.----	-.----
348.000	-.----	-.----	13.462	13.462	-.----	-.----	-.----	-.----	-.----	-.----

Dy, Dysprosium

A = 162.500

Z = 66

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.087		6.174		12.348		15.435			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
349.000	-.----	-.----	15.838	15.838	-.----	-.----	-.----	-.----		
350.000	1194.507	1194.756	18.210	18.210	-.----	-.----	-.----	-.----		
355.000	-.----	-.----	30.007	30.007	-.----	-.----	-.----	-.----		
360.000	1229.091	1230.378	41.697	41.697	-.----	-.----	-.----	-.----		
365.000	-.----	-.----	53.277	53.277	-.----	-.----	-.----	-.----		
370.000	1261.350	1264.411	64.744	64.744	-.----	-.----	-.----	-.----		
375.000	-.----	-.----	76.095	76.095	-.----	-.----	-.----	-.----		
380.000	1291.475	1296.983	87.327	87.327	-.----	-.----	-.----	-.----		
385.000	-.----	-.----	98.439	98.439	-.----	-.----	-.----	-.----		
390.000	1319.639	1328.208	109.427	109.427	-.----	-.----	-.----	-.----		
395.000	-.----	-.----	120.291	120.291	-.----	-.----	-.----	-.----		
400.000	1345.997	1358.188	131.029	131.029	-.----	-.----	-.----	-.----		
410.000	1370.685	1387.015	152.120	152.120	-.----	-.----	-.----	-.----		
420.000	1393.831	1414.774	172.693	172.693	-.----	-.----	-.----	-.----		
430.000	1415.545	1441.539	192.745	192.745	-.----	-.----	-.----	-.----		
440.000	1435.932	1467.380	212.273	212.273	-.----	-.----	-.----	-.----		
450.000	1455.084	1492.359	231.278	231.278	-.----	-.----	-.----	-.----		
460.000	1473.086	1516.532	249.764	249.764	-.----	-.----	-.----	-.----		
470.000	1490.017	1539.951	267.734	267.734	-.----	-.----	-.----	-.----		
480.000	1505.946	1562.664	285.196	285.196	-.----	-.----	-.----	-.----		
490.000	1520.941	1584.713	302.157	302.157	-.----	-.----	-.----	-.----		
500.000	1535.060	1606.140	318.626	318.626	-.----	-.----	-.----	-.----		
510.000	-.----	-.----	334.611	334.611	-.----	-.----	-.----	-.----		
520.000	-.----	-.----	350.124	350.124	-.----	-.----	-.----	-.----		
530.000	-.----	-.----	365.175	365.175	-.----	-.----	-.----	-.----		
540.000	-.----	-.----	379.774	379.774	-.----	-.----	-.----	-.----		
550.000	1594.321	1705.100	393.932	393.932	-.----	-.----	-.----	-.----		
560.000	-.----	-.----	407.662	407.662	-.----	-.----	-.----	-.----		
570.000	-.----	-.----	420.974	420.974	-.----	-.----	-.----	-.----		
580.000	-.----	-.----	433.881	433.881	-.----	-.----	-.----	-.----		
582.310	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
583.000	-.----	-.----	-.----	-.----	0.262	0.262	-.----	-.----		
584.000	-.----	-.----	-.----	-.----	0.647	0.647	-.----	-.----		
585.000	-.----	-.----	-.----	-.----	1.035	1.035	-.----	-.----		
586.000	-.----	-.----	-.----	-.----	1.426	1.426	-.----	-.----		
587.000	-.----	-.----	-.----	-.----	1.819	1.819	-.----	-.----		

Dy, Dysprosium

A = 162.500

Z = 66

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.087		6.174		12.348		15.435			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
588.000	-.----	-.----	-.----	-.----	2.216	2.216	-.----	-.----		
589.000	-.----	-.----	-.----	-.----	2.615	2.615	-.----	-.----		
590.000	-.----	-.----	446.393	446.419	3.017	3.017	-.----	-.----		
595.000	-.----	-.----	-.----	-.----	5.066	5.066	-.----	-.----		
600.000	1638.443	1792.896	458.521	458.663	7.178	7.178	-.----	-.----		
605.000	-.----	-.----	-.----	-.----	9.347	9.347	-.----	-.----		
610.000	-.----	-.----	470.277	470.626	11.571	11.571	-.----	-.----		
615.000	-.----	-.----	-.----	-.----	13.844	13.844	-.----	-.----		
620.000	-.----	-.----	481.673	482.322	16.164	16.164	-.----	-.----		
625.000	-.----	-.----	-.----	-.----	18.527	18.527	-.----	-.----		
630.000	-.----	-.----	492.718	493.761	20.929	20.929	-.----	-.----		
635.000	-.----	-.----	-.----	-.----	23.367	23.367	-.----	-.----		
640.000	-.----	-.----	503.423	504.954	25.838	25.838	-.----	-.----		
650.000	1671.270	1872.020	513.799	515.910	30.870	30.870	-.----	-.----		
660.000	-.----	-.----	523.855	526.641	36.003	36.003	-.----	-.----		
670.000	-.----	-.----	533.603	537.153	41.218	41.218	-.----	-.----		
680.000	-.----	-.----	543.051	547.456	46.497	46.497	-.----	-.----		
684.360	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
685.000	-.----	-.----	-.----	-.----	-.----	-.----	0.136	0.136		
686.000	-.----	-.----	-.----	-.----	-.----	-.----	0.352	0.352		
687.000	-.----	-.----	-.----	-.----	-.----	-.----	0.570	0.570		
688.000	-.----	-.----	-.----	-.----	-.----	-.----	0.790	0.790		
689.000	-.----	-.----	-.----	-.----	-.----	-.----	1.013	1.013		
690.000	-.----	-.----	552.208	557.557	51.826	51.826	1.237	1.237		
695.000	-.----	-.----	-.----	-.----	-.----	-.----	2.391	2.391		
700.000	1695.532	1944.232	561.084	567.465	57.191	57.191	3.596	3.596		
705.000	-.----	-.----	-.----	-.----	-.----	-.----	4.847	4.847		
710.000	-.----	-.----	-.----	-.----	62.580	62.580	6.144	6.144		
715.000	-.----	-.----	-.----	-.----	-.----	-.----	7.483	7.483		
720.000	-.----	-.----	-.----	-.----	67.981	67.981	8.861	8.861		
725.000	-.----	-.----	-.----	-.----	-.----	-.----	10.277	10.277		
730.000	-.----	-.----	-.----	-.----	73.384	73.384	11.728	11.728		
735.000	-.----	-.----	-.----	-.----	-.----	-.----	13.213	13.213		
740.000	-.----	-.----	-.----	-.----	78.781	78.781	14.728	14.728		
750.000	1713.210	2010.806	601.549	614.337	84.163	84.163	17.844	17.844		
760.000	-.----	-.----	-.----	-.----	89.525	89.525	21.062	21.062		

Dy, Dysprosium

A = 162.500

Z = 66

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.087		6.174		12.348		15.435			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
770.000	-----	-----	-----	-----	94.858	94.858	24.369	24.369		
780.000	-----	-----	-----	-----	100.158	100.158	27.753	27.753		
790.000	-----	-----	-----	-----	105.419	105.419	31.202	31.202		
800.000	1725.772	2072.694	636.205	657.301	110.638	110.638	34.706	34.706		
810.000	-----	-----	-----	-----	115.810	115.810	38.256	38.256		
820.000	-----	-----	-----	-----	120.932	120.932	41.845	41.845		
830.000	-----	-----	-----	-----	126.001	126.001	45.462	45.462		
840.000	-----	-----	-----	-----	131.014	131.014	49.103	49.103		
850.000	1734.324	2130.621	665.911	696.960	135.970	135.970	52.761	52.761		
860.000	-----	-----	-----	-----	140.865	140.865	56.428	56.428		
870.000	-----	-----	-----	-----	145.699	145.699	60.101	60.101		
880.000	-----	-----	-----	-----	150.471	150.471	63.775	63.775		
890.000	-----	-----	-----	-----	155.178	155.178	67.444	67.444		
900.000	1739.712	2185.150	691.395	733.795	159.821	159.821	71.106	71.106		
910.000	-----	-----	-----	-----	-----	-----	74.756	74.756		
920.000	-----	-----	-----	-----	-----	-----	78.391	78.391		
930.000	-----	-----	-----	-----	-----	-----	82.007	82.007		
940.000	-----	-----	-----	-----	-----	-----	85.604	85.604		
950.000	1742.588	2236.727	713.271	768.189	182.040	182.040	89.177	89.177		
960.000	-----	-----	-----	-----	-----	-----	92.725	92.725		
970.000	-----	-----	-----	-----	-----	-----	96.245	96.245		
980.000	-----	-----	-----	-----	-----	-----	99.737	99.737		
990.000	-----	-----	-----	-----	-----	-----	103.198	103.198		
1000.000	1743.463	2285.712	732.054	800.454	202.591	202.750	106.627	106.627		
1050.000	1742.741	2332.400	748.181	830.847	221.506	222.194	123.256	123.256		
1100.000	1740.740	2377.032	762.020	859.581	238.855	240.507	138.954	138.954		
1150.000	1737.719	2419.812	773.883	886.836	254.729	257.803	153.678	153.754		
1200.000	1733.882	2460.912	784.036	912.763	269.229	274.182	167.422	167.776		
1250.000	1729.398	2500.480	792.704	937.491	282.457	289.732	180.205	181.090		
1300.000	1724.403	2538.642	800.082	961.133	294.515	304.526	192.066	193.757		
1350.000	1719.007	2575.509	806.336	983.783	305.500	318.633	203.048	205.832		
1400.000	1713.304	2611.178	811.607	1005.527	315.503	332.109	213.203	217.364		
1450.000	1707.367	2645.735	816.020	1026.437	324.609	345.007	222.583	228.395		
1500.000	1701.258	2679.254	819.679	1046.579	332.896	357.373	231.239	238.964		

Ho, Holmium

A = 164.930

Z = 67

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->				T _d					
	T _s 3.251	2T _s 6.502	4T _s 13.004	5T _s 16.255						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
203.670	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
204.000	4.503	4.503	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
205.000	18.342	18.342	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
206.000	32.002	32.002	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
207.000	45.487	45.487	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
208.000	58.801	58.801	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
209.000	71.946	71.946	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
210.000	84.927	84.927	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
215.000	147.487	147.487	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
220.000	206.416	206.416	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
225.000	262.056	262.056	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
230.000	314.702	314.702	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
235.000	364.611	364.611	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
240.000	412.008	412.008	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
245.000	457.092	457.092	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
250.000	500.038	500.038	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
255.000	541.003	541.003	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
260.000	580.125	580.125	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
270.000	653.330	653.330	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
280.000	720.511	720.511	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
290.000	782.375	782.375	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
300.000	839.512	839.512	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
310.000	892.417	892.417	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
320.000	941.515	941.515	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
330.000	987.168	987.168	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
340.000	1029.694	1029.694	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
350.000	1069.369	1069.369	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
360.000	1106.437	1106.437	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
361.010	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---
362.000	-.---	-.---	2.090	2.090	-.---	-.---	-.---	-.---	-.---	-.---
363.000	-.---	-.---	4.203	4.203	-.---	-.---	-.---	-.---	-.---	-.---
364.000	-.---	-.---	6.315	6.315	-.---	-.---	-.---	-.---	-.---	-.---
365.000	-.---	-.---	8.426	8.426	-.---	-.---	-.---	-.---	-.---	-.---
366.000	-.---	-.---	10.535	10.535	-.---	-.---	-.---	-.---	-.---	-.---
367.000	-.---	-.---	12.642	12.642	-.---	-.---	-.---	-.---	-.---	-.---

Ho, Holmium

A = 164.930

Z = 67

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.251		6.502		13.004		16.255			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
368.000	-.----	-.----	14.748	14.748	-.----	-.----	-.----	-.----		
369.000	-.----	-.----	16.852	16.852	-.----	-.----	-.----	-.----		
370.000	1141.113	1141.403	18.955	18.955	-.----	-.----	-.----	-.----		
375.000	-.----	-.----	29.439	29.439	-.----	-.----	-.----	-.----		
380.000	1173.588	1174.850	39.871	39.871	-.----	-.----	-.----	-.----		
385.000	-.----	-.----	50.246	50.246	-.----	-.----	-.----	-.----		
390.000	1204.035	1206.898	60.557	60.557	-.----	-.----	-.----	-.----		
395.000	-.----	-.----	70.800	70.800	-.----	-.----	-.----	-.----		
400.000	1232.608	1237.652	80.970	80.970	-.----	-.----	-.----	-.----		
405.000	-.----	-.----	91.062	91.062	-.----	-.----	-.----	-.----		
410.000	1259.446	1267.207	101.072	101.072	-.----	-.----	-.----	-.----		
415.000	-.----	-.----	110.996	110.996	-.----	-.----	-.----	-.----		
420.000	1284.673	1295.649	120.832	120.832	-.----	-.----	-.----	-.----		
430.000	1308.405	1323.056	140.228	140.228	-.----	-.----	-.----	-.----		
440.000	1330.744	1349.499	159.238	159.238	-.----	-.----	-.----	-.----		
450.000	1351.786	1375.043	177.848	177.848	-.----	-.----	-.----	-.----		
460.000	1371.617	1399.746	196.047	196.047	-.----	-.----	-.----	-.----		
470.000	1390.316	1423.661	213.827	213.827	-.----	-.----	-.----	-.----		
480.000	1407.956	1446.839	231.183	231.183	-.----	-.----	-.----	-.----		
490.000	1424.604	1469.324	248.113	248.113	-.----	-.----	-.----	-.----		
500.000	1440.323	1491.158	264.616	264.616	-.----	-.----	-.----	-.----		
510.000	-.----	-.----	280.694	280.694	-.----	-.----	-.----	-.----		
520.000	-.----	-.----	296.350	296.350	-.----	-.----	-.----	-.----		
530.000	-.----	-.----	311.588	311.588	-.----	-.----	-.----	-.----		
540.000	-.----	-.----	326.414	326.414	-.----	-.----	-.----	-.----		
550.000	1506.817	1591.784	340.833	340.833	-.----	-.----	-.----	-.----		
560.000	-.----	-.----	354.852	354.852	-.----	-.----	-.----	-.----		
570.000	-.----	-.----	368.480	368.480	-.----	-.----	-.----	-.----		
580.000	-.----	-.----	381.723	381.723	-.----	-.----	-.----	-.----		
590.000	-.----	-.----	394.591	394.591	-.----	-.----	-.----	-.----		
600.000	1557.052	1680.737	407.091	407.091	-.----	-.----	-.----	-.----		
610.000	-.----	-.----	419.232	419.232	-.----	-.----	-.----	-.----		
611.350	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
612.000	-.----	-.----	-.----	-.----	0.218	0.218	-.----	-.----		
613.000	-.----	-.----	-.----	-.----	0.560	0.560	-.----	-.----		

Ho, Holmium

A = 164.930

Z = 67

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->						
Displacement	T _s		2T _s		4T _s		5T _s		T _d		
Energy(eV)=	3.251		6.502		13.004		16.255				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
614.000	-.----	-.----	-.----	-.----	0.904	0.904	-.----	-.----			
615.000	-.----	-.----	-.----	-.----	1.251	1.251	-.----	-.----			
616.000	-.----	-.----	-.----	-.----	1.601	1.601	-.----	-.----			
617.000	-.----	-.----	-.----	-.----	1.953	1.953	-.----	-.----			
618.000	-.----	-.----	-.----	-.----	2.309	2.309	-.----	-.----			
619.000	-.----	-.----	-.----	-.----	2.667	2.667	-.----	-.----			
620.000	-.----	-.----	431.023	431.052	3.028	3.028	-.----	-.----			
625.000	-.----	-.----	-.----	-.----	4.870	4.870	-.----	-.----			
630.000	-.----	-.----	442.473	442.608	6.775	6.775	-.----	-.----			
635.000	-.----	-.----	-.----	-.----	8.736	8.736	-.----	-.----			
640.000	-.----	-.----	453.591	453.912	10.752	10.752	-.----	-.----			
645.000	-.----	-.----	-.----	-.----	12.818	12.818	-.----	-.----			
650.000	1595.057	1760.628	464.385	464.973	14.931	14.931	-.----	-.----			
655.000	-.----	-.----	-.----	-.----	17.087	17.087	-.----	-.----			
660.000	-.----	-.----	474.864	475.802	19.283	19.283	-.----	-.----			
665.000	-.----	-.----	-.----	-.----	21.516	21.516	-.----	-.----			
670.000	-.----	-.----	485.036	486.408	23.784	23.784	-.----	-.----			
675.000	-.----	-.----	-.----	-.----	26.084	26.084	-.----	-.----			
680.000	-.----	-.----	494.911	496.798	28.413	28.413	-.----	-.----			
690.000	-.----	-.----	504.496	506.982	33.149	33.149	-.----	-.----			
700.000	1623.717	1833.302	513.800	516.967	37.975	37.975	-.----	-.----			
710.000	-.----	-.----	-.----	-.----	42.873	42.873	-.----	-.----			
717.540	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
718.000	-.----	-.----	-.----	-.----	-.----	-.----	0.086	0.086			
719.000	-.----	-.----	-.----	-.----	-.----	-.----	0.278	0.278			
720.000	-.----	-.----	-.----	-.----	47.829	47.829	0.471	0.471			
725.000	-.----	-.----	-.----	-.----	-.----	-.----	1.469	1.469			
730.000	-.----	-.----	-.----	-.----	52.831	52.831	2.518	2.518			
735.000	-.----	-.----	-.----	-.----	-.----	-.----	3.614	3.614			
740.000	-.----	-.----	-.----	-.----	57.865	57.865	4.756	4.756			
745.000	-.----	-.----	-.----	-.----	-.----	-.----	5.941	5.941			
750.000	1645.147	1900.103	556.379	564.154	62.922	62.922	7.166	7.166			
755.000	-.----	-.----	-.----	-.----	-.----	-.----	8.429	8.429			
760.000	-.----	-.----	-.----	-.----	67.990	67.990	9.729	9.729			
765.000	-.----	-.----	-.----	-.----	-.----	-.----	11.063	11.063			

Ho, Holmium

A = 164.930

Z = 67

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	3.251		6.502		13.004		16.255			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
770.000	-.----	-.----	-.----	-.----	73.062	73.062	12.429	12.429		
775.000	-.----	-.----	-.----	-.----	-.----	-.----	13.825	13.825		
780.000	-.----	-.----	-.----	-.----	78.130	78.130	15.250	15.250		
790.000	-.----	-.----	-.----	-.----	83.186	83.186	18.179	18.179		
800.000	1660.922	1962.030	593.061	607.328	88.225	88.225	21.202	21.202		
810.000	-.----	-.----	-.----	-.----	93.240	93.240	24.308	24.308		
820.000	-.----	-.----	-.----	-.----	98.226	98.226	27.486	27.486		
830.000	-.----	-.----	-.----	-.----	103.179	103.179	30.725	30.725		
840.000	-.----	-.----	-.----	-.----	108.095	108.095	34.018	34.018		
850.000	1672.237	2019.846	624.672	647.110	112.970	112.970	37.354	37.354		
860.000	-.----	-.----	-.----	-.----	117.801	117.801	40.728	40.728		
870.000	-.----	-.----	-.----	-.----	122.586	122.586	44.131	44.131		
880.000	-.----	-.----	-.----	-.----	127.321	127.321	47.558	47.558		
890.000	-.----	-.----	-.----	-.----	132.004	132.004	51.002	51.002		
900.000	1680.008	2074.146	651.924	683.994	136.635	136.635	54.459	54.459		
910.000	-.----	-.----	-.----	-.----	-.----	-.----	57.922	57.922		
920.000	-.----	-.----	-.----	-.----	-.----	-.----	61.388	61.388		
930.000	-.----	-.----	-.----	-.----	-.----	-.----	64.853	64.853		
940.000	-.----	-.----	-.----	-.----	-.----	-.----	68.313	68.313		
950.000	1684.948	2125.400	675.426	718.376	158.940	158.940	71.764	71.764		
960.000	-.----	-.----	-.----	-.----	-.----	-.----	75.203	75.203		
970.000	-.----	-.----	-.----	-.----	-.----	-.----	78.628	78.628		
980.000	-.----	-.----	-.----	-.----	-.----	-.----	82.036	82.036		
990.000	-.----	-.----	-.----	-.----	-.----	-.----	85.424	85.424		
1000.000	1687.616	2173.984	695.699	750.578	179.760	179.763	88.791	88.791		
1050.000	1688.456	2220.208	713.184	780.865	199.064	199.243	105.243	105.243		
1100.000	1687.821	2264.327	728.261	809.458	216.878	217.571	120.943	120.943		
1150.000	1685.996	2306.553	741.249	836.541	233.261	234.866	135.793	135.793		
1200.000	1683.211	2347.067	752.425	862.271	248.292	251.229	149.752	149.821		
1250.000	1679.653	2386.023	762.023	886.781	262.059	266.747	162.812	163.130		
1300.000	1675.475	2423.553	770.246	910.187	274.652	281.499	174.989	175.782		
1350.000	1670.803	2459.772	777.268	932.587	286.160	295.551	186.313	187.834		
1400.000	1665.739	2494.780	783.238	954.068	296.670	308.963	196.823	199.334		
1450.000	1660.369	2528.666	788.286	974.706	306.264	321.788	206.563	210.326		
1500.000	1654.764	2561.508	792.525	994.566	315.016	334.072	215.580	220.849		

Er, Erbium

A = 167.800

Z = 68

Displacement Energy(eV)=	-----Surface Sputtering Regime----- <-----Bulk Displacement Regime----->								T _d	
	T _s 3.290		2T _s 6.580		4T _s 13.160		5T _s 16.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
208.830	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
209.000	2.313	2.313	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
210.000	15.794	15.794	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
215.000	80.767	80.767	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
220.000	141.978	141.978	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
225.000	199.786	199.786	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
230.000	254.501	254.501	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
235.000	306.392	306.392	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
240.000	355.695	355.695	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
245.000	402.615	402.615	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
250.000	447.334	447.334	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
255.000	490.015	490.015	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
260.000	530.800	530.800	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
270.000	607.187	607.187	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
280.000	677.377	677.377	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
290.000	742.095	742.095	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
300.000	801.942	801.942	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
310.000	857.424	857.424	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
320.000	908.974	908.974	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
330.000	956.963	956.963	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
340.000	1001.714	1001.714	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
350.000	1043.508	1043.508	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
360.000	1082.595	1082.595	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
369.440	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---
370.000	1119.195	1119.196	1.141	1.141	-.---	-.---	-.---	-.---	-.---	-.---
371.000	-.---	-.---	3.202	3.202	-.---	-.---	-.---	-.---	-.---	-.---
372.000	-.---	-.---	5.263	5.263	-.---	-.---	-.---	-.---	-.---	-.---
373.000	-.---	-.---	7.323	7.323	-.---	-.---	-.---	-.---	-.---	-.---
374.000	-.---	-.---	9.383	9.383	-.---	-.---	-.---	-.---	-.---	-.---
375.000	-.---	-.---	11.442	11.442	-.---	-.---	-.---	-.---	-.---	-.---
376.000	-.---	-.---	13.500	13.500	-.---	-.---	-.---	-.---	-.---	-.---
377.000	-.---	-.---	15.558	15.558	-.---	-.---	-.---	-.---	-.---	-.---
378.000	-.---	-.---	17.615	17.615	-.---	-.---	-.---	-.---	-.---	-.---
379.000	-.---	-.---	19.671	19.671	-.---	-.---	-.---	-.---	-.---	-.---
380.000	1153.503	1153.885	21.725	21.725	-.---	-.---	-.---	-.---	-.---	-.---

Er, Erbium

A = 167.800

Z = 68

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->											T _d	
Displacement	T _s		2T _s		4T _s		5T _s					
Energy(eV)=	3.290		6.580		13.160		16.450					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)		
385.000	-.----	-.----	31.983	31.983	-.----	-.----	-.----	-.----	-.----	-.----		
390.000	1185.697	1187.109	42.207	42.207	-.----	-.----	-.----	-.----	-.----	-.----		
395.000	-.----	-.----	52.390	52.390	-.----	-.----	-.----	-.----	-.----	-.----		
400.000	1215.933	1218.978	62.526	62.526	-.----	-.----	-.----	-.----	-.----	-.----		
405.000	-.----	-.----	72.607	72.607	-.----	-.----	-.----	-.----	-.----	-.----		
410.000	1244.356	1249.589	82.629	82.629	-.----	-.----	-.----	-.----	-.----	-.----		
415.000	-.----	-.----	92.587	92.587	-.----	-.----	-.----	-.----	-.----	-.----		
420.000	1271.094	1279.034	102.475	102.475	-.----	-.----	-.----	-.----	-.----	-.----		
425.000	-.----	-.----	112.289	112.289	-.----	-.----	-.----	-.----	-.----	-.----		
430.000	1296.265	1307.393	122.026	122.026	-.----	-.----	-.----	-.----	-.----	-.----		
435.000	-.----	-.----	131.682	131.682	-.----	-.----	-.----	-.----	-.----	-.----		
440.000	1319.975	1334.742	141.253	141.253	-.----	-.----	-.----	-.----	-.----	-.----		
450.000	1342.324	1361.146	160.133	160.133	-.----	-.----	-.----	-.----	-.----	-.----		
460.000	1363.400	1386.669	178.646	178.646	-.----	-.----	-.----	-.----	-.----	-.----		
470.000	1383.285	1411.367	196.777	196.777	-.----	-.----	-.----	-.----	-.----	-.----		
480.000	1402.056	1435.290	214.515	214.515	-.----	-.----	-.----	-.----	-.----	-.----		
490.000	1419.782	1458.486	231.853	231.853	-.----	-.----	-.----	-.----	-.----	-.----		
500.000	1436.527	1480.999	248.785	248.785	-.----	-.----	-.----	-.----	-.----	-.----		
510.000	-.----	-.----	265.310	265.310	-.----	-.----	-.----	-.----	-.----	-.----		
520.000	-.----	-.----	281.425	281.425	-.----	-.----	-.----	-.----	-.----	-.----		
530.000	-.----	-.----	297.133	297.133	-.----	-.----	-.----	-.----	-.----	-.----		
540.000	-.----	-.----	312.436	312.436	-.----	-.----	-.----	-.----	-.----	-.----		
550.000	1507.478	1584.606	327.338	327.338	-.----	-.----	-.----	-.----	-.----	-.----		
560.000	-.----	-.----	341.843	341.843	-.----	-.----	-.----	-.----	-.----	-.----		
570.000	-.----	-.----	355.958	355.958	-.----	-.----	-.----	-.----	-.----	-.----		
580.000	-.----	-.----	369.688	369.688	-.----	-.----	-.----	-.----	-.----	-.----		
590.000	-.----	-.----	383.040	383.040	-.----	-.----	-.----	-.----	-.----	-.----		
600.000	1561.221	1675.978	396.021	396.021	-.----	-.----	-.----	-.----	-.----	-.----		
610.000	-.----	-.----	408.640	408.640	-.----	-.----	-.----	-.----	-.----	-.----		
620.000	-.----	-.----	420.904	420.904	-.----	-.----	-.----	-.----	-.----	-.----		
624.450	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
625.000	-.----	-.----	-.----	-.----	0.182	0.182	-.----	-.----	-.----	-.----		
626.000	-.----	-.----	-.----	-.----	0.515	0.515	-.----	-.----	-.----	-.----		
627.000	-.----	-.----	-.----	-.----	0.852	0.852	-.----	-.----	-.----	-.----		
628.000	-.----	-.----	-.----	-.----	1.191	1.191	-.----	-.----	-.----	-.----		

Er, Erbium

A = 167.800

Z = 68

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	3.290		6.580		13.160		16.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
629.000	-.----	-.----	-.----	-.----	1.533	1.533	-.----	-.----		
630.000	-.----	-.----	432.821	432.832	1.878	1.878	-.----	-.----		
635.000	-.----	-.----	-.----	-.----	3.644	3.644	-.----	-.----		
640.000	-.----	-.----	444.399	444.489	5.477	5.477	-.----	-.----		
645.000	-.----	-.----	-.----	-.----	7.371	7.371	-.----	-.----		
650.000	1601.989	1757.860	455.647	455.893	9.324	9.324	-.----	-.----		
655.000	-.----	-.----	-.----	-.----	11.331	11.331	-.----	-.----		
660.000	-.----	-.----	466.573	467.053	13.389	13.389	-.----	-.----		
665.000	-.----	-.----	-.----	-.----	15.494	15.494	-.----	-.----		
670.000	-.----	-.----	477.185	477.979	17.643	17.643	-.----	-.----		
675.000	-.----	-.----	-.----	-.----	19.833	19.833	-.----	-.----		
680.000	-.----	-.----	487.491	488.680	22.060	22.060	-.----	-.----		
690.000	-.----	-.----	497.500	499.165	26.618	26.618	-.----	-.----		
700.000	1632.825	1832.197	507.219	509.442	31.296	31.296	-.----	-.----		
710.000	-.----	-.----	-.----	-.----	36.075	36.075	-.----	-.----		
720.000	-.----	-.----	-.----	-.----	40.936	40.936	-.----	-.----		
730.000	-.----	-.----	-.----	-.----	45.866	45.866	-.----	-.----		
732.490	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
733.000	-.----	-.----	-.----	-.----	-.----	-.----	0.094	0.094		
734.000	-.----	-.----	-.----	-.----	-.----	-.----	0.281	0.281		
735.000	-.----	-.----	-.----	-.----	-.----	-.----	0.470	0.470		
736.000	-.----	-.----	-.----	-.----	-.----	-.----	0.662	0.662		
737.000	-.----	-.----	-.----	-.----	-.----	-.----	0.855	0.855		
738.000	-.----	-.----	-.----	-.----	-.----	-.----	1.051	1.051		
739.000	-.----	-.----	-.----	-.----	-.----	-.----	1.249	1.249		
740.000	-.----	-.----	-.----	-.----	50.850	50.850	1.448	1.448		
745.000	-.----	-.----	-.----	-.----	-.----	-.----	2.478	2.478		
750.000	1655.963	1900.400	551.745	557.962	55.876	55.876	3.556	3.556		
755.000	-.----	-.----	-.----	-.----	-.----	-.----	4.681	4.681		
760.000	-.----	-.----	-.----	-.----	60.931	60.931	5.849	5.849		
765.000	-.----	-.----	-.----	-.----	-.----	-.----	7.059	7.059		
770.000	-.----	-.----	-.----	-.----	66.006	66.006	8.309	8.309		
775.000	-.----	-.----	-.----	-.----	-.----	-.----	9.595	9.595		
780.000	-.----	-.----	-.----	-.----	71.091	71.091	10.916	10.916		
785.000	-.----	-.----	-.----	-.----	-.----	-.----	12.271	12.271		

Er, Erbium

A=167.800

Z=68

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.290		6.580		13.160		16.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
790.000	-.----	-.----	-.----	-.----	76.177	76.177	13.656	13.656		
795.000	-.----	-.----	-.----	-.----	-.----	-.----	15.071	15.071		
800.000	1673.073	1963.524	590.161	602.286	81.258	81.258	16.514	16.514		
810.000	-.----	-.----	-.----	-.----	86.326	86.326	19.476	19.476		
820.000	-.----	-.----	-.----	-.----	91.375	91.375	22.529	22.529		
830.000	-.----	-.----	-.----	-.----	96.400	96.400	25.663	25.663		
840.000	-.----	-.----	-.----	-.----	101.396	101.396	28.867	28.867		
850.000	1685.424	2022.370	623.302	643.069	106.358	106.358	32.130	32.130		
860.000	-.----	-.----	-.----	-.----	111.282	111.282	35.445	35.445		
870.000	-.----	-.----	-.----	-.----	116.166	116.166	38.803	38.803		
880.000	-.----	-.----	-.----	-.----	121.005	121.005	42.197	42.197		
890.000	-.----	-.----	-.----	-.----	125.798	125.798	45.620	45.620		
900.000	1693.991	2077.562	651.894	680.829	130.541	130.541	49.065	49.065		
910.000	-.----	-.----	-.----	-.----	-.----	-.----	52.528	52.528		
920.000	-.----	-.----	-.----	-.----	-.----	-.----	56.001	56.001		
930.000	-.----	-.----	-.----	-.----	-.----	-.----	59.482	59.482		
940.000	-.----	-.----	-.----	-.----	-.----	-.----	62.965	62.965		
950.000	1699.533	2129.595	676.567	715.981	153.456	153.456	66.447	66.447		
960.000	-.----	-.----	-.----	-.----	-.----	-.----	69.923	69.923		
970.000	-.----	-.----	-.----	-.----	-.----	-.----	73.391	73.391		
980.000	-.----	-.----	-.----	-.----	-.----	-.----	76.847	76.847		
990.000	-.----	-.----	-.----	-.----	-.----	-.----	80.288	80.288		
1000.000	1702.644	2178.865	697.857	748.864	174.928	174.928	83.712	83.712		
1010.000	-.----	-.----	-.----	-.----	-.----	-.----	87.117	87.117		
1020.000	-.----	-.----	-.----	-.----	-.----	-.----	90.501	90.501		
1030.000	-.----	-.----	-.----	-.----	-.----	-.----	93.861	93.861		
1040.000	-.----	-.----	-.----	-.----	-.----	-.----	97.197	97.197		
1050.000	1703.799	2225.695	716.225	779.757	194.894	194.966	100.505	100.505		
1060.000	-.----	-.----	-.----	-.----	-.----	-.----	103.786	103.786		
1070.000	-.----	-.----	-.----	-.----	-.----	-.----	107.038	107.038		
1080.000	-.----	-.----	-.----	-.----	-.----	-.----	110.260	110.260		
1090.000	-.----	-.----	-.----	-.----	-.----	-.----	113.450	113.450		
1100.000	1703.375	2270.353	732.065	808.890	213.360	213.795	116.608	116.608		
1150.000	1701.675	2313.061	745.711	836.459	230.371	231.544	131.896	131.896		
1200.000	1698.945	2354.007	757.453	862.625	246.000	248.319	146.306	146.325		

Er, Erbium

A=167.800

Z=68

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	3.290		6.580		13.160		16.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1250.000	1695.385	2393.353	767.537	887.530	260.328	264.214	159.818	159.995		
1300.000	1691.158	2431.235	776.174	911.293	273.446	279.309	172.438	172.979		
1350.000	1686.399	2467.774	783.548	934.019	285.441	293.675	184.190	185.335		
1400.000	1681.217	2503.073	789.816	955.796	296.400	307.376	195.110	197.115		
1450.000	1675.705	2537.225	795.115	976.705	306.407	320.466	205.238	208.365		
1500.000	1669.938	2570.312	799.563	996.815	315.539	332.996	214.620	219.128		

Tm, Thullium

A=168.934

Z=69

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				> <-----Bulk Displacement Regime----->				T _d	
	T _s	2T _s	4T _s	5T _s						
	2.514	5.028	10.056	12.570						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
166.390	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
167.000	18.006	18.006	-.----	-.----	-.----	-.----	-.----	-.----		
168.000	47.061	47.061	-.----	-.----	-.----	-.----	-.----	-.----		
169.000	75.571	75.571	-.----	-.----	-.----	-.----	-.----	-.----		
170.000	103.553	103.553	-.----	-.----	-.----	-.----	-.----	-.----		
175.000	236.034	236.034	-.----	-.----	-.----	-.----	-.----	-.----		
180.000	357.318	357.318	-.----	-.----	-.----	-.----	-.----	-.----		
185.000	468.801	468.801	-.----	-.----	-.----	-.----	-.----	-.----		
190.000	571.646	571.646	-.----	-.----	-.----	-.----	-.----	-.----		
195.000	666.838	666.838	-.----	-.----	-.----	-.----	-.----	-.----		
200.000	755.211	755.211	-.----	-.----	-.----	-.----	-.----	-.----		
205.000	837.478	837.478	-.----	-.----	-.----	-.----	-.----	-.----		
210.000	914.251	914.251	-.----	-.----	-.----	-.----	-.----	-.----		
215.000	986.060	986.060	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	1053.364	1053.364	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	1176.023	1176.023	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	1284.902	1284.902	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	1382.100	1382.100	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	1469.292	1469.292	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	1547.837	1547.837	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	1618.848	1618.848	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	1683.249	1683.249	-.----	-.----	-.----	-.----	-.----	-.----		
299.300	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
300.000	1741.818	1741.822	3.065	3.065	-.----	-.----	-.----	-.----		
301.000	-.----	-.----	7.447	7.447	-.----	-.----	-.----	-.----		
302.000	-.----	-.----	11.811	11.811	-.----	-.----	-.----	-.----		
303.000	-.----	-.----	16.156	16.156	-.----	-.----	-.----	-.----		
304.000	-.----	-.----	20.483	20.483	-.----	-.----	-.----	-.----		
305.000	-.----	-.----	24.791	24.791	-.----	-.----	-.----	-.----		
306.000	-.----	-.----	29.082	29.082	-.----	-.----	-.----	-.----		
307.000	-.----	-.----	33.355	33.355	-.----	-.----	-.----	-.----		
308.000	-.----	-.----	37.610	37.610	-.----	-.----	-.----	-.----		
309.000	-.----	-.----	41.847	41.847	-.----	-.----	-.----	-.----		
310.000	1795.210	1796.193	46.067	46.067	-.----	-.----	-.----	-.----		
315.000	-.----	-.----	66.907	66.907	-.----	-.----	-.----	-.----		

Tm, Thullium

A = 168.934

Z = 69

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.514		5.028		10.056		12.570			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
320.000	1843.986	1847.509	87.327	87.327	-----	-----	-----	-----		
325.000	-----	-----	107.337	107.337	-----	-----	-----	-----		
330.000	1888.631	1896.063	126.951	126.951	-----	-----	-----	-----		
335.000	-----	-----	146.177	146.177	-----	-----	-----	-----		
340.000	1929.560	1942.109	165.026	165.026	-----	-----	-----	-----		
345.000	-----	-----	183.507	183.507	-----	-----	-----	-----		
350.000	1967.138	1985.874	201.627	201.627	-----	-----	-----	-----		
355.000	-----	-----	219.395	219.395	-----	-----	-----	-----		
360.000	2001.683	2027.560	236.817	236.817	-----	-----	-----	-----		
370.000	2033.476	2067.344	270.656	270.656	-----	-----	-----	-----		
380.000	2062.765	2105.387	303.196	303.196	-----	-----	-----	-----		
390.000	2089.770	2141.828	334.488	334.488	-----	-----	-----	-----		
400.000	2114.686	2176.797	364.580	364.580	-----	-----	-----	-----		
410.000	2137.689	2210.406	393.518	393.518	-----	-----	-----	-----		
420.000	2158.936	2242.759	421.345	421.345	-----	-----	-----	-----		
430.000	2178.567	2273.948	448.105	448.105	-----	-----	-----	-----		
440.000	2196.711	2304.056	473.837	473.837	-----	-----	-----	-----		
450.000	2213.482	2333.159	498.582	498.582	-----	-----	-----	-----		
460.000	2228.985	2361.326	522.378	522.378	-----	-----	-----	-----		
470.000	2243.314	2388.619	545.261	545.261	-----	-----	-----	-----		
480.000	2256.556	2415.095	567.268	567.268	-----	-----	-----	-----		
490.000	2268.790	2440.806	588.434	588.434	-----	-----	-----	-----		
500.000	2280.087	2465.799	608.790	608.790	-----	-----	-----	-----		
510.000	-----	-----	628.370	628.370	-----	-----	-----	-----		
514.690	-----	-----	-----	-----	0.000	0.000	-----	-----		
515.000	-----	-----	-----	-----	0.209	0.209	-----	-----		
516.000	-----	-----	-----	-----	0.904	0.904	-----	-----		
517.000	-----	-----	-----	-----	1.603	1.603	-----	-----		
518.000	-----	-----	-----	-----	2.306	2.306	-----	-----		
519.000	-----	-----	-----	-----	3.013	3.013	-----	-----		
520.000	-----	-----	647.204	647.229	3.723	3.723	-----	-----		
525.000	-----	-----	-----	-----	7.331	7.331	-----	-----		
530.000	-----	-----	665.322	665.532	11.022	11.022	-----	-----		
535.000	-----	-----	-----	-----	14.792	14.792	-----	-----		
540.000	-----	-----	682.753	683.325	18.632	18.632	-----	-----		

Tm, Thullium

A = 168.934

Z = 69

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	2.514		5.028		10.056		12.570			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
545.000	-.----	-.----	-.----	-.----	22.536	22.536	-.----	-.----		
550.000	2324.646	2581.397	699.523	700.635	26.498	26.498	-.----	-.----		
555.000	-.----	-.----	-.----	-.----	30.512	30.512	-.----	-.----		
560.000	-.----	-.----	715.659	717.486	34.573	34.573	-.----	-.----		
565.000	-.----	-.----	-.----	-.----	38.675	38.675	-.----	-.----		
570.000	-.----	-.----	731.186	733.899	42.814	42.814	-.----	-.----		
575.000	-.----	-.----	-.----	-.----	46.986	46.986	-.----	-.----		
580.000	-.----	-.----	746.129	749.896	51.185	51.185	-.----	-.----		
590.000	-.----	-.----	760.511	765.497	59.651	59.651	-.----	-.----		
600.000	2353.694	2684.272	774.354	780.720	68.184	68.184	-.----	-.----		
606.940	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
607.000	-.----	-.----	-.----	-.----	-.----	-.----	0.023	0.023		
608.000	-.----	-.----	-.----	-.----	-.----	-.----	0.410	0.410		
609.000	-.----	-.----	-.----	-.----	-.----	-.----	0.801	0.801		
610.000	-.----	-.----	-.----	-.----	76.757	76.757	1.195	1.195		
615.000	-.----	-.----	-.----	-.----	-.----	-.----	3.212	3.212		
620.000	-.----	-.----	-.----	-.----	85.348	85.348	5.305	5.305		
625.000	-.----	-.----	-.----	-.----	-.----	-.----	7.469	7.469		
630.000	-.----	-.----	-.----	-.----	93.936	93.936	9.699	9.699		
635.000	-.----	-.----	-.----	-.----	-.----	-.----	11.991	11.991		
640.000	-.----	-.----	-.----	-.----	102.503	102.503	14.340	14.340		
645.000	-.----	-.----	-.----	-.----	-.----	-.----	16.742	16.742		
650.000	2371.606	2777.328	836.198	851.733	111.034	111.034	19.194	19.194		
655.000	-.----	-.----	-.----	-.----	-.----	-.----	21.692	21.692		
660.000	-.----	-.----	-.----	-.----	119.514	119.514	24.232	24.232		
670.000	-.----	-.----	-.----	-.----	127.933	127.933	29.426	29.426		
680.000	-.----	-.----	-.----	-.----	136.279	136.279	34.752	34.752		
690.000	-.----	-.----	-.----	-.----	144.543	144.543	40.188	40.188		
700.000	2381.398	2862.589	887.407	915.483	152.718	152.718	45.714	45.714		
710.000	-.----	-.----	-.----	-.----	160.796	160.796	51.312	51.312		
720.000	-.----	-.----	-.----	-.----	168.773	168.773	56.966	56.966		
730.000	-.----	-.----	-.----	-.----	176.643	176.643	62.660	62.660		
740.000	-.----	-.----	-.----	-.----	184.402	184.402	68.383	68.383		
750.000	2385.204	2941.512	929.878	973.316	192.046	192.046	74.122	74.122		
760.000	-.----	-.----	-.----	-.----	199.574	199.574	79.866	79.866		

Tm, Thullium

A=168.934

Z=69

Displacement Energy(eV)=		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
		T _s 2.514		2T _s 5.028		4T _s 10.056		5T _s 12.570			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
770.000	-----	-----	-----	-----	206.982	206.982	85.607	85.607			
780.000	-----	-----	-----	-----	214.269	214.269	91.334	91.334			
790.000	-----	-----	-----	-----	221.434	221.434	97.042	97.042			
800.000	2384.563	3015.171	965.138	1026.249	228.476	228.476	102.722	102.722			
810.000	-----	-----	-----	-----	-----	-----	108.369	108.369			
820.000	-----	-----	-----	-----	-----	-----	113.978	113.978			
830.000	-----	-----	-----	-----	-----	-----	119.543	119.543			
840.000	-----	-----	-----	-----	-----	-----	125.060	125.060			
850.000	2380.602	3084.382	994.421	1075.066	261.834	261.835	130.526	130.526			
860.000	-----	-----	-----	-----	-----	-----	135.937	135.937			
870.000	-----	-----	-----	-----	-----	-----	141.290	141.290			
880.000	-----	-----	-----	-----	-----	-----	146.583	146.583			
890.000	-----	-----	-----	-----	-----	-----	151.813	151.813			
900.000	2374.162	3149.772	1018.727	1120.382	292.151	292.477	156.979	156.979			
950.000	2365.876	3211.840	1038.873	1162.688	319.567	320.903	181.798	181.798			
1000.000	2356.224	3270.982	1055.527	1202.379	344.278	347.390	204.865	204.876			
1050.000	2345.574	3327.524	1069.239	1239.777	366.500	372.169	226.164	226.423			
1100.000	2334.211	3381.732	1080.464	1275.148	386.453	395.436	245.741	246.648			
1150.000	2322.355	3433.831	1089.581	1308.717	404.349	417.355	263.675	265.691			
1200.000	2310.180	3484.011	1096.906	1340.670	420.388	438.066	280.066	283.671			
1250.000	2297.818	3532.436	1102.703	1371.167	434.754	457.692	295.021	300.691			
1300.000	2285.377	3579.244	1107.195	1400.344	447.614	476.336	308.647	316.843			
1350.000	2272.938	3624.558	1110.571	1428.320	459.122	494.088	321.051	332.205			
1400.000	2260.564	3668.486	1112.991	1455.196	469.413	511.028	332.334	346.845			
1450.000	2248.307	3711.122	1114.590	1481.064	478.611	527.226	342.591	360.826			
1500.000	2236.204	3752.550	1115.485	1506.001	486.826	542.742	351.910	374.201			

Yb, Ytterbium

A=173.040

Z=70

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=		1.580	3.160			6.320	7.900				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
112.220	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
113.000	82.112	82.112	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
114.000	185.500	185.500	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
115.000	285.461	285.461	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
116.000	382.148	382.148	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
117.000	475.704	475.704	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
118.000	566.266	566.266	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
119.000	653.963	653.963	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
120.000	738.916	738.916	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
125.000	1126.355	1126.355	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
130.000	1460.173	1460.173	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	1749.942	1749.942	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	2003.154	2003.154	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	2225.736	2225.736	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	2422.436	2422.436	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	2597.089	2597.089	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	2752.829	2752.829	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	2892.235	2892.235	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	3017.448	3017.448	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	3130.260	3130.260	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	3232.180	3232.180	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	3408.283	3408.283	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	3553.939	3553.939	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
207.120	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
208.000	-.----	-.----	13.429	13.429	-.----	-.----	-.----	-.----	-.----	-.----	
209.000	-.----	-.----	28.645	28.645	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	3675.233	3675.584	43.670	43.670	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	-.----	-.----	116.048	116.048	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	3776.780	3783.255	184.190	184.190	-.----	-.----	-.----	-.----	-.----	-.----	
225.000	-.----	-.----	248.502	248.502	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	3862.139	3881.003	309.333	309.333	-.----	-.----	-.----	-.----	-.----	-.----	
235.000	-.----	-.----	366.988	366.988	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	3934.098	3970.226	421.732	421.732	-.----	-.----	-.----	-.----	-.----	-.----	
245.000	-.----	-.----	473.797	473.797	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	3994.869	4052.088	523.390	523.390	-.----	-.----	-.----	-.----	-.----	-.----	

Yb, Ytterbium

A=173.040

Z=70

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.580		3.160		6.320		7.900			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
255.000	-.----	-.----	570.692	570.692	-.----	-.----	-.----	-.----		
260.000	4046.230	4127.564	615.864	615.864	-.----	-.----	-.----	-.----		
270.000	4089.621	4197.477	700.384	700.384	-.----	-.----	-.----	-.----		
280.000	4126.222	4262.520	777.945	777.945	-.----	-.----	-.----	-.----		
290.000	4157.009	4323.283	849.361	849.361	-.----	-.----	-.----	-.----		
300.000	4182.793	4380.270	915.309	915.309	-.----	-.----	-.----	-.----		
310.000	4204.254	4433.911	976.358	976.358	-.----	-.----	-.----	-.----		
320.000	4221.965	4484.578	1032.996	1032.996	-.----	-.----	-.----	-.----		
330.000	4236.411	4532.590	1085.639	1085.639	-.----	-.----	-.----	-.----		
340.000	4248.008	4578.225	1134.651	1134.651	-.----	-.----	-.----	-.----		
350.000	4257.109	4621.724	1180.351	1180.351	-.----	-.----	-.----	-.----		
360.000	4264.021	4663.298	1223.018	1223.018	-.----	-.----	-.----	-.----		
366.660	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
367.000	-.----	-.----	-.----	-.----	0.791	0.791	-.----	-.----		
368.000	-.----	-.----	-.----	-.----	3.139	3.139	-.----	-.----		
369.000	-.----	-.----	-.----	-.----	5.487	5.487	-.----	-.----		
370.000	4269.006	4703.132	1262.900	1262.945	7.834	7.834	-.----	-.----		
375.000	-.----	-.----	-.----	-.----	19.552	19.552	-.----	-.----		
380.000	4272.295	4741.386	1300.220	1300.914	31.239	31.239	-.----	-.----		
385.000	-.----	-.----	-.----	-.----	42.886	42.886	-.----	-.----		
390.000	4274.085	4778.205	1335.175	1337.246	54.484	54.484	-.----	-.----		
395.000	-.----	-.----	-.----	-.----	66.025	66.025	-.----	-.----		
400.000	4274.550	4813.713	1367.944	1372.064	77.502	77.502	-.----	-.----		
405.000	-.----	-.----	-.----	-.----	88.909	88.909	-.----	-.----		
410.000	-.----	-.----	1398.687	1405.479	100.239	100.239	-.----	-.----		
415.000	-.----	-.----	-.----	-.----	111.487	111.487	-.----	-.----		
420.000	-.----	-.----	1427.551	1437.593	122.648	122.648	-.----	-.----		
430.000	-.----	-.----	1454.669	1468.498	144.691	144.691	-.----	-.----		
436.400	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
437.000	-.----	-.----	-.----	-.----	-.----	-.----	0.766	0.766		
438.000	-.----	-.----	-.----	-.----	-.----	-.----	2.065	2.065		
439.000	-.----	-.----	-.----	-.----	-.----	-.----	3.368	3.368		
440.000	-.----	-.----	1480.160	1498.277	166.338	166.338	4.675	4.675		
445.000	-.----	-.----	-.----	-.----	-.----	-.----	11.258	11.258		
450.000	4261.735	4975.111	1504.135	1527.006	187.562	187.562	17.918	17.918		

Yb, Ytterbium

A = 173.040

Z = 70

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement T_s $2T_s$ $4T_s$ $5T_s$ T_d </div> <div> Energy(eV)= 1.580 3.160 6.320 7.900 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
455.000	----	----	----	----	----	----	24.644	24.644		
460.000	----	----	1526.696	1554.755	208.346	208.346	31.427	31.427		
465.000	----	----	----	----	----	----	38.256	38.256		
470.000	----	----	1547.935	1581.586	228.674	228.674	45.123	45.123		
475.000	----	----	----	----	----	----	52.021	52.021		
480.000	----	----	1567.937	1607.557	248.535	248.535	58.942	58.942		
485.000	----	----	----	----	----	----	65.879	65.879		
490.000	----	----	1586.780	1632.722	267.923	267.923	72.826	72.826		
495.000	----	----	----	----	----	----	79.777	79.777		
500.000	4232.367	5116.250	1604.538	1657.129	286.834	286.834	86.726	86.726		
510.000	----	----	----	----	305.266	305.266	100.598	100.598		
520.000	----	----	----	----	323.220	323.220	114.406	114.406		
530.000	----	----	----	----	340.699	340.699	128.117	128.117		
540.000	----	----	----	----	357.706	357.706	141.706	141.706		
550.000	4193.965	5243.162	1679.209	1769.249	374.248	374.248	155.149	155.149		
560.000	----	----	----	----	390.331	390.331	168.426	168.426		
570.000	----	----	----	----	405.962	405.962	181.522	181.522		
580.000	----	----	----	----	421.149	421.149	194.422	194.422		
590.000	----	----	----	----	435.901	435.901	207.117	207.117		
600.000	4150.849	5359.566	1734.941	1867.857	450.227	450.227	219.596	219.596		
610.000	----	----	----	----	464.136	464.136	231.853	231.853		
620.000	----	----	----	----	477.639	477.639	243.882	243.882		
630.000	----	----	----	----	490.745	490.786	255.680	255.680		
640.000	----	----	----	----	503.463	503.632	267.242	267.242		
650.000	4105.580	5467.865	1776.475	1956.024	515.805	516.191	278.568	278.568		
660.000	----	----	----	----	527.779	528.472	289.656	289.656		
670.000	----	----	----	----	539.395	540.488	300.507	300.507		
680.000	----	----	----	----	550.664	552.250	311.121	311.121		
690.000	----	----	----	----	561.595	563.766	321.499	321.499		
700.000	4059.710	5569.679	1807.206	2035.914	572.197	575.047	331.643	331.643		
710.000	----	----	----	----	----	----	341.555	341.555		
720.000	----	----	----	----	----	----	351.239	351.239		
730.000	----	----	----	----	----	----	360.696	360.697		
740.000	----	----	----	----	----	----	369.930	369.962		
750.000	4014.184	5666.141	1829.620	2109.096	620.602	628.212	378.944	379.052		

Yb, Ytterbium

A = 173.040

Z = 70

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		1.580	3.160		6.320	7.900				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
760.000	-.----	-.----	-.----	-.----	-.----	-.----	387.741	387.973		
770.000	-.----	-.----	-.----	-.----	-.----	-.----	396.327	396.730		
780.000	-.----	-.----	-.----	-.----	-.----	-.----	404.703	405.329		
790.000	-.----	-.----	-.----	-.----	-.----	-.----	412.875	413.775		
800.000	3969.577	5758.069	1845.567	2176.739	662.116	676.649	420.846	422.073		
850.000	3926.232	5846.072	1856.445	2239.730	697.709	721.108	457.830	461.499		
900.000	3884.346	5930.621	1863.325	2298.758	728.220	762.182	490.399	497.853		
950.000	3844.017	6012.085	1867.038	2354.364	754.370	800.345	519.039	531.558		
1000.000	3805.285	6090.763	1868.231	2406.985	776.773	835.984	544.201	562.960		
1050.000	3768.146	6166.898	1867.416	2456.975	795.952	869.413	566.293	592.343		
1100.000	3732.570	6240.692	1865.000	2504.625	812.353	900.895	585.679	619.945		
1150.000	3698.511	6312.320	1861.308	2550.180	826.354	930.649	602.681	645.967		
1200.000	3665.914	6381.928	1856.602	2593.842	838.279	958.858	617.582	670.577		
1250.000	3634.716	6449.647	1851.094	2635.788	848.404	985.680	630.632	693.919		
1300.000	3604.855	6515.590	1844.956	2676.166	856.965	1011.249	642.048	716.117		
1350.000	3576.267	6579.859	1838.327	2715.106	864.166	1035.681	652.021	737.278		
1400.000	3548.887	6642.545	1831.324	2752.720	870.182	1059.077	660.717	757.495		
1450.000	3522.657	6703.732	1824.039	2789.109	875.164	1081.524	668.285	776.849		
1500.000	3497.517	6763.496	1816.551	2824.360	879.241	1103.100	674.852	795.413		

Lu, Lutetium

A = 174.967

Z = 71

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T_s	$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=		3.312	6.624		13.248		16.560			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
217.640	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----		
218.000	4.907	4.907	-.----	-.----	-.----	-.----	-.----	-.----		
219.000	18.666	18.666	-.----	-.----	-.----	-.----	-.----	-.----		
220.000	32.266	32.266	-.----	-.----	-.----	-.----	-.----	-.----		
225.000	98.006	98.006	-.----	-.----	-.----	-.----	-.----	-.----		
230.000	160.234	160.234	-.----	-.----	-.----	-.----	-.----	-.----		
235.000	219.265	219.265	-.----	-.----	-.----	-.----	-.----	-.----		
240.000	275.375	275.375	-.----	-.----	-.----	-.----	-.----	-.----		
245.000	328.802	328.802	-.----	-.----	-.----	-.----	-.----	-.----		
250.000	379.754	379.754	-.----	-.----	-.----	-.----	-.----	-.----		
255.000	428.417	428.417	-.----	-.----	-.----	-.----	-.----	-.----		
260.000	474.954	474.954	-.----	-.----	-.----	-.----	-.----	-.----		
265.000	519.510	519.510	-.----	-.----	-.----	-.----	-.----	-.----		
270.000	562.216	562.216	-.----	-.----	-.----	-.----	-.----	-.----		
275.000	603.188	603.188	-.----	-.----	-.----	-.----	-.----	-.----		
280.000	642.532	642.532	-.----	-.----	-.----	-.----	-.----	-.----		
290.000	716.709	716.709	-.----	-.----	-.----	-.----	-.----	-.----		
300.000	785.415	785.415	-.----	-.----	-.----	-.----	-.----	-.----		
310.000	849.210	849.210	-.----	-.----	-.----	-.----	-.----	-.----		
320.000	908.570	908.570	-.----	-.----	-.----	-.----	-.----	-.----		
330.000	963.905	963.905	-.----	-.----	-.----	-.----	-.----	-.----		
340.000	1015.569	1015.569	-.----	-.----	-.----	-.----	-.----	-.----		
350.000	1063.875	1063.875	-.----	-.----	-.----	-.----	-.----	-.----		
360.000	1109.097	1109.097	-.----	-.----	-.----	-.----	-.----	-.----		
370.000	1151.478	1151.478	-.----	-.----	-.----	-.----	-.----	-.----		
380.000	1191.238	1191.238	-.----	-.----	-.----	-.----	-.----	-.----		
383.830	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
384.000	-.----	-.----	0.353	0.353	-.----	-.----	-.----	-.----		
385.000	-.----	-.----	2.472	2.472	-.----	-.----	-.----	-.----		
386.000	-.----	-.----	4.593	4.593	-.----	-.----	-.----	-.----		
387.000	-.----	-.----	6.715	6.715	-.----	-.----	-.----	-.----		
388.000	-.----	-.----	8.837	8.837	-.----	-.----	-.----	-.----		
389.000	-.----	-.----	10.961	10.961	-.----	-.----	-.----	-.----		
390.000	1228.571	1228.703	13.086	13.086	-.----	-.----	-.----	-.----		
395.000	-.----	-.----	23.717	23.717	-.----	-.----	-.----	-.----		

Lu, Lutetium

A=174.967

Z=71

<-----Surface Sputtering Regime----->					<-----Bulk Displacement Regime----->					T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	3.312		6.624		13.248		16.560			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
400.000	1263.655	1264.539	34.356	34.356	-----	-----	-----	-----	-----	-----
405.000	-----	-----	44.990	44.990	-----	-----	-----	-----	-----	-----
410.000	1296.649	1298.914	55.611	55.611	-----	-----	-----	-----	-----	-----
415.000	-----	-----	66.209	66.209	-----	-----	-----	-----	-----	-----
420.000	1327.699	1331.933	76.776	76.776	-----	-----	-----	-----	-----	-----
425.000	-----	-----	87.304	87.304	-----	-----	-----	-----	-----	-----
430.000	1356.937	1363.690	97.785	97.785	-----	-----	-----	-----	-----	-----
435.000	-----	-----	108.215	108.215	-----	-----	-----	-----	-----	-----
440.000	1384.485	1394.271	118.585	118.585	-----	-----	-----	-----	-----	-----
450.000	1410.452	1423.755	139.128	139.128	-----	-----	-----	-----	-----	-----
460.000	1434.942	1452.215	159.377	159.377	-----	-----	-----	-----	-----	-----
470.000	1458.048	1479.716	179.301	179.301	-----	-----	-----	-----	-----	-----
480.000	1479.856	1506.318	198.873	198.873	-----	-----	-----	-----	-----	-----
490.000	1500.447	1532.076	218.074	218.074	-----	-----	-----	-----	-----	-----
500.000	1519.893	1557.042	236.887	236.887	-----	-----	-----	-----	-----	-----
510.000	-----	-----	255.301	255.301	-----	-----	-----	-----	-----	-----
520.000	-----	-----	273.306	273.306	-----	-----	-----	-----	-----	-----
530.000	-----	-----	290.898	290.898	-----	-----	-----	-----	-----	-----
540.000	-----	-----	308.072	308.072	-----	-----	-----	-----	-----	-----
550.000	1602.197	1671.495	324.828	324.828	-----	-----	-----	-----	-----	-----
560.000	-----	-----	341.166	341.166	-----	-----	-----	-----	-----	-----
570.000	-----	-----	357.088	357.088	-----	-----	-----	-----	-----	-----
580.000	-----	-----	372.597	372.597	-----	-----	-----	-----	-----	-----
590.000	-----	-----	387.697	387.697	-----	-----	-----	-----	-----	-----
600.000	1664.353	1771.810	402.395	402.395	-----	-----	-----	-----	-----	-----
610.000	-----	-----	416.696	416.696	-----	-----	-----	-----	-----	-----
620.000	-----	-----	430.607	430.607	-----	-----	-----	-----	-----	-----
630.000	-----	-----	444.134	444.134	-----	-----	-----	-----	-----	-----
640.000	-----	-----	457.285	457.285	-----	-----	-----	-----	-----	-----
646.720	-----	-----	-----	-----	0.000	0.000	-----	-----	-----	-----
647.000	-----	-----	-----	-----	0.094	0.094	-----	-----	-----	-----
648.000	-----	-----	-----	-----	0.437	0.437	-----	-----	-----	-----
649.000	-----	-----	-----	-----	0.784	0.784	-----	-----	-----	-----
650.000	1711.293	1861.207	470.068	470.072	1.134	1.134	-----	-----	-----	-----
655.000	-----	-----	-----	-----	2.932	2.932	-----	-----	-----	-----

Lu, Lutetium

A = 174.967

Z = 71

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		3.312	6.624		13.248	16.560					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
660.000	-.----	-.----	482.492	482.558	4.807	4.807	-.----	-.----			
665.000	-.----	-.----	-.----	-.----	6.756	6.756	-.----	-.----			
670.000	-.----	-.----	494.563	494.768	8.772	8.772	-.----	-.----			
675.000	-.----	-.----	-.----	-.----	10.852	10.852	-.----	-.----			
680.000	-.----	-.----	506.291	506.715	12.992	12.992	-.----	-.----			
685.000	-.----	-.----	-.----	-.----	15.188	15.188	-.----	-.----			
690.000	-.----	-.----	517.683	518.409	17.435	17.435	-.----	-.----			
695.000	-.----	-.----	-.----	-.----	19.732	19.732	-.----	-.----			
700.000	1746.582	1941.958	528.749	529.859	22.074	22.074	-.----	-.----			
710.000	-.----	-.----	-.----	-.----	26.880	26.880	-.----	-.----			
720.000	-.----	-.----	-.----	-.----	31.831	31.831	-.----	-.----			
730.000	-.----	-.----	-.----	-.----	36.906	36.906	-.----	-.----			
740.000	-.----	-.----	-.----	-.----	42.083	42.083	-.----	-.----			
750.000	1772.847	2015.716	579.457	583.761	47.347	47.347	-.----	-.----			
757.900	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000			
758.000	-.----	-.----	-.----	-.----	-.----	-.----	0.018	0.018			
759.000	-.----	-.----	-.----	-.----	-.----	-.----	0.210	0.210			
760.000	-.----	-.----	-.----	-.----	52.680	52.680	0.405	0.405			
765.000	-.----	-.----	-.----	-.----	-.----	-.----	1.414	1.414			
770.000	-.----	-.----	-.----	-.----	58.067	58.067	2.482	2.482			
775.000	-.----	-.----	-.----	-.----	-.----	-.----	3.604	3.604			
780.000	-.----	-.----	-.----	-.----	63.497	63.497	4.778	4.778			
785.000	-.----	-.----	-.----	-.----	-.----	-.----	6.001	6.001			
790.000	-.----	-.----	-.----	-.----	68.956	68.956	7.271	7.271			
795.000	-.----	-.----	-.----	-.----	-.----	-.----	8.585	8.585			
800.000	1792.058	2083.707	623.193	632.774	74.434	74.434	9.941	9.941			
805.000	-.----	-.----	-.----	-.----	-.----	-.----	11.337	11.337			
810.000	-.----	-.----	-.----	-.----	79.922	79.922	12.770	12.770			
815.000	-.----	-.----	-.----	-.----	-.----	-.----	14.239	14.239			
820.000	-.----	-.----	-.----	-.----	85.409	85.409	15.740	15.740			
830.000	-.----	-.----	-.----	-.----	90.889	90.889	18.836	18.836			
840.000	-.----	-.----	-.----	-.----	96.354	96.354	22.044	22.044			
850.000	1805.712	2146.868	660.878	677.675	101.798	101.798	25.350	25.350			
860.000	-.----	-.----	-.----	-.----	107.214	107.214	28.742	28.742			
870.000	-.----	-.----	-.----	-.----	112.598	112.598	32.209	32.209			

Lu, Lutetium

A=174.967

Z=71

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	3.312		6.624		13.248		16.560			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
880.000	-.----	-.----	-.----	-.----	117.946	117.946	35.741	35.741		
890.000	-.----	-.----	-.----	-.----	123.252	123.252	39.328	39.328		
900.000	1814.958	2205.922	693.327	719.080	128.513	128.513	42.962	42.962		
910.000	-.----	-.----	-.----	-.----	133.727	133.727	46.634	46.634		
920.000	-.----	-.----	-.----	-.----	138.889	138.889	50.337	50.337		
930.000	-.----	-.----	-.----	-.----	143.998	143.998	54.065	54.065		
940.000	-.----	-.----	-.----	-.----	149.051	149.051	57.811	57.811		
950.000	1820.693	2261.439	721.255	757.483	154.046	154.046	61.570	61.570		
960.000	-.----	-.----	-.----	-.----	158.982	158.982	65.337	65.337		
970.000	-.----	-.----	-.----	-.----	163.857	163.857	69.106	69.106		
980.000	-.----	-.----	-.----	-.----	168.670	168.670	72.873	72.873		
990.000	-.----	-.----	-.----	-.----	173.421	173.421	76.635	76.635		
1000.000	1823.619	2313.878	745.279	793.284	178.107	178.107	80.388	80.388		
1010.000	-.----	-.----	-.----	-.----	-.----	-.----	84.128	84.128		
1020.000	-.----	-.----	-.----	-.----	-.----	-.----	87.853	87.853		
1030.000	-.----	-.----	-.----	-.----	-.----	-.----	91.559	91.559		
1040.000	-.----	-.----	-.----	-.----	-.----	-.----	95.244	95.244		
1050.000	1824.292	2363.610	765.930	826.811	200.563	200.565	98.906	98.906		
1060.000	-.----	-.----	-.----	-.----	-.----	-.----	102.543	102.543		
1070.000	-.----	-.----	-.----	-.----	-.----	-.----	106.153	106.153		
1080.000	-.----	-.----	-.----	-.----	-.----	-.----	109.734	109.734		
1090.000	-.----	-.----	-.----	-.----	-.----	-.----	113.285	113.285		
1100.000	1823.157	2410.940	783.662	858.336	221.380	221.540	116.805	116.805		
1150.000	1820.570	2456.125	798.865	888.087	240.584	241.245	133.891	133.891		
1200.000	1816.819	2499.377	811.875	916.256	258.237	259.807	150.056	150.056		
1250.000	1812.136	2540.879	822.978	943.004	274.420	277.341	165.252	165.295		
1300.000	1806.712	2580.787	832.421	968.472	289.228	293.945	179.467	179.722		
1350.000	1800.702	2619.234	840.417	992.779	302.757	309.704	192.717	193.411		
1400.000	1794.234	2656.339	847.149	1016.031	315.102	324.694	205.033	206.426		
1450.000	1787.413	2692.204	852.776	1038.317	326.357	338.981	216.455	218.822		
1500.000	1780.327	2726.919	857.435	1059.717	336.609	352.623	227.030	230.650		

Hf, Hafnium

A=178.490

Z=72

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T _s	2T _s		4T _s		5T _s		T _d	
Energy(eV)=		6.420	12.840		25.680		32.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
380.420	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---		
381.000	1.322	1.322	-.---	-.---	-.---	-.---	-.---	-.---		
382.000	3.624	3.624	-.---	-.---	-.---	-.---	-.---	-.---		
383.000	5.927	5.927	-.---	-.---	-.---	-.---	-.---	-.---		
384.000	8.231	8.231	-.---	-.---	-.---	-.---	-.---	-.---		
385.000	10.535	10.535	-.---	-.---	-.---	-.---	-.---	-.---		
386.000	12.841	12.841	-.---	-.---	-.---	-.---	-.---	-.---		
387.000	15.146	15.146	-.---	-.---	-.---	-.---	-.---	-.---		
388.000	17.452	17.452	-.---	-.---	-.---	-.---	-.---	-.---		
389.000	19.759	19.759	-.---	-.---	-.---	-.---	-.---	-.---		
390.000	22.065	22.065	-.---	-.---	-.---	-.---	-.---	-.---		
395.000	33.598	33.598	-.---	-.---	-.---	-.---	-.---	-.---		
400.000	45.122	45.122	-.---	-.---	-.---	-.---	-.---	-.---		
405.000	56.628	56.628	-.---	-.---	-.---	-.---	-.---	-.---		
410.000	68.105	68.105	-.---	-.---	-.---	-.---	-.---	-.---		
415.000	79.544	79.544	-.---	-.---	-.---	-.---	-.---	-.---		
420.000	90.937	90.937	-.---	-.---	-.---	-.---	-.---	-.---		
425.000	102.276	102.276	-.---	-.---	-.---	-.---	-.---	-.---		
430.000	113.554	113.554	-.---	-.---	-.---	-.---	-.---	-.---		
435.000	124.765	124.765	-.---	-.---	-.---	-.---	-.---	-.---		
440.000	135.903	135.903	-.---	-.---	-.---	-.---	-.---	-.---		
450.000	157.937	157.937	-.---	-.---	-.---	-.---	-.---	-.---		
460.000	179.621	179.621	-.---	-.---	-.---	-.---	-.---	-.---		
470.000	200.923	200.923	-.---	-.---	-.---	-.---	-.---	-.---		
480.000	221.819	221.819	-.---	-.---	-.---	-.---	-.---	-.---		
490.000	242.292	242.292	-.---	-.---	-.---	-.---	-.---	-.---		
500.000	262.325	262.325	-.---	-.---	-.---	-.---	-.---	-.---		
510.000	281.909	281.909	-.---	-.---	-.---	-.---	-.---	-.---		
520.000	301.037	301.037	-.---	-.---	-.---	-.---	-.---	-.---		
530.000	319.703	319.703	-.---	-.---	-.---	-.---	-.---	-.---		
540.000	337.907	337.907	-.---	-.---	-.---	-.---	-.---	-.---		
550.000	355.649	355.649	-.---	-.---	-.---	-.---	-.---	-.---		
560.000	372.931	372.931	-.---	-.---	-.---	-.---	-.---	-.---		
570.000	389.756	389.756	-.---	-.---	-.---	-.---	-.---	-.---		
580.000	406.129	406.129	-.---	-.---	-.---	-.---	-.---	-.---		

Hf, Hafnium

A = 178.490

Z = 72

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 6.420		2T _s 12.840		4T _s 25.680		5T _s 32.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
590.000	422.056	422.056	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	437.544	437.544	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	452.599	452.599	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	467.231	467.231	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	481.447	481.447	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	495.257	495.257	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
641.450	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
642.000	-.----	-.----	0.202	0.202	-.----	-.----	-.----	-.----	-.----	-.----
643.000	-.----	-.----	0.576	0.576	-.----	-.----	-.----	-.----	-.----	-.----
644.000	-.----	-.----	0.953	0.953	-.----	-.----	-.----	-.----	-.----	-.----
645.000	-.----	-.----	1.334	1.334	-.----	-.----	-.----	-.----	-.----	-.----
646.000	-.----	-.----	1.718	1.718	-.----	-.----	-.----	-.----	-.----	-.----
647.000	-.----	-.----	2.106	2.106	-.----	-.----	-.----	-.----	-.----	-.----
648.000	-.----	-.----	2.497	2.497	-.----	-.----	-.----	-.----	-.----	-.----
649.000	-.----	-.----	2.892	2.892	-.----	-.----	-.----	-.----	-.----	-.----
650.000	508.668	508.698	3.290	3.290	-.----	-.----	-.----	-.----	-.----	-.----
655.000	-.----	-.----	5.328	5.328	-.----	-.----	-.----	-.----	-.----	-.----
660.000	521.691	521.832	7.445	7.445	-.----	-.----	-.----	-.----	-.----	-.----
665.000	-.----	-.----	9.634	9.634	-.----	-.----	-.----	-.----	-.----	-.----
670.000	534.334	534.673	11.892	11.892	-.----	-.----	-.----	-.----	-.----	-.----
675.000	-.----	-.----	14.213	14.213	-.----	-.----	-.----	-.----	-.----	-.----
680.000	546.607	547.233	16.594	16.594	-.----	-.----	-.----	-.----	-.----	-.----
685.000	-.----	-.----	19.031	19.031	-.----	-.----	-.----	-.----	-.----	-.----
690.000	558.520	559.522	21.519	21.519	-.----	-.----	-.----	-.----	-.----	-.----
695.000	-.----	-.----	24.055	24.055	-.----	-.----	-.----	-.----	-.----	-.----
700.000	570.081	571.551	26.636	26.636	-.----	-.----	-.----	-.----	-.----	-.----
710.000	-.----	-.----	31.918	31.918	-.----	-.----	-.----	-.----	-.----	-.----
720.000	-.----	-.----	37.340	37.340	-.----	-.----	-.----	-.----	-.----	-.----
730.000	-.----	-.----	42.881	42.881	-.----	-.----	-.----	-.----	-.----	-.----
740.000	-.----	-.----	48.520	48.520	-.----	-.----	-.----	-.----	-.----	-.----
750.000	622.935	628.124	54.238	54.238	-.----	-.----	-.----	-.----	-.----	-.----
760.000	-.----	-.----	60.019	60.019	-.----	-.----	-.----	-.----	-.----	-.----
770.000	-.----	-.----	65.849	65.849	-.----	-.----	-.----	-.----	-.----	-.----
780.000	-.----	-.----	71.713	71.713	-.----	-.----	-.----	-.----	-.----	-.----
790.000	-.----	-.----	77.600	77.600	-.----	-.----	-.----	-.----	-.----	-.----

Hf, Hafnium

A = 178.490

Z = 72

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	6.420		12.840		25.680		32.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
800.000	668.341	679.493	83.498	83.498	-.----	-.----	-.----	-.----		
810.000	-.----	-.----	89.398	89.398	-.----	-.----	-.----	-.----		
820.000	-.----	-.----	95.290	95.290	-.----	-.----	-.----	-.----		
830.000	-.----	-.----	101.166	101.166	-.----	-.----	-.----	-.----		
840.000	-.----	-.----	107.020	107.020	-.----	-.----	-.----	-.----		
850.000	707.306	726.493	112.844	112.844	-.----	-.----	-.----	-.----		
860.000	-.----	-.----	118.633	118.633	-.----	-.----	-.----	-.----		
870.000	-.----	-.----	124.381	124.381	-.----	-.----	-.----	-.----		
880.000	-.----	-.----	130.085	130.085	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	135.739	135.739	-.----	-.----	-.----	-.----		
900.000	740.720	769.785	141.341	141.341	-.----	-.----	-.----	-.----		
910.000	-.----	-.----	146.886	146.886	-.----	-.----	-.----	-.----		
920.000	-.----	-.----	152.373	152.373	-.----	-.----	-.----	-.----		
930.000	-.----	-.----	157.799	157.799	-.----	-.----	-.----	-.----		
940.000	-.----	-.----	163.161	163.161	-.----	-.----	-.----	-.----		
950.000	769.354	809.899	168.458	168.458	-.----	-.----	-.----	-.----		
960.000	-.----	-.----	173.688	173.688	-.----	-.----	-.----	-.----		
970.000	-.----	-.----	178.850	178.850	-.----	-.----	-.----	-.----		
980.000	-.----	-.----	183.943	183.943	-.----	-.----	-.----	-.----		
990.000	-.----	-.----	188.965	188.965	-.----	-.----	-.----	-.----		
1000.000	793.874	847.263	193.917	193.917	-.----	-.----	-.----	-.----		
1036.630	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
1037.000	-.----	-.----	-.----	-.----	0.023	0.023	-.----	-.----		
1038.000	-.----	-.----	-.----	-.----	0.086	0.086	-.----	-.----		
1039.000	-.----	-.----	-.----	-.----	0.150	0.150	-.----	-.----		
1040.000	-.----	-.----	-.----	-.----	0.215	0.215	-.----	-.----		
1045.000	-.----	-.----	-.----	-.----	0.558	0.558	-.----	-.----		
1050.000	814.849	882.227	217.601	217.609	0.930	0.930	-.----	-.----		
1055.000	-.----	-.----	-.----	-.----	1.329	1.329	-.----	-.----		
1060.000	-.----	-.----	-.----	-.----	1.755	1.755	-.----	-.----		
1065.000	-.----	-.----	-.----	-.----	2.205	2.205	-.----	-.----		
1070.000	-.----	-.----	-.----	-.----	2.680	2.680	-.----	-.----		
1075.000	-.----	-.----	-.----	-.----	3.178	3.178	-.----	-.----		
1080.000	-.----	-.----	-.----	-.----	3.699	3.699	-.----	-.----		
1085.000	-.----	-.----	-.----	-.----	4.241	4.241	-.----	-.----		

Hf, Hafnium

A = 178.490

Z = 72

Displacement		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d
Energy(eV)=	T _s	6.420	2T _s	12.840	4T _s	25.680	5T _s	32.100		
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)
1090.000	-.----	-.----	-.----	-.----	4.804	4.804	-.----	-.----		
1095.000	-.----	-.----	-.----	-.----	5.387	5.387	-.----	-.----		
1100.000	832.765	915.082	239.489	239.722	5.989	5.989	-.----	-.----		
1110.000	-.----	-.----	-.----	-.----	7.248	7.248	-.----	-.----		
1120.000	-.----	-.----	-.----	-.----	8.575	8.575	-.----	-.----		
1130.000	-.----	-.----	-.----	-.----	9.964	9.964	-.----	-.----		
1140.000	-.----	-.----	-.----	-.----	11.411	11.411	-.----	-.----		
1150.000	848.039	946.069	259.623	260.468	12.911	12.911	-.----	-.----		
1160.000	-.----	-.----	-.----	-.----	14.459	14.459	-.----	-.----		
1170.000	-.----	-.----	-.----	-.----	16.050	16.050	-.----	-.----		
1180.000	-.----	-.----	-.----	-.----	17.682	17.682	-.----	-.----		
1190.000	-.----	-.----	-.----	-.----	19.350	19.350	-.----	-.----		
1200.000	861.026	975.393	278.081	279.989	21.051	21.051	-.----	-.----		
1200.330	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1201.000	-.----	-.----	-.----	-.----	-.----	-.----	0.023	0.023		
1202.000	-.----	-.----	-.----	-.----	-.----	-.----	0.059	0.059		
1203.000	-.----	-.----	-.----	-.----	-.----	-.----	0.096	0.096		
1204.000	-.----	-.----	-.----	-.----	-.----	-.----	0.133	0.133		
1205.000	-.----	-.----	-.----	-.----	-.----	-.----	0.172	0.172		
1206.000	-.----	-.----	-.----	-.----	-.----	-.----	0.211	0.211		
1207.000	-.----	-.----	-.----	-.----	-.----	-.----	0.250	0.250		
1208.000	-.----	-.----	-.----	-.----	-.----	-.----	0.291	0.291		
1209.000	-.----	-.----	-.----	-.----	-.----	-.----	0.332	0.332		
1210.000	-.----	-.----	-.----	-.----	22.781	22.781	0.374	0.374		
1215.000	-.----	-.----	-.----	-.----	-.----	-.----	0.596	0.596		
1220.000	-.----	-.----	-.----	-.----	24.538	24.538	0.836	0.836		
1225.000	-.----	-.----	-.----	-.----	-.----	-.----	1.093	1.093		
1230.000	-.----	-.----	-.----	-.----	26.318	26.318	1.367	1.367		
1235.000	-.----	-.----	-.----	-.----	-.----	-.----	1.658	1.658		
1240.000	-.----	-.----	-.----	-.----	28.120	28.120	1.964	1.964		
1245.000	-.----	-.----	-.----	-.----	-.----	-.----	2.286	2.286		
1250.000	872.030	1003.225	294.959	298.410	29.939	29.939	2.623	2.623		
1255.000	-.----	-.----	-.----	-.----	-.----	-.----	2.974	2.974		
1260.000	-.----	-.----	-.----	-.----	31.774	31.774	3.339	3.339		
1270.000	-.----	-.----	-.----	-.----	33.623	33.623	4.109	4.109		

Hf, Hafnium

A = 178.490

Z = 72

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	6.420		12.840		25.680		32.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1280.000	-.----	-.----	-.----	-.----	35.484	35.484	4.929	4.929		
1290.000	-.----	-.----	-.----	-.----	37.354	37.354	5.796	5.796		
1300.000	881.313	1029.713	310.361	315.837	39.232	39.232	6.706	6.706		
1310.000	-.----	-.----	-.----	-.----	41.116	41.116	7.657	7.657		
1320.000	-.----	-.----	-.----	-.----	43.005	43.005	8.646	8.646		
1330.000	-.----	-.----	-.----	-.----	44.896	44.896	9.670	9.670		
1340.000	-.----	-.----	-.----	-.----	46.789	46.789	10.725	10.725		
1350.000	889.099	1054.986	324.397	332.363	48.682	48.682	11.811	11.811		
1360.000	-.----	-.----	-.----	-.----	50.574	50.574	12.925	12.925		
1370.000	-.----	-.----	-.----	-.----	52.464	52.464	14.063	14.063		
1380.000	-.----	-.----	-.----	-.----	54.350	54.350	15.226	15.226		
1390.000	-.----	-.----	-.----	-.----	56.232	56.232	16.409	16.409		
1400.000	895.581	1079.152	337.172	348.069	58.109	58.109	17.612	17.612		
1410.000	-.----	-.----	-.----	-.----	-.----	-.----	18.833	18.833		
1420.000	-.----	-.----	-.----	-.----	-.----	-.----	20.070	20.070		
1430.000	-.----	-.----	-.----	-.----	-.----	-.----	21.322	21.322		
1440.000	-.----	-.----	-.----	-.----	-.----	-.----	22.587	22.587		
1450.000	900.927	1102.309	348.789	363.029	67.385	67.385	23.863	23.863		
1460.000	-.----	-.----	-.----	-.----	-.----	-.----	25.150	25.150		
1470.000	-.----	-.----	-.----	-.----	-.----	-.----	26.446	26.446		
1480.000	-.----	-.----	-.----	-.----	-.----	-.----	27.750	27.750		
1490.000	-.----	-.----	-.----	-.----	-.----	-.----	29.061	29.061		
1500.000	905.279	1124.540	359.342	377.303	76.421	76.421	30.378	30.378		

Ta, Tantalum

A=180.948

Z=73

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 8.100		$2T_s$ 16.200		$4T_s$ 32.400		$5T_s$ 40.500		T_d 33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
460.350	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
461.000	0.820	0.820	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
462.000	2.086	2.086	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
463.000	3.356	3.356	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
464.000	4.631	4.631	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
465.000	5.911	5.911	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
466.000	7.196	7.196	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
467.000	8.485	8.485	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
468.000	9.778	9.778	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
469.000	11.076	11.076	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	12.378	12.378	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
475.000	18.947	18.947	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	25.606	25.606	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
485.000	32.344	32.344	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
490.000	39.152	39.152	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
495.000	46.019	46.019	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
500.000	52.937	52.937	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
505.000	59.896	59.896	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
510.000	66.889	66.889	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
515.000	73.908	73.908	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
520.000	80.947	80.947	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
530.000	95.058	95.058	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
540.000	109.175	109.175	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
550.000	123.259	123.259	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
560.000	137.274	137.274	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
570.000	151.190	151.190	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
580.000	164.982	164.982	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
590.000	178.628	178.628	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	192.109	192.109	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	205.409	205.409	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	218.515	218.515	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	231.417	231.417	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	244.105	244.105	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
650.000	256.572	256.572	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
660.000	268.813	268.813	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----

Ta, Tantalum

A = 180.948

Z = 73

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	8.100		16.200		32.400		40.500		33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
670.000	280.824	280.824	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
680.000	292.600	292.600	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
690.000	304.141	304.141	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
700.000	315.445	315.445	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
710.000	326.512	326.512	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
720.000	337.342	337.342	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
730.000	347.937	347.937	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
740.000	358.296	358.296	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
750.000	368.424	368.424	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
760.000	378.321	378.321	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
764.110	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
765.000	-.----	-.----	0.184	0.184	-.----	-.----	-.----	-.----	-.----	-.----
766.000	-.----	-.----	0.393	0.393	-.----	-.----	-.----	-.----	-.----	-.----
767.000	-.----	-.----	0.605	0.605	-.----	-.----	-.----	-.----	-.----	-.----
768.000	-.----	-.----	0.820	0.820	-.----	-.----	-.----	-.----	-.----	-.----
769.000	-.----	-.----	1.038	1.038	-.----	-.----	-.----	-.----	-.----	-.----
770.000	387.991	387.997	1.258	1.258	-.----	-.----	-.----	-.----	-.----	-.----
775.000	-.----	-.----	2.396	2.396	-.----	-.----	-.----	-.----	-.----	-.----
780.000	397.435	397.486	3.596	3.596	-.----	-.----	-.----	-.----	-.----	-.----
785.000	-.----	-.----	4.855	4.855	-.----	-.----	-.----	-.----	-.----	-.----
790.000	406.659	406.797	6.168	6.168	-.----	-.----	-.----	-.----	-.----	-.----
795.000	-.----	-.----	7.534	7.534	-.----	-.----	-.----	-.----	-.----	-.----
800.000	415.664	415.936	8.949	8.949	-.----	-.----	-.----	-.----	-.----	-.----
805.000	-.----	-.----	10.411	10.411	-.----	-.----	-.----	-.----	-.----	-.----
810.000	-.----	-.----	11.918	11.918	-.----	-.----	-.----	-.----	-.----	-.----
815.000	-.----	-.----	13.467	13.467	-.----	-.----	-.----	-.----	-.----	-.----
820.000	-.----	-.----	15.055	15.055	-.----	-.----	-.----	-.----	-.----	-.----
830.000	-.----	-.----	18.341	18.341	-.----	-.----	-.----	-.----	-.----	-.----
840.000	-.----	-.----	21.760	21.760	-.----	-.----	-.----	-.----	-.----	-.----
850.000	457.544	459.234	25.297	25.297	-.----	-.----	-.----	-.----	-.----	-.----
860.000	-.----	-.----	28.937	28.937	-.----	-.----	-.----	-.----	-.----	-.----
870.000	-.----	-.----	32.666	32.666	-.----	-.----	-.----	-.----	-.----	-.----
880.000	-.----	-.----	36.474	36.474	-.----	-.----	-.----	-.----	-.----	-.----
890.000	-.----	-.----	40.349	40.349	-.----	-.----	-.----	-.----	-.----	-.----
900.000	494.531	498.975	44.280	44.280	-.----	-.----	-.----	-.----	-.----	-.----

Ta, Tantalum

A = 180.948

Z = 73

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 33.000	
	T _s		2T _s		4T _s		5T _s			
	8.100		16.200		32.400		40.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
910.000	-----	-----	48.259	48.259	-----	-----	-----	-----	-----	-----
920.000	-----	-----	52.277	52.277	-----	-----	-----	-----	-----	-----
930.000	-----	-----	56.326	56.326	-----	-----	-----	-----	-----	-----
940.000	-----	-----	60.399	60.399	-----	-----	-----	-----	-----	-----
950.000	527.115	535.660	64.490	64.490	-----	-----	-----	-----	-----	-----
960.000	-----	-----	68.591	68.591	-----	-----	-----	-----	-----	-----
970.000	-----	-----	72.698	72.698	-----	-----	-----	-----	-----	-----
980.000	-----	-----	76.806	76.806	-----	-----	-----	-----	-----	-----
990.000	-----	-----	80.909	80.909	-----	-----	-----	-----	-----	-----
1000.000	555.768	569.698	85.005	85.005	-----	-----	-----	-----	-----	-----
1010.000	-----	-----	89.088	89.088	-----	-----	-----	-----	-----	-----
1020.000	-----	-----	93.155	93.155	-----	-----	-----	-----	-----	-----
1030.000	-----	-----	97.203	97.203	-----	-----	-----	-----	-----	-----
1040.000	-----	-----	101.229	101.229	-----	-----	-----	-----	-----	-----
1050.000	580.933	601.426	105.231	105.231	-----	-----	-----	-----	-----	-----
1060.000	-----	-----	109.206	109.206	-----	-----	-----	-----	-----	-----
1070.000	-----	-----	113.151	113.151	-----	-----	-----	-----	-----	-----
1080.000	-----	-----	117.066	117.066	-----	-----	-----	-----	-----	-----
1090.000	-----	-----	120.947	120.947	-----	-----	-----	-----	-----	-----
1100.000	603.009	631.125	124.795	124.795	-----	-----	-----	-----	-----	-----
1150.000	622.356	659.029	143.469	143.469	-----	-----	-----	-----	-----	-----
1200.000	639.293	685.336	161.128	161.128	-----	-----	-----	-----	-----	-----
1218.360	-----	-----	-----	-----	0.000	0.000	-----	-----	-----	-----
1219.000	-----	-----	-----	-----	0.022	0.022	-----	-----	-----	-----
1220.000	-----	-----	-----	-----	0.058	0.058	-----	-----	-----	-----
1225.000	-----	-----	-----	-----	0.248	0.248	-----	-----	-----	-----
1230.000	-----	-----	-----	-----	0.458	0.458	-----	-----	-----	-----
1232.910	-----	-----	-----	-----	-----	-----	-----	-----	0.000	0.000
1233.000	-----	-----	-----	-----	-----	-----	-----	-----	0.003	0.003
1234.000	-----	-----	-----	-----	-----	-----	-----	-----	0.037	0.037
1235.000	-----	-----	-----	-----	0.687	0.687	-----	-----	0.071	0.071
1236.000	-----	-----	-----	-----	-----	-----	-----	-----	0.106	0.106
1237.000	-----	-----	-----	-----	-----	-----	-----	-----	0.142	0.142
1238.000	-----	-----	-----	-----	-----	-----	-----	-----	0.179	0.179
1239.000	-----	-----	-----	-----	-----	-----	-----	-----	0.216	0.216

Ta, Tantalum

A = 180.948

Z = 73

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 33.000	
	T _s		2T _s		4T _s		5T _s			
	8.100		16.200		32.400		40.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1240.000	-.----	-.----	-.----	-.----	0.934	0.934	-.----	-.----	0.255	0.255
1245.000	-.----	-.----	-.----	-.----	1.198	1.198	-.----	-.----	0.457	0.457
1250.000	654.103	710.214	177.712	177.739	1.480	1.480	-.----	-.----	0.677	0.677
1255.000	-.----	-.----	-.----	-.----	1.778	1.778	-.----	-.----	0.915	0.915
1260.000	-.----	-.----	-.----	-.----	2.092	2.092	-.----	-.----	1.171	1.171
1265.000	-.----	-.----	-.----	-.----	2.422	2.422	-.----	-.----	1.442	1.442
1270.000	-.----	-.----	-.----	-.----	2.767	2.767	-.----	-.----	1.730	1.730
1275.000	-.----	-.----	-.----	-.----	3.126	3.126	-.----	-.----	2.033	2.033
1280.000	-.----	-.----	-.----	-.----	3.499	3.499	-.----	-.----	2.351	2.351
1285.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.683	2.683
1290.000	-.----	-.----	-.----	-.----	4.285	4.285	-.----	-.----	3.030	3.030
1295.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.390	3.390
1300.000	667.035	733.809	193.208	193.424	5.122	5.122	-.----	-.----	3.763	3.763
1310.000	-.----	-.----	-.----	-.----	6.005	6.005	-.----	-.----	4.546	4.546
1320.000	-.----	-.----	-.----	-.----	6.933	6.933	-.----	-.----	5.377	5.377
1330.000	-.----	-.----	-.----	-.----	7.902	7.902	-.----	-.----	6.252	6.252
1340.000	-.----	-.----	-.----	-.----	8.908	8.908	-.----	-.----	7.169	7.169
1350.000	678.306	756.244	207.630	208.275	9.950	9.950	-.----	-.----	8.123	8.123
1360.000	-.----	-.----	-.----	-.----	11.024	11.024	-.----	-.----	9.113	9.113
1370.000	-.----	-.----	-.----	-.----	12.129	12.129	-.----	-.----	10.136	10.136
1380.000	-.----	-.----	-.----	-.----	13.261	13.261	-.----	-.----	11.190	11.190
1390.000	-.----	-.----	-.----	-.----	14.420	14.420	-.----	-.----	12.272	12.272
1400.000	688.110	777.626	221.014	222.364	15.601	15.601	-.----	-.----	13.380	13.380
1405.520	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
1406.000	-.----	-.----	-.----	-.----	-.----	-.----	0.009	0.009	-.----	-.----
1407.000	-.----	-.----	-.----	-.----	-.----	-.----	0.030	0.030	-.----	-.----
1408.000	-.----	-.----	-.----	-.----	-.----	-.----	0.050	0.050	-.----	-.----
1409.000	-.----	-.----	-.----	-.----	-.----	-.----	0.072	0.072	-.----	-.----
1410.000	-.----	-.----	-.----	-.----	16.805	16.805	0.093	0.093	14.512	14.512
1415.000	-.----	-.----	-.----	-.----	-.----	-.----	0.210	0.210	-.----	-.----
1420.000	-.----	-.----	-.----	-.----	18.028	18.028	0.340	0.340	15.667	15.667
1425.000	-.----	-.----	-.----	-.----	-.----	-.----	0.481	0.481	-.----	-.----
1430.000	-.----	-.----	-.----	-.----	19.269	19.269	0.635	0.635	16.841	16.841
1435.000	-.----	-.----	-.----	-.----	-.----	-.----	0.800	0.800	-.----	-.----
1440.000	-.----	-.----	-.----	-.----	20.527	20.527	0.977	0.977	18.035	18.035

Ta, Tantalum

A = 180.948

Z = 73

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d 33.000	
	T _s 8.100		2T _s 16.200		4T _s 32.400		5T _s 40.500			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1445.000	-----	-----	-----	-----	-----	-----	1.164	1.164	-----	-----
1450.000	696.615	798.050	233.406	235.759	21.799	21.799	1.362	1.362	19.245	19.245
1455.000	-----	-----	-----	-----	-----	-----	1.571	1.571	-----	-----
1460.000	-----	-----	-----	-----	23.085	23.085	1.789	1.789	20.471	20.471
1470.000	-----	-----	-----	-----	24.383	24.383	2.255	2.255	21.710	21.710
1480.000	-----	-----	-----	-----	25.691	25.691	2.758	2.758	22.962	22.962
1490.000	-----	-----	-----	-----	27.008	27.008	3.295	3.295	24.225	24.225
1500.000	703.969	817.598	244.857	248.517	28.334	28.334	3.865	3.865	25.498	25.498

W, Tungsten

A = 183.850

Z = 74

Displacement		Surface Sputtering Regime				Bulk Displacement Regime				T _d	
Energy(eV)=		T _s	2T _s			4T _s	5T _s			40.000	
Accel.	Cross-	Cascade	Cross-	Cascade	Cross-	Cascade	Cross-	Cascade	Cross-	Cascade	
Voltage	section	CS	section	CS	section	CS	section	CS	section	CS	
(kV)	(barns)	(barns)	(barns)	(barns)	(barns)	(barns)	(barns)	(barns)	(barns)	(barns)	
496.590	0.000	0.000	----	----	----	----	----	----	----	----	
497.000	0.418	0.418	----	----	----	----	----	----	----	----	
498.000	1.443	1.443	----	----	----	----	----	----	----	----	
499.000	2.472	2.472	----	----	----	----	----	----	----	----	
500.000	3.507	3.507	----	----	----	----	----	----	----	----	
505.000	8.760	8.760	----	----	----	----	----	----	----	----	
510.000	14.131	14.131	----	----	----	----	----	----	----	----	
515.000	19.609	19.609	----	----	----	----	----	----	----	----	
520.000	25.185	25.185	----	----	----	----	----	----	----	----	
525.000	30.848	30.848	----	----	----	----	----	----	----	----	
530.000	36.589	36.589	----	----	----	----	----	----	----	----	
535.000	42.398	42.398	----	----	----	----	----	----	----	----	
540.000	48.269	48.269	----	----	----	----	----	----	----	----	
545.000	54.192	54.192	----	----	----	----	----	----	----	----	
550.000	60.161	60.161	----	----	----	----	----	----	----	----	
555.000	66.169	66.169	----	----	----	----	----	----	----	----	
560.000	72.210	72.210	----	----	----	----	----	----	----	----	
570.000	84.366	84.366	----	----	----	----	----	----	----	----	
580.000	96.585	96.585	----	----	----	----	----	----	----	----	
590.000	108.828	108.828	----	----	----	----	----	----	----	----	
600.000	121.064	121.064	----	----	----	----	----	----	----	----	
610.000	133.262	133.262	----	----	----	----	----	----	----	----	
620.000	145.397	145.397	----	----	----	----	----	----	----	----	
630.000	157.447	157.447	----	----	----	----	----	----	----	----	
640.000	169.394	169.394	----	----	----	----	----	----	----	----	
650.000	181.219	181.219	----	----	----	----	----	----	----	----	
660.000	192.910	192.910	----	----	----	----	----	----	----	----	
670.000	204.454	204.454	----	----	----	----	----	----	----	----	
680.000	215.841	215.841	----	----	----	----	----	----	----	----	
690.000	227.063	227.063	----	----	----	----	----	----	----	----	
700.000	238.111	238.111	----	----	----	----	----	----	----	----	
710.000	248.982	248.982	----	----	----	----	----	----	----	----	
720.000	259.669	259.669	----	----	----	----	----	----	----	----	
730.000	270.169	270.169	----	----	----	----	----	----	----	----	
740.000	280.480	280.480	----	----	----	----	----	----	----	----	

W, Tungsten

A=183.850

Z=74

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	8.810		17.620		35.240		44.050		40.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
750.000	290.599	290.599	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
760.000	300.525	300.525	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
770.000	310.258	310.258	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
780.000	319.797	319.797	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
790.000	329.142	329.142	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
800.000	338.296	338.296	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
819.160	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---
820.000	-.---	-.---	0.140	0.140	-.---	-.---	-.---	-.---	-.---	-.---
821.000	-.---	-.---	0.311	0.311	-.---	-.---	-.---	-.---	-.---	-.---
822.000	-.---	-.---	0.484	0.484	-.---	-.---	-.---	-.---	-.---	-.---
823.000	-.---	-.---	0.660	0.660	-.---	-.---	-.---	-.---	-.---	-.---
824.000	-.---	-.---	0.838	0.838	-.---	-.---	-.---	-.---	-.---	-.---
825.000	-.---	-.---	1.018	1.018	-.---	-.---	-.---	-.---	-.---	-.---
826.000	-.---	-.---	1.201	1.201	-.---	-.---	-.---	-.---	-.---	-.---
827.000	-.---	-.---	1.386	1.386	-.---	-.---	-.---	-.---	-.---	-.---
828.000	-.---	-.---	1.573	1.573	-.---	-.---	-.---	-.---	-.---	-.---
829.000	-.---	-.---	1.763	1.763	-.---	-.---	-.---	-.---	-.---	-.---
830.000	-.---	-.---	1.955	1.955	-.---	-.---	-.---	-.---	-.---	-.---
835.000	-.---	-.---	2.947	2.947	-.---	-.---	-.---	-.---	-.---	-.---
840.000	-.---	-.---	3.993	3.993	-.---	-.---	-.---	-.---	-.---	-.---
845.000	-.---	-.---	5.089	5.089	-.---	-.---	-.---	-.---	-.---	-.---
850.000	381.223	381.378	6.233	6.233	-.---	-.---	-.---	-.---	-.---	-.---
855.000	-.---	-.---	7.424	7.424	-.---	-.---	-.---	-.---	-.---	-.---
860.000	-.---	-.---	8.658	8.658	-.---	-.---	-.---	-.---	-.---	-.---
865.000	-.---	-.---	9.933	9.933	-.---	-.---	-.---	-.---	-.---	-.---
870.000	-.---	-.---	11.247	11.247	-.---	-.---	-.---	-.---	-.---	-.---
875.000	-.---	-.---	12.599	12.599	-.---	-.---	-.---	-.---	-.---	-.---
880.000	-.---	-.---	13.986	13.986	-.---	-.---	-.---	-.---	-.---	-.---
890.000	-.---	-.---	16.859	16.859	-.---	-.---	-.---	-.---	-.---	-.---
900.000	419.615	420.797	19.852	19.852	-.---	-.---	-.---	-.---	-.---	-.---
910.000	-.---	-.---	22.951	22.951	-.---	-.---	-.---	-.---	-.---	-.---
920.000	-.---	-.---	26.146	26.146	-.---	-.---	-.---	-.---	-.---	-.---
930.000	-.---	-.---	29.424	29.424	-.---	-.---	-.---	-.---	-.---	-.---
940.000	-.---	-.---	32.776	32.776	-.---	-.---	-.---	-.---	-.---	-.---
950.000	453.805	457.111	36.192	36.192	-.---	-.---	-.---	-.---	-.---	-.---

W, Tungsten

A=183.850

Z=74

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	8.810		17.620		35.240		44.050		40.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
960.000	-.----	-.----	39.663	39.663	-.----	-.----	-.----	-.----	-.----	-.----
970.000	-.----	-.----	43.182	43.182	-.----	-.----	-.----	-.----	-.----	-.----
980.000	-.----	-.----	46.741	46.741	-.----	-.----	-.----	-.----	-.----	-.----
990.000	-.----	-.----	50.333	50.333	-.----	-.----	-.----	-.----	-.----	-.----
1000.000	484.162	490.735	53.951	53.951	-.----	-.----	-.----	-.----	-.----	-.----
1010.000	-.----	-.----	57.591	57.591	-.----	-.----	-.----	-.----	-.----	-.----
1020.000	-.----	-.----	61.246	61.246	-.----	-.----	-.----	-.----	-.----	-.----
1030.000	-.----	-.----	64.911	64.911	-.----	-.----	-.----	-.----	-.----	-.----
1040.000	-.----	-.----	68.583	68.583	-.----	-.----	-.----	-.----	-.----	-.----
1050.000	511.059	522.014	72.256	72.256	-.----	-.----	-.----	-.----	-.----	-.----
1060.000	-.----	-.----	75.927	75.927	-.----	-.----	-.----	-.----	-.----	-.----
1070.000	-.----	-.----	79.592	79.592	-.----	-.----	-.----	-.----	-.----	-.----
1080.000	-.----	-.----	83.249	83.249	-.----	-.----	-.----	-.----	-.----	-.----
1090.000	-.----	-.----	86.894	86.894	-.----	-.----	-.----	-.----	-.----	-.----
1100.000	534.852	551.231	90.524	90.524	-.----	-.----	-.----	-.----	-.----	-.----
1150.000	555.871	578.629	108.374	108.374	-.----	-.----	-.----	-.----	-.----	-.----
1200.000	574.419	604.408	125.563	125.563	-.----	-.----	-.----	-.----	-.----	-.----
1250.000	590.766	628.742	141.946	141.946	-.----	-.----	-.----	-.----	-.----	-.----
1299.400	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
1300.000	605.157	651.778	157.442	157.442	0.017	0.017	-.----	-.----	-.----	-.----
1301.000	-.----	-.----	-.----	-.----	0.046	0.046	-.----	-.----	-.----	-.----
1302.000	-.----	-.----	-.----	-.----	0.076	0.076	-.----	-.----	-.----	-.----
1303.000	-.----	-.----	-.----	-.----	0.107	0.107	-.----	-.----	-.----	-.----
1304.000	-.----	-.----	-.----	-.----	0.138	0.138	-.----	-.----	-.----	-.----
1305.000	-.----	-.----	-.----	-.----	0.170	0.170	-.----	-.----	-.----	-.----
1306.000	-.----	-.----	-.----	-.----	0.203	0.203	-.----	-.----	-.----	-.----
1307.000	-.----	-.----	-.----	-.----	0.236	0.236	-.----	-.----	-.----	-.----
1308.000	-.----	-.----	-.----	-.----	0.270	0.270	-.----	-.----	-.----	-.----
1309.000	-.----	-.----	-.----	-.----	0.305	0.305	-.----	-.----	-.----	-.----
1310.000	-.----	-.----	-.----	-.----	0.340	0.340	-.----	-.----	-.----	-.----
1315.000	-.----	-.----	-.----	-.----	0.527	0.527	-.----	-.----	-.----	-.----
1320.000	-.----	-.----	-.----	-.----	0.731	0.731	-.----	-.----	-.----	-.----
1325.000	-.----	-.----	-.----	-.----	0.950	0.950	-.----	-.----	-.----	-.----
1330.000	-.----	-.----	-.----	-.----	1.184	1.184	-.----	-.----	-.----	-.----
1335.000	-.----	-.----	-.----	-.----	1.433	1.433	-.----	-.----	-.----	-.----

W, Tungsten

A = 183.850

Z = 74

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 8.810		$2T_s$ 17.620		$4T_s$ 35.240		$5T_s$ 44.050		T_d 40.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1340.000	-.----	-.----	-.----	-.----	1.696	1.696	-.----	-.----	-.----	-.----
1345.000	-.----	-.----	-.----	-.----	1.974	1.974	-.----	-.----	-.----	-.----
1350.000	617.807	673.644	172.013	172.072	2.265	2.265	-.----	-.----	-.----	-.----
1355.000	-.----	-.----	-.----	-.----	2.568	2.568	-.----	-.----	-.----	-.----
1360.000	-.----	-.----	-.----	-.----	2.885	2.885	-.----	-.----	-.----	-.----
1370.000	-.----	-.----	-.----	-.----	3.554	3.554	-.----	-.----	-.----	-.----
1380.000	-.----	-.----	-.----	-.----	4.270	4.270	-.----	-.----	-.----	-.----
1390.000	-.----	-.----	-.----	-.----	5.028	5.028	-.----	-.----	-.----	-.----
1400.000	628.911	694.449	185.658	185.937	5.827	5.827	-.----	-.----	-.----	-.----
1408.630	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
1409.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.008	0.008
1410.000	-.----	-.----	-.----	-.----	6.663	6.663	-.----	-.----	0.029	0.029
1415.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.142	0.142
1420.000	-.----	-.----	-.----	-.----	7.534	7.534	-.----	-.----	0.270	0.270
1425.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.410	0.410
1430.000	-.----	-.----	-.----	-.----	8.439	8.439	-.----	-.----	0.563	0.563
1435.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.729	0.729
1440.000	-.----	-.----	-.----	-.----	9.373	9.373	-.----	-.----	0.907	0.907
1445.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.096	1.096
1450.000	638.638	714.290	198.390	199.102	10.337	10.337	-.----	-.----	1.297	1.297
1455.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.509	1.509
1460.000	-.----	-.----	-.----	-.----	11.326	11.326	-.----	-.----	1.732	1.732
1470.000	-.----	-.----	-.----	-.----	12.340	12.340	-.----	-.----	2.209	2.209
1480.000	-.----	-.----	-.----	-.----	13.377	13.377	-.----	-.----	2.725	2.725
1490.000	-.----	-.----	-.----	-.----	14.434	14.434	-.----	-.----	3.278	3.278
1496.890	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
1497.000	-.----	-.----	-.----	-.----	-.----	-.----	0.002	0.002	-.----	-.----
1498.000	-.----	-.----	-.----	-.----	-.----	-.----	0.018	0.018	-.----	-.----
1499.000	-.----	-.----	-.----	-.----	-.----	-.----	0.035	0.035	-.----	-.----
1500.000	647.140	733.250	210.239	211.627	15.511	15.511	0.052	0.052	3.867	3.867

Re, Rhenium

A = 186.200

Z = 75

		<-----Surface Sputtering Regime----->			<-----Bulk Displacement Regime----->					T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	8.020		16.040		32.080		40.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
466.950	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
467.000	0.063	0.063	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
468.000	1.397	1.397	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
469.000	2.737	2.737	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	4.082	4.082	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
475.000	10.889	10.889	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	17.817	17.817	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
485.000	24.854	24.854	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
490.000	31.987	31.987	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
495.000	39.205	39.205	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
500.000	46.495	46.495	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
505.000	53.848	53.848	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
510.000	61.254	61.254	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
515.000	68.704	68.704	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
520.000	76.190	76.190	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
530.000	91.236	91.236	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
540.000	106.336	106.336	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
550.000	121.441	121.441	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
560.000	136.506	136.506	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
570.000	151.496	151.496	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
580.000	166.377	166.377	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
590.000	181.123	181.123	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	195.709	195.709	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	210.117	210.117	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	224.328	224.328	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	238.329	238.329	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	252.109	252.109	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
650.000	265.657	265.657	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
660.000	278.966	278.966	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
670.000	292.031	292.031	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
680.000	304.845	304.845	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
690.000	317.408	317.408	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
700.000	329.715	329.715	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
710.000	341.766	341.766	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
720.000	353.561	353.561	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----

Re, Rhenium

A=186.200

Z=75

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	8.020		16.040		32.080		40.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
730.000	365.100	365.100	-.----	-.----	-.----	-.----	-.----	-.----		
740.000	376.384	376.384	-.----	-.----	-.----	-.----	-.----	-.----		
750.000	387.414	387.414	-.----	-.----	-.----	-.----	-.----	-.----		
760.000	398.194	398.194	-.----	-.----	-.----	-.----	-.----	-.----		
770.000	408.724	408.724	-.----	-.----	-.----	-.----	-.----	-.----		
774.160	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
775.000	-.----	-.----	0.182	0.182	-.----	-.----	-.----	-.----		
776.000	-.----	-.----	0.404	0.404	-.----	-.----	-.----	-.----		
777.000	-.----	-.----	0.629	0.629	-.----	-.----	-.----	-.----		
778.000	-.----	-.----	0.856	0.856	-.----	-.----	-.----	-.----		
779.000	-.----	-.----	1.087	1.087	-.----	-.----	-.----	-.----		
780.000	419.009	419.016	1.320	1.320	-.----	-.----	-.----	-.----		
785.000	-.----	-.----	2.528	2.528	-.----	-.----	-.----	-.----		
790.000	429.051	429.104	3.804	3.804	-.----	-.----	-.----	-.----		
795.000	-.----	-.----	5.143	5.143	-.----	-.----	-.----	-.----		
800.000	438.854	438.999	6.542	6.542	-.----	-.----	-.----	-.----		
805.000	-.----	-.----	7.999	7.999	-.----	-.----	-.----	-.----		
810.000	-.----	-.----	9.510	9.510	-.----	-.----	-.----	-.----		
815.000	-.----	-.----	11.073	11.073	-.----	-.----	-.----	-.----		
820.000	-.----	-.----	12.684	12.684	-.----	-.----	-.----	-.----		
825.000	-.----	-.----	14.341	14.341	-.----	-.----	-.----	-.----		
830.000	-.----	-.----	16.042	16.042	-.----	-.----	-.----	-.----		
835.000	-.----	-.----	17.783	17.783	-.----	-.----	-.----	-.----		
840.000	-.----	-.----	19.563	19.563	-.----	-.----	-.----	-.----		
850.000	484.412	485.785	23.230	23.230	-.----	-.----	-.----	-.----		
860.000	-.----	-.----	27.026	27.026	-.----	-.----	-.----	-.----		
870.000	-.----	-.----	30.935	30.935	-.----	-.----	-.----	-.----		
880.000	-.----	-.----	34.942	34.942	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	39.035	39.035	-.----	-.----	-.----	-.----		
900.000	524.585	528.590	43.202	43.202	-.----	-.----	-.----	-.----		
910.000	-.----	-.----	47.430	47.430	-.----	-.----	-.----	-.----		
920.000	-.----	-.----	51.711	51.711	-.----	-.----	-.----	-.----		
930.000	-.----	-.----	56.035	56.035	-.----	-.----	-.----	-.----		
940.000	-.----	-.----	60.393	60.393	-.----	-.----	-.----	-.----		
950.000	559.903	567.986	64.777	64.777	-.----	-.----	-.----	-.----		

Re, Rhenium

A = 186.200

Z = 75

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 8.020		2T _s 16.040		4T _s 32.080		5T _s 40.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
960.000	-.----	-.----	69.180	69.180	-.----	-.----	-.----	-.----	-.----	-.----
970.000	-.----	-.----	73.595	73.595	-.----	-.----	-.----	-.----	-.----	-.----
980.000	-.----	-.----	78.016	78.016	-.----	-.----	-.----	-.----	-.----	-.----
990.000	-.----	-.----	82.439	82.439	-.----	-.----	-.----	-.----	-.----	-.----
1000.000	590.887	604.441	86.856	86.856	-.----	-.----	-.----	-.----	-.----	-.----
1010.000	-.----	-.----	91.265	91.265	-.----	-.----	-.----	-.----	-.----	-.----
1020.000	-.----	-.----	95.660	95.660	-.----	-.----	-.----	-.----	-.----	-.----
1030.000	-.----	-.----	100.038	100.038	-.----	-.----	-.----	-.----	-.----	-.----
1040.000	-.----	-.----	104.396	104.396	-.----	-.----	-.----	-.----	-.----	-.----
1050.000	618.022	638.336	108.729	108.729	-.----	-.----	-.----	-.----	-.----	-.----
1060.000	-.----	-.----	113.036	113.036	-.----	-.----	-.----	-.----	-.----	-.----
1070.000	-.----	-.----	117.313	117.313	-.----	-.----	-.----	-.----	-.----	-.----
1080.000	-.----	-.----	121.558	121.558	-.----	-.----	-.----	-.----	-.----	-.----
1090.000	-.----	-.----	125.769	125.769	-.----	-.----	-.----	-.----	-.----	-.----
1100.000	641.752	669.989	129.944	129.944	-.----	-.----	-.----	-.----	-.----	-.----
1150.000	662.478	699.665	150.225	150.225	-.----	-.----	-.----	-.----	-.----	-.----
1200.000	680.553	727.587	169.417	169.417	-.----	-.----	-.----	-.----	-.----	-.----
1233.180	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----
1234.000	-.----	-.----	-.----	-.----	0.030	0.030	-.----	-.----	-.----	-.----
1235.000	-.----	-.----	-.----	-.----	0.068	0.068	-.----	-.----	-.----	-.----
1236.000	-.----	-.----	-.----	-.----	0.107	0.107	-.----	-.----	-.----	-.----
1237.000	-.----	-.----	-.----	-.----	0.147	0.147	-.----	-.----	-.----	-.----
1238.000	-.----	-.----	-.----	-.----	0.188	0.188	-.----	-.----	-.----	-.----
1239.000	-.----	-.----	-.----	-.----	0.229	0.229	-.----	-.----	-.----	-.----
1240.000	-.----	-.----	-.----	-.----	0.271	0.271	-.----	-.----	-.----	-.----
1245.000	-.----	-.----	-.----	-.----	0.495	0.495	-.----	-.----	-.----	-.----
1250.000	696.291	753.945	187.443	187.450	0.740	0.740	-.----	-.----	-.----	-.----
1255.000	-.----	-.----	-.----	-.----	1.004	1.004	-.----	-.----	-.----	-.----
1260.000	-.----	-.----	-.----	-.----	1.288	1.288	-.----	-.----	-.----	-.----
1265.000	-.----	-.----	-.----	-.----	1.590	1.590	-.----	-.----	-.----	-.----
1270.000	-.----	-.----	-.----	-.----	1.910	1.910	-.----	-.----	-.----	-.----
1275.000	-.----	-.----	-.----	-.----	2.247	2.247	-.----	-.----	-.----	-.----
1280.000	-.----	-.----	-.----	-.----	2.602	2.602	-.----	-.----	-.----	-.----
1285.000	-.----	-.----	-.----	-.----	2.972	2.972	-.----	-.----	-.----	-.----
1290.000	-.----	-.----	-.----	-.----	3.358	3.358	-.----	-.----	-.----	-.----

Re, Rhenium

A=186.200

Z=75

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 8.020		2T _s 16.040		4T _s 32.080		5T _s 40.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1295.000	-.----	-.----	-.----	-.----	3.760	3.760	-.----	-.----		
1300.000	709.969	778.900	204.279	204.425	4.176	4.176	-.----	-.----		
1310.000	-.----	-.----	-.----	-.----	5.050	5.050	-.----	-.----		
1320.000	-.----	-.----	-.----	-.----	5.977	5.977	-.----	-.----		
1330.000	-.----	-.----	-.----	-.----	6.954	6.954	-.----	-.----		
1340.000	-.----	-.----	-.----	-.----	7.976	7.976	-.----	-.----		
1350.000	721.830	802.592	219.939	220.459	9.041	9.041	-.----	-.----		
1360.000	-.----	-.----	-.----	-.----	10.146	10.146	-.----	-.----		
1370.000	-.----	-.----	-.----	-.----	11.288	11.288	-.----	-.----		
1380.000	-.----	-.----	-.----	-.----	12.464	12.464	-.----	-.----		
1390.000	-.----	-.----	-.----	-.----	13.671	13.671	-.----	-.----		
1400.000	732.088	825.140	234.456	235.638	14.907	14.907	-.----	-.----		
1410.000	-.----	-.----	-.----	-.----	16.169	16.169	-.----	-.----		
1420.000	-.----	-.----	-.----	-.----	17.457	17.457	-.----	-.----		
1422.240	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1423.000	-.----	-.----	-.----	-.----	-.----	-.----	0.016	0.016		
1424.000	-.----	-.----	-.----	-.----	-.----	-.----	0.038	0.038		
1425.000	-.----	-.----	-.----	-.----	-.----	-.----	0.060	0.060		
1426.000	-.----	-.----	-.----	-.----	-.----	-.----	0.083	0.083		
1427.000	-.----	-.----	-.----	-.----	-.----	-.----	0.106	0.106		
1428.000	-.----	-.----	-.----	-.----	-.----	-.----	0.130	0.130		
1429.000	-.----	-.----	-.----	-.----	-.----	-.----	0.154	0.154		
1430.000	-.----	-.----	-.----	-.----	18.766	18.766	0.179	0.179		
1435.000	-.----	-.----	-.----	-.----	-.----	-.----	0.312	0.312		
1440.000	-.----	-.----	-.----	-.----	20.096	20.096	0.459	0.459		
1445.000	-.----	-.----	-.----	-.----	-.----	-.----	0.619	0.619		
1450.000	740.929	846.648	247.880	250.038	21.445	21.445	0.792	0.792		
1455.000	-.----	-.----	-.----	-.----	-.----	-.----	0.977	0.977		
1460.000	-.----	-.----	-.----	-.----	22.810	22.810	1.174	1.174		
1465.000	-.----	-.----	-.----	-.----	-.----	-.----	1.382	1.382		
1470.000	-.----	-.----	-.----	-.----	24.190	24.190	1.602	1.602		
1475.000	-.----	-.----	-.----	-.----	-.----	-.----	1.833	1.833		
1480.000	-.----	-.----	-.----	-.----	25.584	25.584	2.075	2.075		
1490.000	-.----	-.----	-.----	-.----	26.990	26.990	2.590	2.590		
1500.000	748.519	867.208	260.269	263.727	28.407	28.407	3.143	3.143		

Os, Osmium

A = 190.200

Z = 76

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d		
Displacement		T _s	2T _s		4T _s		5T _s					
Energy(eV)=		8.150	16.300		32.600		40.750					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)		
480.380	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
481.000	0.786	0.786	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
482.000	2.063	2.063	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
483.000	3.347	3.347	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
484.000	4.636	4.636	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
485.000	5.932	5.932	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
486.000	7.233	7.233	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
487.000	8.539	8.539	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
488.000	9.851	9.851	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
489.000	11.169	11.169	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
490.000	12.491	12.491	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
495.000	19.180	19.180	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
500.000	25.983	25.983	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
505.000	32.889	32.889	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
510.000	39.885	39.885	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
515.000	46.961	46.961	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
520.000	54.107	54.107	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
525.000	61.311	61.311	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
530.000	68.566	68.566	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
535.000	75.863	75.863	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
540.000	83.194	83.194	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
550.000	97.927	97.927	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
560.000	112.713	112.713	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
570.000	127.504	127.504	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
580.000	142.259	142.259	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
590.000	156.942	156.942	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
600.000	171.524	171.524	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
610.000	185.978	185.978	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
620.000	200.281	200.281	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
630.000	214.414	214.414	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
640.000	228.360	228.360	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
650.000	242.106	242.106	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
660.000	255.640	255.640	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
670.000	268.953	268.953	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		
680.000	282.037	282.037	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----		

Os, Osmium

A=190.200

Z=76

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	8.150		16.300		32.600		40.750			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
690.000	294.886	294.886	-.----	-.----	-.----	-.----	-.----	-.----		
700.000	307.496	307.496	-.----	-.----	-.----	-.----	-.----	-.----		
710.000	319.862	319.862	-.----	-.----	-.----	-.----	-.----	-.----		
720.000	331.984	331.984	-.----	-.----	-.----	-.----	-.----	-.----		
730.000	343.858	343.858	-.----	-.----	-.----	-.----	-.----	-.----		
740.000	355.485	355.485	-.----	-.----	-.----	-.----	-.----	-.----		
750.000	366.865	366.865	-.----	-.----	-.----	-.----	-.----	-.----		
760.000	377.999	377.999	-.----	-.----	-.----	-.----	-.----	-.----		
770.000	388.887	388.887	-.----	-.----	-.----	-.----	-.----	-.----		
780.000	399.532	399.532	-.----	-.----	-.----	-.----	-.----	-.----		
790.000	409.936	409.936	-.----	-.----	-.----	-.----	-.----	-.----		
794.580	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----		
795.000	-.----	-.----	0.087	0.087	-.----	-.----	-.----	-.----		
796.000	-.----	-.----	0.298	0.298	-.----	-.----	-.----	-.----		
797.000	-.----	-.----	0.512	0.512	-.----	-.----	-.----	-.----		
798.000	-.----	-.----	0.729	0.729	-.----	-.----	-.----	-.----		
799.000	-.----	-.----	0.949	0.949	-.----	-.----	-.----	-.----		
800.000	420.101	420.106	1.172	1.172	-.----	-.----	-.----	-.----		
805.000	-.----	-.----	2.327	2.327	-.----	-.----	-.----	-.----		
810.000	-.----	-.----	3.551	3.551	-.----	-.----	-.----	-.----		
815.000	-.----	-.----	4.838	4.838	-.----	-.----	-.----	-.----		
820.000	-.----	-.----	6.186	6.186	-.----	-.----	-.----	-.----		
825.000	-.----	-.----	7.593	7.593	-.----	-.----	-.----	-.----		
830.000	-.----	-.----	9.054	9.054	-.----	-.----	-.----	-.----		
835.000	-.----	-.----	10.567	10.567	-.----	-.----	-.----	-.----		
840.000	-.----	-.----	12.130	12.130	-.----	-.----	-.----	-.----		
845.000	-.----	-.----	13.739	13.739	-.----	-.----	-.----	-.----		
850.000	467.455	468.125	15.392	15.392	-.----	-.----	-.----	-.----		
855.000	-.----	-.----	17.087	17.087	-.----	-.----	-.----	-.----		
860.000	-.----	-.----	18.822	18.822	-.----	-.----	-.----	-.----		
870.000	-.----	-.----	22.400	22.400	-.----	-.----	-.----	-.----		
880.000	-.----	-.----	26.110	26.110	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	29.937	29.937	-.----	-.----	-.----	-.----		
900.000	509.354	511.976	33.866	33.866	-.----	-.----	-.----	-.----		
910.000	-.----	-.----	37.884	37.884	-.----	-.----	-.----	-.----		

Os, Osmium

A = 190.200

Z = 76

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement T_s 2T_s 4T_s 5T_s T_d </div> <div> Energy(eV)= 8.150 16.300 32.600 40.750 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
920.000	-.----	-.----	41.979	41.979	-.----	-.----	-.----	-.----		
930.000	-.----	-.----	46.140	46.140	-.----	-.----	-.----	-.----		
940.000	-.----	-.----	50.357	50.357	-.----	-.----	-.----	-.----		
950.000	546.290	552.263	54.620	54.620	-.----	-.----	-.----	-.----		
960.000	-.----	-.----	58.920	58.920	-.----	-.----	-.----	-.----		
970.000	-.----	-.----	63.250	63.250	-.----	-.----	-.----	-.----		
980.000	-.----	-.----	67.603	67.603	-.----	-.----	-.----	-.----		
990.000	-.----	-.----	71.971	71.971	-.----	-.----	-.----	-.----		
1000.000	578.767	589.477	76.348	76.348	-.----	-.----	-.----	-.----		
1010.000	-.----	-.----	80.729	80.729	-.----	-.----	-.----	-.----		
1020.000	-.----	-.----	85.109	85.109	-.----	-.----	-.----	-.----		
1030.000	-.----	-.----	89.482	89.482	-.----	-.----	-.----	-.----		
1040.000	-.----	-.----	93.845	93.845	-.----	-.----	-.----	-.----		
1050.000	607.264	624.022	98.193	98.193	-.----	-.----	-.----	-.----		
1060.000	-.----	-.----	102.524	102.524	-.----	-.----	-.----	-.----		
1070.000	-.----	-.----	106.833	106.833	-.----	-.----	-.----	-.----		
1080.000	-.----	-.----	111.117	111.117	-.----	-.----	-.----	-.----		
1090.000	-.----	-.----	115.374	115.374	-.----	-.----	-.----	-.----		
1100.000	632.228	656.231	119.602	119.602	-.----	-.----	-.----	-.----		
1150.000	654.063	686.385	140.224	140.224	-.----	-.----	-.----	-.----		
1200.000	673.132	714.717	159.852	159.852	-.----	-.----	-.----	-.----		
1250.000	689.758	741.427	178.370	178.370	-.----	-.----	-.----	-.----		
1263.240	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
1264.000	-.----	-.----	-.----	-.----	0.027	0.027	-.----	-.----		
1265.000	-.----	-.----	-.----	-.----	0.063	0.063	-.----	-.----		
1266.000	-.----	-.----	-.----	-.----	0.100	0.100	-.----	-.----		
1267.000	-.----	-.----	-.----	-.----	0.138	0.138	-.----	-.----		
1268.000	-.----	-.----	-.----	-.----	0.177	0.177	-.----	-.----		
1269.000	-.----	-.----	-.----	-.----	0.217	0.217	-.----	-.----		
1270.000	-.----	-.----	-.----	-.----	0.258	0.258	-.----	-.----		
1275.000	-.----	-.----	-.----	-.----	0.474	0.474	-.----	-.----		
1280.000	-.----	-.----	-.----	-.----	0.710	0.710	-.----	-.----		
1285.000	-.----	-.----	-.----	-.----	0.965	0.965	-.----	-.----		
1290.000	-.----	-.----	-.----	-.----	1.240	1.240	-.----	-.----		
1295.000	-.----	-.----	-.----	-.----	1.533	1.533	-.----	-.----		

Os, Osmium

A=190.200

Z=76

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 8.150		2T _s 16.300		4T _s 32.600		5T _s 40.750			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1300.000	704.225	766.685	195.728	195.765	1.844	1.844	-.----	-.----		
1305.000	-.----	-.----	-.----	-.----	2.172	2.172	-.----	-.----		
1310.000	-.----	-.----	-.----	-.----	2.517	2.517	-.----	-.----		
1315.000	-.----	-.----	-.----	-.----	2.878	2.878	-.----	-.----		
1320.000	-.----	-.----	-.----	-.----	3.255	3.255	-.----	-.----		
1330.000	-.----	-.----	-.----	-.----	4.054	4.054	-.----	-.----		
1340.000	-.----	-.----	-.----	-.----	4.909	4.909	-.----	-.----		
1350.000	716.787	790.636	211.921	212.172	5.817	5.817	-.----	-.----		
1360.000	-.----	-.----	-.----	-.----	6.774	6.774	-.----	-.----		
1370.000	-.----	-.----	-.----	-.----	7.777	7.777	-.----	-.----		
1380.000	-.----	-.----	-.----	-.----	8.823	8.823	-.----	-.----		
1390.000	-.----	-.----	-.----	-.----	9.909	9.909	-.----	-.----		
1400.000	727.665	813.405	226.970	227.685	11.032	11.032	-.----	-.----		
1410.000	-.----	-.----	-.----	-.----	12.190	12.190	-.----	-.----		
1420.000	-.----	-.----	-.----	-.----	13.378	13.378	-.----	-.----		
1430.000	-.----	-.----	-.----	-.----	14.597	14.597	-.----	-.----		
1440.000	-.----	-.----	-.----	-.----	15.842	15.842	-.----	-.----		
1450.000	737.055	835.102	240.914	242.385	17.112	17.112	-.----	-.----		
1456.140	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1457.000	-.----	-.----	-.----	-.----	-.----	-.----	0.017	0.017		
1458.000	-.----	-.----	-.----	-.----	-.----	-.----	0.038	0.038		
1459.000	-.----	-.----	-.----	-.----	-.----	-.----	0.059	0.059		
1460.000	-.----	-.----	-.----	-.----	18.404	18.404	0.081	0.081		
1465.000	-.----	-.----	-.----	-.----	-.----	-.----	0.199	0.199		
1470.000	-.----	-.----	-.----	-.----	19.718	19.718	0.331	0.331		
1475.000	-.----	-.----	-.----	-.----	-.----	-.----	0.476	0.476		
1480.000	-.----	-.----	-.----	-.----	21.050	21.050	0.634	0.634		
1485.000	-.----	-.----	-.----	-.----	-.----	-.----	0.804	0.804		
1490.000	-.----	-.----	-.----	-.----	22.400	22.400	0.986	0.986		
1495.000	-.----	-.----	-.----	-.----	-.----	-.----	1.181	1.181		
1500.000	745.127	855.823	253.804	256.342	23.765	23.765	1.387	1.387		

Ir, Iridium

A = 192.200

Z = 77

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$		T_d		
Energy(eV)=		6.940	13.880		27.760	34.700				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
428.220	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
429.000	1.537	1.537	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
430.000	3.536	3.536	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
435.000	13.608	13.608	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
440.000	23.795	23.795	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
445.000	34.079	34.079	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
450.000	44.443	44.443	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
455.000	54.874	54.874	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
460.000	65.357	65.357	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
465.000	75.878	75.878	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	86.426	86.426	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
475.000	96.990	96.990	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	107.558	107.558	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
490.000	128.672	128.672	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
500.000	149.698	149.698	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
510.000	170.579	170.579	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
520.000	191.263	191.263	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
530.000	211.708	211.708	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
540.000	231.880	231.880	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
550.000	251.748	251.748	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
560.000	271.289	271.289	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
570.000	290.482	290.482	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
580.000	309.312	309.312	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
590.000	327.766	327.766	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	345.836	345.836	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	363.514	363.514	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	380.797	380.797	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	397.681	397.681	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	414.166	414.166	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
650.000	430.252	430.252	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
660.000	445.942	445.942	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
670.000	461.238	461.238	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
680.000	476.144	476.144	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
690.000	490.665	490.665	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
700.000	504.806	504.806	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----

Ir, Iridium

A=192.200

Z=77

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	6.940		13.880		27.760		34.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
715.040	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
716.000	-.----	-.----	0.313	0.313	-.----	-.----	-.----	-.----	-.----	-.----
717.000	-.----	-.----	0.642	0.642	-.----	-.----	-.----	-.----	-.----	-.----
718.000	-.----	-.----	0.976	0.976	-.----	-.----	-.----	-.----	-.----	-.----
719.000	-.----	-.----	1.313	1.313	-.----	-.----	-.----	-.----	-.----	-.----
720.000	-.----	-.----	1.655	1.655	-.----	-.----	-.----	-.----	-.----	-.----
725.000	-.----	-.----	3.417	3.417	-.----	-.----	-.----	-.----	-.----	-.----
730.000	-.----	-.----	5.270	5.270	-.----	-.----	-.----	-.----	-.----	-.----
735.000	-.----	-.----	7.208	7.208	-.----	-.----	-.----	-.----	-.----	-.----
740.000	-.----	-.----	9.225	9.225	-.----	-.----	-.----	-.----	-.----	-.----
745.000	-.----	-.----	11.318	11.318	-.----	-.----	-.----	-.----	-.----	-.----
750.000	570.021	570.443	13.481	13.481	-.----	-.----	-.----	-.----	-.----	-.----
755.000	-.----	-.----	15.711	15.711	-.----	-.----	-.----	-.----	-.----	-.----
760.000	-.----	-.----	18.004	18.004	-.----	-.----	-.----	-.----	-.----	-.----
765.000	-.----	-.----	20.356	20.356	-.----	-.----	-.----	-.----	-.----	-.----
770.000	-.----	-.----	22.762	22.762	-.----	-.----	-.----	-.----	-.----	-.----
775.000	-.----	-.----	25.221	25.221	-.----	-.----	-.----	-.----	-.----	-.----
780.000	-.----	-.----	27.727	27.727	-.----	-.----	-.----	-.----	-.----	-.----
790.000	-.----	-.----	32.872	32.872	-.----	-.----	-.----	-.----	-.----	-.----
800.000	626.723	629.398	38.172	38.172	-.----	-.----	-.----	-.----	-.----	-.----
810.000	-.----	-.----	43.607	43.607	-.----	-.----	-.----	-.----	-.----	-.----
820.000	-.----	-.----	49.155	49.155	-.----	-.----	-.----	-.----	-.----	-.----
830.000	-.----	-.----	54.800	54.800	-.----	-.----	-.----	-.----	-.----	-.----
840.000	-.----	-.----	60.523	60.523	-.----	-.----	-.----	-.----	-.----	-.----
850.000	675.828	682.836	66.310	66.310	-.----	-.----	-.----	-.----	-.----	-.----
860.000	-.----	-.----	72.147	72.147	-.----	-.----	-.----	-.----	-.----	-.----
870.000	-.----	-.----	78.021	78.021	-.----	-.----	-.----	-.----	-.----	-.----
880.000	-.----	-.----	83.921	83.921	-.----	-.----	-.----	-.----	-.----	-.----
890.000	-.----	-.----	89.837	89.837	-.----	-.----	-.----	-.----	-.----	-.----
900.000	718.235	731.625	95.758	95.758	-.----	-.----	-.----	-.----	-.----	-.----
910.000	-.----	-.----	101.677	101.677	-.----	-.----	-.----	-.----	-.----	-.----
920.000	-.----	-.----	107.585	107.585	-.----	-.----	-.----	-.----	-.----	-.----
930.000	-.----	-.----	113.476	113.476	-.----	-.----	-.----	-.----	-.----	-.----
940.000	-.----	-.----	119.343	119.343	-.----	-.----	-.----	-.----	-.----	-.----
950.000	754.779	776.456	125.179	125.179	-.----	-.----	-.----	-.----	-.----	-.----

Ir, Iridium

A = 192.200

Z = 77

Displacement		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Energy(eV)=		T _s	2T _s		4T _s	5T _s					
		6.940	13.880		27.760	34.700					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
960.000	-.----	-.----	130.981	130.981	-.----	-.----	-.----	-.----	-.----	-.----	
970.000	-.----	-.----	136.744	136.744	-.----	-.----	-.----	-.----	-.----	-.----	
980.000	-.----	-.----	142.462	142.462	-.----	-.----	-.----	-.----	-.----	-.----	
990.000	-.----	-.----	148.133	148.133	-.----	-.----	-.----	-.----	-.----	-.----	
1000.000	786.211	817.888	153.753	153.753	-.----	-.----	-.----	-.----	-.----	-.----	
1050.000	813.196	856.376	180.993	180.993	-.----	-.----	-.----	-.----	-.----	-.----	
1100.000	836.318	892.295	206.637	206.637	-.----	-.----	-.----	-.----	-.----	-.----	
1145.860	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	
1146.000	-.----	-.----	-.----	-.----	0.007	0.007	-.----	-.----	-.----	-.----	
1147.000	-.----	-.----	-.----	-.----	0.062	0.062	-.----	-.----	-.----	-.----	
1148.000	-.----	-.----	-.----	-.----	0.119	0.119	-.----	-.----	-.----	-.----	
1149.000	-.----	-.----	-.----	-.----	0.177	0.177	-.----	-.----	-.----	-.----	
1150.000	856.082	925.957	230.560	230.561	0.236	0.236	-.----	-.----	-.----	-.----	
1155.000	-.----	-.----	-.----	-.----	0.548	0.548	-.----	-.----	-.----	-.----	
1160.000	-.----	-.----	-.----	-.----	0.890	0.890	-.----	-.----	-.----	-.----	
1165.000	-.----	-.----	-.----	-.----	1.259	1.259	-.----	-.----	-.----	-.----	
1170.000	-.----	-.----	-.----	-.----	1.655	1.655	-.----	-.----	-.----	-.----	
1175.000	-.----	-.----	-.----	-.----	2.076	2.076	-.----	-.----	-.----	-.----	
1180.000	-.----	-.----	-.----	-.----	2.523	2.523	-.----	-.----	-.----	-.----	
1185.000	-.----	-.----	-.----	-.----	2.994	2.994	-.----	-.----	-.----	-.----	
1190.000	-.----	-.----	-.----	-.----	3.488	3.488	-.----	-.----	-.----	-.----	
1195.000	-.----	-.----	-.----	-.----	4.005	4.005	-.----	-.----	-.----	-.----	
1200.000	872.927	957.621	252.733	252.873	4.543	4.543	-.----	-.----	-.----	-.----	
1210.000	-.----	-.----	-.----	-.----	5.681	5.681	-.----	-.----	-.----	-.----	
1220.000	-.----	-.----	-.----	-.----	6.896	6.896	-.----	-.----	-.----	-.----	
1230.000	-.----	-.----	-.----	-.----	8.183	8.183	-.----	-.----	-.----	-.----	
1240.000	-.----	-.----	-.----	-.----	9.536	9.536	-.----	-.----	-.----	-.----	
1250.000	887.234	987.509	273.185	273.792	10.951	10.951	-.----	-.----	-.----	-.----	
1260.000	-.----	-.----	-.----	-.----	12.422	12.422	-.----	-.----	-.----	-.----	
1270.000	-.----	-.----	-.----	-.----	13.945	13.945	-.----	-.----	-.----	-.----	
1280.000	-.----	-.----	-.----	-.----	15.515	15.515	-.----	-.----	-.----	-.----	
1290.000	-.----	-.----	-.----	-.----	17.130	17.130	-.----	-.----	-.----	-.----	
1300.000	899.331	1015.807	291.979	293.459	18.785	18.785	-.----	-.----	-.----	-.----	
1310.000	-.----	-.----	-.----	-.----	20.476	20.476	-.----	-.----	-.----	-.----	
1320.000	-.----	-.----	-.----	-.----	22.201	22.201	-.----	-.----	-.----	-.----	

Ir, Iridium

A=192.200

Z=77

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T_d	
	T_s 6.940		$2T_s$ 13.880		$4T_s$ 27.760		$5T_s$ 34.700			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1323.730	-----	-----	-----	-----	-----	-----	0.000	0.000		
1324.000	-----	-----	-----	-----	-----	-----	0.008	0.008		
1325.000	-----	-----	-----	-----	-----	-----	0.040	0.040		
1326.000	-----	-----	-----	-----	-----	-----	0.072	0.072		
1327.000	-----	-----	-----	-----	-----	-----	0.105	0.105		
1328.000	-----	-----	-----	-----	-----	-----	0.139	0.139		
1329.000	-----	-----	-----	-----	-----	-----	0.174	0.174		
1330.000	-----	-----	-----	-----	23.955	23.955	0.210	0.210		
1335.000	-----	-----	-----	-----	-----	-----	0.399	0.399		
1340.000	-----	-----	-----	-----	25.737	25.737	0.607	0.607		
1345.000	-----	-----	-----	-----	-----	-----	0.833	0.833		
1350.000	909.503	1042.676	309.200	311.999	27.543	27.543	1.077	1.077		
1355.000	-----	-----	-----	-----	-----	-----	1.338	1.338		
1360.000	-----	-----	-----	-----	29.372	29.372	1.616	1.616		
1365.000	-----	-----	-----	-----	-----	-----	1.910	1.910		
1370.000	-----	-----	-----	-----	31.219	31.219	2.219	2.219		
1375.000	-----	-----	-----	-----	-----	-----	2.544	2.544		
1380.000	-----	-----	-----	-----	33.083	33.083	2.884	2.884		
1390.000	-----	-----	-----	-----	34.962	34.962	3.605	3.605		
1400.000	917.996	1068.254	324.943	329.520	36.854	36.854	4.380	4.380		
1410.000	-----	-----	-----	-----	38.757	38.757	5.205	5.205		
1420.000	-----	-----	-----	-----	40.669	40.669	6.077	6.077		
1430.000	-----	-----	-----	-----	42.587	42.587	6.992	6.992		
1440.000	-----	-----	-----	-----	44.512	44.512	7.948	7.948		
1450.000	925.023	1092.660	339.309	346.117	46.441	46.441	8.943	8.943		
1460.000	-----	-----	-----	-----	48.372	48.372	9.973	9.973		
1470.000	-----	-----	-----	-----	50.305	50.305	11.036	11.036		
1480.000	-----	-----	-----	-----	52.238	52.238	12.130	12.130		
1490.000	-----	-----	-----	-----	54.169	54.169	13.252	13.252		
1500.000	930.771	1115.999	352.398	361.874	56.099	56.099	14.400	14.400		

Pt, Platinum

A=195.090

Z=78

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=		5.860	11.720			23.440	29.300			33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
379.720	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
380.000	0.868	0.868	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
381.000	4.032	4.032	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
382.000	7.198	7.198	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
383.000	10.365	10.365	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
384.000	13.533	13.533	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
385.000	16.702	16.702	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
386.000	19.871	19.871	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
387.000	23.041	23.041	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
388.000	26.212	26.212	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
389.000	29.383	29.383	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
390.000	32.554	32.554	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
395.000	48.407	48.407	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
400.000	64.243	64.243	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
405.000	80.047	80.047	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
410.000	95.805	95.805	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
415.000	111.503	111.503	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
420.000	127.130	127.130	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
425.000	142.673	142.673	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
430.000	158.123	158.123	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
435.000	173.470	173.470	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
440.000	188.706	188.706	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
450.000	218.813	218.813	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
460.000	248.392	248.392	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
470.000	277.399	277.399	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
480.000	305.800	305.800	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
490.000	333.569	333.569	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
500.000	360.686	360.686	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
510.000	387.138	387.138	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
520.000	412.916	412.916	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
530.000	438.015	438.015	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
540.000	462.434	462.434	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
550.000	486.176	486.176	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
560.000	509.245	509.245	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
570.000	531.647	531.647	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	

Displacement		Surface Sputtering Regime		Bulk Displacement Regime		Displacement		Regime		T _d	
Energy(eV)=		T _s	2T _s	4T _s	5T _s	Energy(eV)=		T _s	2T _s	T _d	
		5.860	11.720	23.440	29.300			5.860	11.720	33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)
580.000	553.392	553.392	-----	-----	-----	-----	-----	-----	-----	-----	-----
590.000	574.489	574.489	-----	-----	-----	-----	-----	-----	-----	-----	-----
600.000	594.950	594.950	-----	-----	-----	-----	-----	-----	-----	-----	-----
610.000	614.786	614.786	-----	-----	-----	-----	-----	-----	-----	-----	-----
620.000	634.011	634.011	-----	-----	-----	-----	-----	-----	-----	-----	-----
630.000	652.637	652.637	-----	-----	-----	-----	-----	-----	-----	-----	-----
640.000	670.679	670.679	-----	-----	-----	-----	-----	-----	-----	-----	-----
640.370	-----	-----	0.000	0.000	-----	-----	-----	-----	-----	-----	-----
641.000	-----	-----	0.321	0.321	-----	-----	-----	-----	-----	-----	-----
642.000	-----	-----	0.836	0.836	-----	-----	-----	-----	-----	-----	-----
643.000	-----	-----	1.357	1.357	-----	-----	-----	-----	-----	-----	-----
644.000	-----	-----	1.882	1.882	-----	-----	-----	-----	-----	-----	-----
645.000	-----	-----	2.413	2.413	-----	-----	-----	-----	-----	-----	-----
646.000	-----	-----	2.948	2.948	-----	-----	-----	-----	-----	-----	-----
647.000	-----	-----	3.489	3.489	-----	-----	-----	-----	-----	-----	-----
648.000	-----	-----	4.034	4.034	-----	-----	-----	-----	-----	-----	-----
649.000	-----	-----	4.584	4.584	-----	-----	-----	-----	-----	-----	-----
650.000	688.151	688.203	5.139	5.139	-----	-----	-----	-----	-----	-----	-----
655.000	-----	-----	7.983	7.983	-----	-----	-----	-----	-----	-----	-----
660.000	705.068	705.287	10.935	10.935	-----	-----	-----	-----	-----	-----	-----
665.000	-----	-----	13.989	13.989	-----	-----	-----	-----	-----	-----	-----
670.000	721.443	721.949	17.139	17.139	-----	-----	-----	-----	-----	-----	-----
675.000	-----	-----	20.377	20.377	-----	-----	-----	-----	-----	-----	-----
680.000	737.292	738.208	23.697	23.697	-----	-----	-----	-----	-----	-----	-----
685.000	-----	-----	27.094	27.094	-----	-----	-----	-----	-----	-----	-----
690.000	752.628	754.080	30.561	30.561	-----	-----	-----	-----	-----	-----	-----
695.000	-----	-----	34.094	34.094	-----	-----	-----	-----	-----	-----	-----
700.000	767.466	769.582	37.688	37.688	-----	-----	-----	-----	-----	-----	-----
710.000	-----	-----	45.038	45.038	-----	-----	-----	-----	-----	-----	-----
720.000	-----	-----	52.575	52.575	-----	-----	-----	-----	-----	-----	-----
730.000	-----	-----	60.267	60.267	-----	-----	-----	-----	-----	-----	-----
740.000	-----	-----	68.085	68.085	-----	-----	-----	-----	-----	-----	-----
750.000	834.676	842.026	76.003	76.003	-----	-----	-----	-----	-----	-----	-----
760.000	-----	-----	83.996	83.996	-----	-----	-----	-----	-----	-----	-----
770.000	-----	-----	92.044	92.044	-----	-----	-----	-----	-----	-----	-----

Pt, Platinum

A=195.090

Z=78

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s	$2T_s$	$4T_s$	$5T_s$	T_d					
Energy(eV)=	5.860	11.720	23.440	29.300	33.000					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
780.000	----	----	100.128	100.128	----	----	----	----	----	----
790.000	----	----	108.230	108.230	----	----	----	----	----	----
800.000	891.465	907.153	116.334	116.334	----	----	----	----	----	----
810.000	----	----	124.428	124.428	----	----	----	----	----	----
820.000	----	----	132.497	132.497	----	----	----	----	----	----
830.000	----	----	140.532	140.532	----	----	----	----	----	----
840.000	----	----	148.521	148.521	----	----	----	----	----	----
850.000	939.339	966.212	156.457	156.457	----	----	----	----	----	----
860.000	----	----	164.331	164.331	----	----	----	----	----	----
870.000	----	----	172.137	172.137	----	----	----	----	----	----
880.000	----	----	179.867	179.867	----	----	----	----	----	----
890.000	----	----	187.518	187.518	----	----	----	----	----	----
900.000	979.615	1020.177	195.083	195.083	----	----	----	----	----	----
910.000	----	----	202.559	202.559	----	----	----	----	----	----
920.000	----	----	209.942	209.942	----	----	----	----	----	----
930.000	----	----	217.230	217.230	----	----	----	----	----	----
940.000	----	----	224.419	224.419	----	----	----	----	----	----
950.000	1013.418	1069.821	231.508	231.508	----	----	----	----	----	----
960.000	----	----	238.494	238.494	----	----	----	----	----	----
970.000	----	----	245.376	245.376	----	----	----	----	----	----
980.000	----	----	252.153	252.153	----	----	----	----	----	----
990.000	----	----	258.824	258.824	----	----	----	----	----	----
1000.000	1041.712	1115.763	265.388	265.388	----	----	----	----	----	----
1035.020	----	----	----	----	0.000	0.000	----	----	----	----
1036.000	----	----	----	----	0.084	0.084	----	----	----	----
1037.000	----	----	----	----	0.172	0.172	----	----	----	----
1038.000	----	----	----	----	0.262	0.262	----	----	----	----
1039.000	----	----	----	----	0.353	0.353	----	----	----	----
1040.000	----	----	----	----	0.446	0.446	----	----	----	----
1045.000	----	----	----	----	0.935	0.935	----	----	----	----
1050.000	1065.309	1158.506	296.605	296.620	1.463	1.463	----	----	----	----
1055.000	----	----	----	----	2.031	2.031	----	----	----	----
1060.000	----	----	----	----	2.635	2.635	----	----	----	----
1065.000	----	----	----	----	3.275	3.275	----	----	----	----
1070.000	----	----	----	----	3.949	3.949	----	----	----	----

Pt, Platinum

A=195.090

Z=78

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	5.860		11.720		23.440		29.300		33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1075.000	-.----	-.----	-.----	-.----	4.655	4.655	-.----	-.----	-.----	-.----
1080.000	-.----	-.----	-.----	-.----	5.393	5.393	-.----	-.----	-.----	-.----
1085.000	-.----	-.----	-.----	-.----	6.162	6.162	-.----	-.----	-.----	-.----
1090.000	-.----	-.----	-.----	-.----	6.959	6.959	-.----	-.----	-.----	-.----
1095.000	-.----	-.----	-.----	-.----	7.784	7.784	-.----	-.----	-.----	-.----
1100.000	1084.901	1198.461	325.175	325.518	8.635	8.635	-.----	-.----	-.----	-.----
1110.000	-.----	-.----	-.----	-.----	10.414	10.414	-.----	-.----	-.----	-.----
1120.000	-.----	-.----	-.----	-.----	12.287	12.287	-.----	-.----	-.----	-.----
1130.000	-.----	-.----	-.----	-.----	14.245	14.245	-.----	-.----	-.----	-.----
1140.000	-.----	-.----	-.----	-.----	16.281	16.281	-.----	-.----	-.----	-.----
1150.000	1101.072	1235.969	351.192	352.411	18.389	18.389	-.----	-.----	-.----	-.----
1160.000	-.----	-.----	-.----	-.----	20.562	20.562	-.----	-.----	-.----	-.----
1170.000	-.----	-.----	-.----	-.----	22.794	22.794	-.----	-.----	-.----	-.----
1180.000	-.----	-.----	-.----	-.----	25.079	25.079	-.----	-.----	-.----	-.----
1190.000	-.----	-.----	-.----	-.----	27.412	27.412	-.----	-.----	-.----	-.----
1198.510	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----
1199.000	-.----	-.----	-.----	-.----	-.----	-.----	0.024	0.024	-.----	-.----
1200.000	1114.317	1271.314	374.798	377.527	29.787	29.787	0.073	0.073	-.----	-.----
1205.000	-.----	-.----	-.----	-.----	-.----	-.----	0.337	0.337	-.----	-.----
1210.000	-.----	-.----	-.----	-.----	32.200	32.200	0.628	0.628	-.----	-.----
1215.000	-.----	-.----	-.----	-.----	-.----	-.----	0.945	0.945	-.----	-.----
1220.000	-.----	-.----	-.----	-.----	34.648	34.648	1.289	1.289	-.----	-.----
1225.000	-.----	-.----	-.----	-.----	-.----	-.----	1.657	1.657	-.----	-.----
1230.000	-.----	-.----	-.----	-.----	37.124	37.124	2.049	2.049	-.----	-.----
1235.000	-.----	-.----	-.----	-.----	-.----	-.----	2.464	2.464	-.----	-.----
1240.000	-.----	-.----	-.----	-.----	39.627	39.627	2.901	2.901	-.----	-.----
1245.000	-.----	-.----	-.----	-.----	-.----	-.----	3.360	3.360	-.----	-.----
1250.000	1125.055	1304.735	396.154	401.063	42.151	42.151	3.840	3.840	-.----	-.----
1255.000	-.----	-.----	-.----	-.----	-.----	-.----	4.340	4.340	-.----	-.----
1260.000	-.----	-.----	-.----	-.----	44.694	44.694	4.859	4.859	-.----	-.----
1270.000	-.----	-.----	-.----	-.----	47.253	47.253	5.953	5.953	-.----	-.----
1280.000	-.----	-.----	-.----	-.----	49.825	49.825	7.117	7.117	-.----	-.----
1290.000	-.----	-.----	-.----	-.----	52.406	52.406	8.345	8.345	-.----	-.----
1294.130	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
1295.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.031	0.031

Pt, Platinum

A = 195.090

Z = 78

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	5.860		11.720		23.440		29.300		33.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1296.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.068	0.068
1297.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.106	0.106
1298.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.145	0.145
1299.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.184	0.184
1300.000	1133.645	1336.435	415.431	423.186	54.995	54.995	9.633	9.633	0.225	0.225
1305.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.440	0.440
1310.000	-.----	-.----	-.----	-.----	57.588	57.588	10.977	10.977	0.677	0.677
1315.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.935	0.935
1320.000	-.----	-.----	-.----	-.----	60.185	60.185	12.372	12.372	1.213	1.213
1325.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.510	1.510
1330.000	-.----	-.----	-.----	-.----	62.781	62.781	13.814	13.814	1.826	1.826
1335.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.161	2.161
1340.000	-.----	-.----	-.----	-.----	65.377	65.377	15.300	15.300	2.513	2.513
1345.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.882	2.882
1350.000	1140.389	1366.588	432.798	444.041	67.969	67.969	16.826	16.826	3.268	3.268
1355.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.670	3.670
1360.000	-.----	-.----	-.----	-.----	70.556	70.556	18.389	18.389	4.087	4.087
1370.000	-.----	-.----	-.----	-.----	73.137	73.137	19.986	19.986	4.966	4.966
1380.000	-.----	-.----	-.----	-.----	75.710	75.710	21.613	21.613	5.901	5.901
1390.000	-.----	-.----	-.----	-.----	78.274	78.274	23.268	23.268	6.889	6.889
1400.000	1145.548	1395.341	448.419	463.752	80.827	80.827	24.949	24.949	7.925	7.925
1410.000	-.----	-.----	-.----	-.----	-.----	-.----	26.652	26.652	9.007	9.007
1420.000	-.----	-.----	-.----	-.----	-.----	-.----	28.376	28.376	10.131	10.131
1430.000	-.----	-.----	-.----	-.----	-.----	-.----	30.118	30.118	11.295	11.295
1440.000	-.----	-.----	-.----	-.----	-.----	-.----	31.876	31.876	12.495	12.495
1450.000	1149.344	1422.825	462.449	482.429	93.396	93.396	33.648	33.648	13.729	13.729
1460.000	-.----	-.----	-.----	-.----	-.----	-.----	35.432	35.432	14.994	14.994
1470.000	-.----	-.----	-.----	-.----	-.----	-.----	37.227	37.227	16.289	16.289
1480.000	-.----	-.----	-.----	-.----	-.----	-.----	39.031	39.031	17.609	17.609
1490.000	-.----	-.----	-.----	-.----	-.----	-.----	40.842	40.842	18.954	18.954
1500.000	1151.967	1449.152	475.032	500.167	105.558	105.558	42.658	42.658	20.321	20.321

Au, Gold

A=196.967

Z=79

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->		-----> <-----Bulk Displacement Regime----->							
	T_s 3.820	$2T_s$ 7.640	$4T_s$ 15.280	$5T_s$ 19.100	T_d 36.000					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
270.940	0.000	0.000	-----	-----	-----	-----	-----	-----	-----	-----
271.000	0.580	0.580	-----	-----	-----	-----	-----	-----	-----	-----
272.000	10.812	10.812	-----	-----	-----	-----	-----	-----	-----	-----
273.000	20.976	20.976	-----	-----	-----	-----	-----	-----	-----	-----
274.000	31.073	31.073	-----	-----	-----	-----	-----	-----	-----	-----
275.000	41.103	41.103	-----	-----	-----	-----	-----	-----	-----	-----
276.000	51.067	51.067	-----	-----	-----	-----	-----	-----	-----	-----
277.000	60.967	60.967	-----	-----	-----	-----	-----	-----	-----	-----
278.000	70.802	70.802	-----	-----	-----	-----	-----	-----	-----	-----
279.000	80.574	80.574	-----	-----	-----	-----	-----	-----	-----	-----
280.000	90.284	90.284	-----	-----	-----	-----	-----	-----	-----	-----
285.000	137.920	137.920	-----	-----	-----	-----	-----	-----	-----	-----
290.000	184.100	184.100	-----	-----	-----	-----	-----	-----	-----	-----
295.000	228.900	228.900	-----	-----	-----	-----	-----	-----	-----	-----
300.000	272.388	272.388	-----	-----	-----	-----	-----	-----	-----	-----
305.000	314.627	314.627	-----	-----	-----	-----	-----	-----	-----	-----
310.000	355.671	355.671	-----	-----	-----	-----	-----	-----	-----	-----
315.000	395.570	395.570	-----	-----	-----	-----	-----	-----	-----	-----
320.000	434.370	434.370	-----	-----	-----	-----	-----	-----	-----	-----
325.000	472.111	472.111	-----	-----	-----	-----	-----	-----	-----	-----
330.000	508.834	508.834	-----	-----	-----	-----	-----	-----	-----	-----
335.000	544.572	544.572	-----	-----	-----	-----	-----	-----	-----	-----
340.000	579.361	579.361	-----	-----	-----	-----	-----	-----	-----	-----
350.000	646.209	646.209	-----	-----	-----	-----	-----	-----	-----	-----
360.000	709.608	709.608	-----	-----	-----	-----	-----	-----	-----	-----
370.000	769.762	769.762	-----	-----	-----	-----	-----	-----	-----	-----
380.000	826.859	826.859	-----	-----	-----	-----	-----	-----	-----	-----
390.000	881.069	881.069	-----	-----	-----	-----	-----	-----	-----	-----
400.000	932.552	932.552	-----	-----	-----	-----	-----	-----	-----	-----
410.000	981.453	981.453	-----	-----	-----	-----	-----	-----	-----	-----
420.000	1027.912	1027.912	-----	-----	-----	-----	-----	-----	-----	-----
430.000	1072.057	1072.057	-----	-----	-----	-----	-----	-----	-----	-----
440.000	1114.008	1114.008	-----	-----	-----	-----	-----	-----	-----	-----
450.000	1153.880	1153.880	-----	-----	-----	-----	-----	-----	-----	-----
460.000	1191.780	1191.780	-----	-----	-----	-----	-----	-----	-----	-----

Au, Gold

A = 196.967

Z = 79

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> </div>										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.820		7.640		15.280		19.100		36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
469.680	----	----	0.000	0.000	----	----	----	----	----	----
470.000	1227.809	1227.810	0.503	0.503	----	----	----	----	----	----
471.000	----	----	2.115	2.115	----	----	----	----	----	----
472.000	----	----	3.735	3.735	----	----	----	----	----	----
473.000	----	----	5.362	5.362	----	----	----	----	----	----
474.000	----	----	6.995	6.995	----	----	----	----	----	----
475.000	----	----	8.635	8.635	----	----	----	----	----	----
476.000	----	----	10.282	10.282	----	----	----	----	----	----
477.000	----	----	11.935	11.935	----	----	----	----	----	----
478.000	----	----	13.595	13.595	----	----	----	----	----	----
479.000	----	----	15.261	15.261	----	----	----	----	----	----
480.000	1262.063	1262.300	16.933	16.933	----	----	----	----	----	----
485.000	----	----	25.377	25.377	----	----	----	----	----	----
490.000	1294.631	1295.547	33.951	33.951	----	----	----	----	----	----
495.000	----	----	42.640	42.640	----	----	----	----	----	----
500.000	1325.598	1327.623	51.428	51.428	----	----	----	----	----	----
505.000	----	----	60.302	60.302	----	----	----	----	----	----
510.000	1355.046	1358.599	69.249	69.249	----	----	----	----	----	----
515.000	----	----	78.258	78.258	----	----	----	----	----	----
520.000	1383.050	1388.539	87.316	87.316	----	----	----	----	----	----
525.000	----	----	96.413	96.413	----	----	----	----	----	----
530.000	1409.681	1417.503	105.540	105.540	----	----	----	----	----	----
535.000	----	----	114.687	114.687	----	----	----	----	----	----
540.000	1435.009	1445.545	123.846	123.846	----	----	----	----	----	----
550.000	1459.096	1472.717	142.168	142.168	----	----	----	----	----	----
560.000	1482.005	1499.066	160.450	160.450	----	----	----	----	----	----
570.000	1503.792	1524.635	178.642	178.642	----	----	----	----	----	----
580.000	1524.512	1549.467	196.702	196.702	----	----	----	----	----	----
590.000	1544.217	1573.600	214.595	214.595	----	----	----	----	----	----
600.000	1562.954	1597.068	232.288	232.288	----	----	----	----	----	----
610.000	----	----	249.756	249.756	----	----	----	----	----	----
620.000	----	----	266.977	266.977	----	----	----	----	----	----
630.000	----	----	283.932	283.932	----	----	----	----	----	----
640.000	----	----	300.606	300.606	----	----	----	----	----	----
650.000	1643.681	1705.540	316.988	316.988	----	----	----	----	----	----

Au, Gold

A=196.967

Z=79

Displacement		-----Surface Sputtering Regime----- ----->				-----Bulk Displacement Regime----->					
Energy(eV)=		T _s	2T _s		4T _s		5T _s		T _d		
		3.820	7.640		15.280		19.100		36.000		
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
660.000	-.----	-.----	333.066	333.066	-.----	-.----	-.----	-.----	-.----	-.----	
670.000	-.----	-.----	348.834	348.834	-.----	-.----	-.----	-.----	-.----	-.----	
680.000	-.----	-.----	364.286	364.286	-.----	-.----	-.----	-.----	-.----	-.----	
690.000	-.----	-.----	379.417	379.417	-.----	-.----	-.----	-.----	-.----	-.----	
700.000	1706.242	1801.584	394.225	394.225	-.----	-.----	-.----	-.----	-.----	-.----	
710.000	-.----	-.----	408.708	408.708	-.----	-.----	-.----	-.----	-.----	-.----	
720.000	-.----	-.----	422.867	422.867	-.----	-.----	-.----	-.----	-.----	-.----	
730.000	-.----	-.----	436.701	436.701	-.----	-.----	-.----	-.----	-.----	-.----	
740.000	-.----	-.----	450.213	450.213	-.----	-.----	-.----	-.----	-.----	-.----	
750.000	1754.449	1887.707	463.405	463.405	-.----	-.----	-.----	-.----	-.----	-.----	
760.000	-.----	-.----	476.280	476.280	-.----	-.----	-.----	-.----	-.----	-.----	
770.000	-.----	-.----	488.841	488.841	-.----	-.----	-.----	-.----	-.----	-.----	
778.320	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	
779.000	-.----	-.----	-.----	-.----	0.178	0.178	-.----	-.----	-.----	-.----	
780.000	-.----	-.----	501.091	501.092	0.445	0.445	-.----	-.----	-.----	-.----	
785.000	-.----	-.----	-.----	-.----	1.838	1.838	-.----	-.----	-.----	-.----	
790.000	-.----	-.----	513.036	513.070	3.318	3.318	-.----	-.----	-.----	-.----	
795.000	-.----	-.----	-.----	-.----	4.882	4.882	-.----	-.----	-.----	-.----	
800.000	1791.252	1965.769	524.680	524.801	6.524	6.524	-.----	-.----	-.----	-.----	
805.000	-.----	-.----	-.----	-.----	8.241	8.241	-.----	-.----	-.----	-.----	
810.000	-.----	-.----	-.----	-.----	10.028	10.028	-.----	-.----	-.----	-.----	
815.000	-.----	-.----	-.----	-.----	11.883	11.883	-.----	-.----	-.----	-.----	
820.000	-.----	-.----	-.----	-.----	13.800	13.800	-.----	-.----	-.----	-.----	
825.000	-.----	-.----	-.----	-.----	15.778	15.778	-.----	-.----	-.----	-.----	
830.000	-.----	-.----	-.----	-.----	17.811	17.811	-.----	-.----	-.----	-.----	
835.000	-.----	-.----	-.----	-.----	19.898	19.898	-.----	-.----	-.----	-.----	
840.000	-.----	-.----	-.----	-.----	22.034	22.034	-.----	-.----	-.----	-.----	
850.000	1818.945	2037.177	578.555	580.033	26.446	26.446	-.----	-.----	-.----	-.----	
860.000	-.----	-.----	-.----	-.----	31.023	31.023	-.----	-.----	-.----	-.----	
870.000	-.----	-.----	-.----	-.----	35.746	35.746	-.----	-.----	-.----	-.----	
880.000	-.----	-.----	-.----	-.----	40.597	40.597	-.----	-.----	-.----	-.----	
890.000	-.----	-.----	-.----	-.----	45.557	45.557	-.----	-.----	-.----	-.----	
900.000	1839.332	2103.016	625.689	630.223	50.610	50.610	-.----	-.----	-.----	-.----	
907.680	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	
908.000	-.----	-.----	-.----	-.----	-.----	-.----	0.046	0.046	-.----	-.----	

Au, Gold

A=196.967

Z=79

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.820		7.640		15.280		19.100		36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
909.000	-.----	-.----	-.----	-.----	-.----	-.----	0.197	0.197	-.----	-.----
910.000	-.----	-.----	-.----	-.----	55.744	55.744	0.350	0.350	-.----	-.----
915.000	-.----	-.----	-.----	-.----	-.----	-.----	1.151	1.151	-.----	-.----
920.000	-.----	-.----	-.----	-.----	60.943	60.943	2.014	2.014	-.----	-.----
925.000	-.----	-.----	-.----	-.----	-.----	-.----	2.934	2.934	-.----	-.----
930.000	-.----	-.----	-.----	-.----	66.197	66.197	3.910	3.910	-.----	-.----
935.000	-.----	-.----	-.----	-.----	-.----	-.----	4.939	4.939	-.----	-.----
940.000	-.----	-.----	-.----	-.----	71.493	71.493	6.018	6.018	-.----	-.----
945.000	-.----	-.----	-.----	-.----	-.----	-.----	7.146	7.146	-.----	-.----
950.000	1853.833	2164.135	666.777	676.130	76.822	76.822	8.319	8.319	-.----	-.----
955.000	-.----	-.----	-.----	-.----	-.----	-.----	9.537	9.537	-.----	-.----
960.000	-.----	-.----	-.----	-.----	82.173	82.173	10.796	10.796	-.----	-.----
970.000	-.----	-.----	-.----	-.----	87.540	87.540	13.432	13.432	-.----	-.----
980.000	-.----	-.----	-.----	-.----	92.913	92.913	16.213	16.213	-.----	-.----
990.000	-.----	-.----	-.----	-.----	98.286	98.286	19.124	19.124	-.----	-.----
1000.000	1863.581	2221.206	702.494	718.370	103.652	103.652	22.153	22.153	-.----	-.----
1010.000	-.----	-.----	-.----	-.----	109.005	109.005	25.287	25.287	-.----	-.----
1020.000	-.----	-.----	-.----	-.----	114.339	114.339	28.516	28.516	-.----	-.----
1030.000	-.----	-.----	-.----	-.----	119.651	119.651	31.829	31.829	-.----	-.----
1040.000	-.----	-.----	-.----	-.----	124.934	124.934	35.215	35.215	-.----	-.----
1050.000	1869.479	2274.772	733.470	757.441	130.186	130.186	38.667	38.667	-.----	-.----
1060.000	-.----	-.----	-.----	-.----	135.402	135.402	42.177	42.177	-.----	-.----
1070.000	-.----	-.----	-.----	-.----	140.579	140.579	45.735	45.735	-.----	-.----
1080.000	-.----	-.----	-.----	-.----	145.714	145.714	49.336	49.336	-.----	-.----
1090.000	-.----	-.----	-.----	-.----	150.805	150.805	52.972	52.972	-.----	-.----
1100.000	1872.256	2325.275	760.275	793.756	155.849	155.849	56.637	56.637	-.----	-.----
1110.000	-.----	-.----	-.----	-.----	-.----	-.----	60.326	60.326	-.----	-.----
1120.000	-.----	-.----	-.----	-.----	-.----	-.----	64.034	64.034	-.----	-.----
1130.000	-.----	-.----	-.----	-.----	-.----	-.----	67.755	67.755	-.----	-.----
1140.000	-.----	-.----	-.----	-.----	-.----	-.----	71.485	71.485	-.----	-.----
1150.000	1872.500	2373.079	783.419	827.657	180.297	180.297	75.220	75.220	-.----	-.----
1160.000	-.----	-.----	-.----	-.----	-.----	-.----	78.955	78.955	-.----	-.----
1170.000	-.----	-.----	-.----	-.----	-.----	-.----	82.688	82.688	-.----	-.----
1180.000	-.----	-.----	-.----	-.----	-.----	-.----	86.415	86.415	-.----	-.----
1190.000	-.----	-.----	-.----	-.----	-.----	-.----	90.133	90.133	-.----	-.----

Au, Gold

A=196.967

Z=79

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
	T_s 3.820		$2T_s$ 7.640		$4T_s$ 15.280		$5T_s$ 19.100		T_d 36.000	
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1200.000	1870.689	2418.486	803.353	859.429	203.337	203.337	93.838	93.838	-.----	-.----
1250.000	1867.214	2461.752	820.474	889.313	224.883	224.886	112.106	112.106	-.----	-.----
1300.000	1862.394	2503.090	835.131	917.515	244.912	245.054	129.768	129.768	-.----	-.----
1350.000	1856.492	2542.686	847.626	944.208	263.448	264.008	146.663	146.663	-.----	-.----
1376.448	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000
1377.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.016	0.016
1378.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.047	0.047
1379.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.078	0.078
1380.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.109	0.109
1385.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.281	0.281
1390.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.471	0.471
1395.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	0.679	0.679
1400.000	1849.724	2580.698	858.227	969.543	280.542	281.867	162.696	162.696	0.907	0.907
1450.000	1842.270	2617.262	867.165	993.650	296.263	298.734	177.819	177.826	-.----	-.----
1405.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.152	1.152
1410.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.413	1.413
1415.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.692	1.692
1420.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	1.987	1.987
1425.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.296	2.296
1430.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.621	2.621
1435.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	2.961	2.961
1440.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	3.315	3.315
1450.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.063	4.063
1460.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	4.864	4.864
1470.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	5.712	5.712
1480.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	6.606	6.606
1490.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	7.543	7.543
1500.000	1834.277	2652.498	874.644	1016.642	310.688	314.702	192.017	192.125	8.519	8.519

Tl, Thallium

A = 204.370

Z = 81

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> </div>										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	1.890		3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
153.040	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
154.000	66.950	66.950	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	135.659	135.659	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
156.000	202.794	202.794	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
157.000	268.406	268.406	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
158.000	332.548	332.548	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
159.000	395.267	395.267	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	456.610	456.610	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	744.169	744.169	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	1003.248	1003.248	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	1237.832	1237.832	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	1451.190	1451.190	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	1646.020	1646.020	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	1824.573	1824.573	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	1988.736	1988.736	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	2140.106	2140.106	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	2280.043	2280.043	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	2409.715	2409.715	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	2530.126	2530.126	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	2642.151	2642.151	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	2843.999	2843.999	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	3020.322	3020.322	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	3175.093	3175.093	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	3311.481	3311.481	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	3432.055	3432.055	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
276.900	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	
277.000	-.----	-.----	0.994	0.994	-.----	-.----	-.----	-.----	-.----	
278.000	-.----	-.----	11.548	11.548	-.----	-.----	-.----	-.----	-.----	
279.000	-.----	-.----	22.036	22.036	-.----	-.----	-.----	-.----	-.----	
280.000	3538.924	3539.142	32.459	32.459	-.----	-.----	-.----	-.----	-.----	
285.000	-.----	-.----	83.619	83.619	-.----	-.----	-.----	-.----	-.----	
290.000	3633.837	3637.542	133.257	133.257	-.----	-.----	-.----	-.----	-.----	
295.000	-.----	-.----	181.453	181.453	-.----	-.----	-.----	-.----	-.----	
300.000	3718.265	3729.214	228.281	228.281	-.----	-.----	-.----	-.----	-.----	
305.000	-.----	-.----	273.802	273.802	-.----	-.----	-.----	-.----	-.----	

Tl, Thallium

A = 204.370

Z = 81

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement T_s $2T_s$ $4T_s$ $5T_s$ T_d </div> <div> Energy(eV)= 1.890 3.780 7.560 9.450 </div> </div>										
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
310.000	3793.452	3814.864	318.074	318.074	-.----	-.----	-.----	-.----		
315.000	-.----	-.----	361.148	361.148	-.----	-.----	-.----	-.----		
320.000	3860.458	3895.110	403.070	403.070	-.----	-.----	-.----	-.----		
325.000	-.----	-.----	443.882	443.882	-.----	-.----	-.----	-.----		
330.000	3920.194	3970.494	483.623	483.623	-.----	-.----	-.----	-.----		
335.000	-.----	-.----	522.328	522.328	-.----	-.----	-.----	-.----		
340.000	3973.450	4041.493	560.032	560.032	-.----	-.----	-.----	-.----		
350.000	4020.909	4108.529	632.556	632.556	-.----	-.----	-.----	-.----		
360.000	4063.170	4171.974	701.425	701.425	-.----	-.----	-.----	-.----		
370.000	4100.758	4232.155	766.842	766.842	-.----	-.----	-.----	-.----		
380.000	4134.135	4289.365	828.996	828.996	-.----	-.----	-.----	-.----		
390.000	4163.710	4343.864	888.059	888.059	-.----	-.----	-.----	-.----		
400.000	4189.846	4395.884	944.193	944.193	-.----	-.----	-.----	-.----		
410.000	4212.865	4445.630	997.548	997.548	-.----	-.----	-.----	-.----		
420.000	4233.055	4493.289	1048.265	1048.265	-.----	-.----	-.----	-.----		
430.000	4250.675	4539.026	1096.477	1096.477	-.----	-.----	-.----	-.----		
440.000	4265.955	4582.990	1142.311	1142.311	-.----	-.----	-.----	-.----		
450.000	4279.102	4625.317	1185.885	1185.885	-.----	-.----	-.----	-.----		
460.000	4290.305	4666.127	1227.311	1227.311	-.----	-.----	-.----	-.----		
470.000	4299.733	4705.531	1266.698	1266.698	-.----	-.----	-.----	-.----		
479.180	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
480.000	4307.537	4743.628	1304.145	1304.146	1.357	1.357	-.----	-.----		
481.000	-.----	-.----	-.----	-.----	3.030	3.030	-.----	-.----		
482.000	-.----	-.----	-.----	-.----	4.712	4.712	-.----	-.----		
483.000	-.----	-.----	-.----	-.----	6.401	6.401	-.----	-.----		
484.000	-.----	-.----	-.----	-.----	8.099	8.099	-.----	-.----		
485.000	-.----	-.----	-.----	-.----	9.804	9.804	-.----	-.----		
486.000	-.----	-.----	-.----	-.----	11.516	11.516	-.----	-.----		
487.000	-.----	-.----	-.----	-.----	13.236	13.236	-.----	-.----		
488.000	-.----	-.----	-.----	-.----	14.962	14.962	-.----	-.----		
489.000	-.----	-.----	-.----	-.----	16.696	16.696	-.----	-.----		
490.000	4313.858	4780.509	1339.749	1340.016	18.436	18.436	-.----	-.----		
495.000	-.----	-.----	-.----	-.----	27.235	27.235	-.----	-.----		
500.000	4318.820	4816.255	1373.601	1374.583	36.181	36.181	-.----	-.----		
505.000	-.----	-.----	-.----	-.----	45.257	45.257	-.----	-.----		

Tl, Thallium

A = 204.370

Z = 81

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	1.890		3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
510.000	-.----	-.----	1405.787	1407.927	54.448	54.448	-.----	-.----		
515.000	-.----	-.----	-.----	-.----	63.738	63.738	-.----	-.----		
520.000	-.----	-.----	1436.389	1440.119	73.113	73.113	-.----	-.----		
525.000	-.----	-.----	-.----	-.----	82.560	82.560	-.----	-.----		
530.000	-.----	-.----	1465.485	1471.227	92.067	92.067	-.----	-.----		
535.000	-.----	-.----	-.----	-.----	101.622	101.622	-.----	-.----		
540.000	-.----	-.----	1493.147	1501.311	111.214	111.214	-.----	-.----		
550.000	4326.912	4980.379	1519.447	1530.431	130.471	130.471	-.----	-.----		
560.000	-.----	-.----	1544.449	1558.638	149.767	149.767	-.----	-.----		
566.170	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
567.000	-.----	-.----	-.----	-.----	-.----	-.----	0.767	0.767		
568.000	-.----	-.----	-.----	-.----	-.----	-.----	1.703	1.703		
569.000	-.----	-.----	-.----	-.----	-.----	-.----	2.646	2.646		
570.000	-.----	-.----	1568.216	1585.982	169.037	169.037	3.596	3.596		
575.000	-.----	-.----	-.----	-.----	-.----	-.----	8.452	8.452		
580.000	-.----	-.----	1590.809	1612.510	188.229	188.229	13.474	13.474		
585.000	-.----	-.----	-.----	-.----	-.----	-.----	18.648	18.648		
590.000	-.----	-.----	1612.283	1638.264	207.295	207.295	23.963	23.963		
595.000	-.----	-.----	-.----	-.----	-.----	-.----	29.407	29.407		
600.000	4314.514	5125.047	1632.692	1663.284	226.195	226.195	34.968	34.968		
605.000	-.----	-.----	-.----	-.----	-.----	-.----	40.636	40.636		
610.000	-.----	-.----	-.----	-.----	244.894	244.894	46.402	46.402		
615.000	-.----	-.----	-.----	-.----	-.----	-.----	52.257	52.257		
620.000	-.----	-.----	-.----	-.----	263.365	263.365	58.191	58.191		
630.000	-.----	-.----	-.----	-.----	281.581	281.581	70.265	70.265		
640.000	-.----	-.----	-.----	-.----	299.522	299.522	82.565	82.565		
650.000	4288.784	5255.086	1720.445	1778.600	317.171	317.171	95.036	95.036		
660.000	-.----	-.----	-.----	-.----	334.514	334.514	107.632	107.632		
670.000	-.----	-.----	-.----	-.----	351.540	351.540	120.308	120.308		
680.000	-.----	-.----	-.----	-.----	368.239	368.239	133.029	133.029		
690.000	-.----	-.----	-.----	-.----	384.605	384.605	145.759	145.759		
700.000	4254.441	5373.778	1788.166	1880.246	400.633	400.633	158.471	158.471		
710.000	-.----	-.----	-.----	-.----	416.319	416.319	171.137	171.137		
720.000	-.----	-.----	-.----	-.----	431.662	431.662	183.736	183.736		
730.000	-.----	-.----	-.----	-.----	446.661	446.661	196.246	196.246		

Tl, Thallium

A = 204.370

Z = 81

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	1.890		3.780		7.560		9.450			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
740.000	----	----	----	----	461.315	461.315	208.651	208.651		
750.000	4214.658	5483.427	1840.064	1971.022	475.628	475.628	220.934	220.934		
760.000	----	----	----	----	489.600	489.600	233.083	233.083		
770.000	----	----	----	----	503.234	503.234	245.087	245.087		
780.000	----	----	----	----	516.534	516.534	256.934	256.934		
790.000	----	----	----	----	529.503	529.503	268.617	268.617		
800.000	4171.602	5585.695	1879.404	2053.005	542.147	542.160	280.129	280.129		
810.000	----	----	----	----	----	----	291.463	291.463		
820.000	----	----	----	----	----	----	302.615	302.615		
830.000	----	----	----	----	----	----	313.581	313.581		
840.000	----	----	----	----	----	----	324.357	324.357		
850.000	4126.768	5681.815	1908.729	2127.757	600.649	601.596	334.942	334.942		
860.000	----	----	----	----	----	----	345.334	345.334		
870.000	----	----	----	----	----	----	355.530	355.530		
880.000	----	----	----	----	----	----	365.532	365.532		
890.000	----	----	----	----	----	----	375.339	375.339		
900.000	4081.194	5772.721	1930.037	2196.482	651.800	655.393	384.950	384.950		
950.000	4035.599	5859.134	1944.906	2260.117	696.333	704.419	430.120	430.212		
1000.000	3990.481	5941.619	1954.588	2319.404	734.976	749.374	470.634	471.550		
1050.000	3946.184	6020.633	1960.085	2374.940	768.414	790.825	506.789	509.558		
1100.000	3902.939	6096.548	1962.201	2427.208	797.270	829.239	538.929	544.672		
1150.000	3860.899	6169.673	1961.586	2476.605	822.107	865.003	567.414	577.258		
1200.000	3820.159	6240.265	1958.766	2523.462	843.421	898.437	592.594	607.622		
1250.000	3780.768	6308.541	1954.169	2568.054	861.651	929.812	614.802	636.020		
1300.000	3742.746	6374.686	1948.147	2610.614	877.182	959.358	634.345	662.672		
1350.000	3706.090	6438.857	1940.987	2651.341	890.349	987.268	651.505	687.765		
1400.000	3670.783	6501.194	1932.925	2690.406	901.448	1013.710	666.537	711.459		
1450.000	3636.795	6561.820	1924.156	2727.956	910.735	1038.829	679.670	733.894		
1500.000	3604.092	6620.842	1914.839	2764.118	918.434	1062.748	691.111	755.190		

Pb, Lead

A = 207.200

Z = 82

		<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->					
Displacement		T_s	$2T_s$			$4T_s$	$5T_s$			T_d	
Energy(eV)=		2.020	4.040			8.080	10.100				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
164.270	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	43.269	43.269	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
166.000	101.531	101.531	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
167.000	158.588	158.588	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
168.000	214.477	214.477	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
169.000	269.234	269.234	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	322.894	322.894	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	575.849	575.849	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	805.828	805.828	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
185.000	1015.861	1015.861	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	1208.452	1208.452	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
195.000	1385.689	1385.689	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	1549.325	1549.325	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
205.000	1700.844	1700.844	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	1841.510	1841.510	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
215.000	1972.406	1972.406	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	2094.468	2094.468	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	2315.238	2315.238	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	2509.179	2509.179	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	2680.466	2680.466	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	2832.406	2832.406	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
270.000	2967.670	2967.670	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
280.000	3088.444	3088.444	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
290.000	3196.538	3196.538	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
295.750	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
296.000	-.----	-.----	2.170	2.170	-.----	-.----	-.----	-.----	-.----	-.----	
297.000	-.----	-.----	11.112	11.112	-.----	-.----	-.----	-.----	-.----	-.----	
298.000	-.----	-.----	20.012	20.012	-.----	-.----	-.----	-.----	-.----	-.----	
299.000	-.----	-.----	28.869	28.869	-.----	-.----	-.----	-.----	-.----	-.----	
300.000	3293.473	3293.801	37.684	37.684	-.----	-.----	-.----	-.----	-.----	-.----	
305.000	-.----	-.----	81.134	81.134	-.----	-.----	-.----	-.----	-.----	-.----	
310.000	3380.536	3384.058	123.576	123.576	-.----	-.----	-.----	-.----	-.----	-.----	
315.000	-.----	-.----	165.047	165.047	-.----	-.----	-.----	-.----	-.----	-.----	
320.000	3458.826	3468.581	205.579	205.579	-.----	-.----	-.----	-.----	-.----	-.----	
325.000	-.----	-.----	245.203	245.203	-.----	-.----	-.----	-.----	-.----	-.----	

Pb, Lead

A = 207.200

Z = 82

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T _s	2T _s		4T _s		5T _s		T _d	
Energy(eV)=		2.020	4.040		8.080		10.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
330.000	3529.288	3547.934	283.943	283.943	-.----	-.----	-.----	-.----		
335.000	-.----	-.----	321.823	321.823	-.----	-.----	-.----	-.----		
340.000	3592.742	3622.614	358.865	358.865	-.----	-.----	-.----	-.----		
345.000	-.----	-.----	395.089	395.089	-.----	-.----	-.----	-.----		
350.000	3649.903	3693.062	430.514	430.514	-.----	-.----	-.----	-.----		
355.000	-.----	-.----	465.157	465.157	-.----	-.----	-.----	-.----		
360.000	3701.395	3759.666	499.036	499.036	-.----	-.----	-.----	-.----		
370.000	3747.769	3822.775	564.563	564.563	-.----	-.----	-.----	-.----		
380.000	3789.512	3882.696	627.217	627.217	-.----	-.----	-.----	-.----		
390.000	3827.055	3939.705	687.114	687.114	-.----	-.----	-.----	-.----		
400.000	3860.783	3994.046	744.364	744.364	-.----	-.----	-.----	-.----		
410.000	3891.038	4045.940	799.072	799.072	-.----	-.----	-.----	-.----		
420.000	3918.127	4095.585	851.341	851.341	-.----	-.----	-.----	-.----		
430.000	3942.327	4143.157	901.271	901.271	-.----	-.----	-.----	-.----		
440.000	3963.885	4188.816	948.957	948.957	-.----	-.----	-.----	-.----		
450.000	3983.026	4232.708	994.494	994.494	-.----	-.----	-.----	-.----		
460.000	3999.951	4274.961	1037.971	1037.971	-.----	-.----	-.----	-.----		
470.000	4014.845	4315.694	1079.475	1079.475	-.----	-.----	-.----	-.----		
480.000	4027.873	4355.014	1119.092	1119.092	-.----	-.----	-.----	-.----		
490.000	4039.187	4393.018	1156.902	1156.902	-.----	-.----	-.----	-.----		
500.000	4048.924	4429.796	1192.985	1192.985	-.----	-.----	-.----	-.----		
509.090	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
510.000	-.----	-.----	1227.416	1227.417	1.288	1.288	-.----	-.----		
511.000	-.----	-.----	-.----	-.----	2.718	2.718	-.----	-.----		
512.000	-.----	-.----	-.----	-.----	4.157	4.157	-.----	-.----		
513.000	-.----	-.----	-.----	-.----	5.604	5.604	-.----	-.----		
514.000	-.----	-.----	-.----	-.----	7.059	7.059	-.----	-.----		
515.000	-.----	-.----	-.----	-.----	8.523	8.523	-.----	-.----		
516.000	-.----	-.----	-.----	-.----	9.994	9.994	-.----	-.----		
517.000	-.----	-.----	-.----	-.----	11.473	11.473	-.----	-.----		
518.000	-.----	-.----	-.----	-.----	12.960	12.960	-.----	-.----		
519.000	-.----	-.----	-.----	-.----	14.454	14.454	-.----	-.----		
520.000	-.----	-.----	1260.267	1260.488	15.955	15.955	-.----	-.----		
525.000	-.----	-.----	-.----	-.----	23.567	23.567	-.----	-.----		
530.000	-.----	-.----	1291.608	1292.419	31.341	31.341	-.----	-.----		

Pb, Lead

A = 207.200

Z = 82

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.020		4.040		8.080		10.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
535.000	----	----	----	----	39.261	39.261	----	----		
540.000	----	----	1321.506	1323.276	47.311	47.311	----	----		
545.000	----	----	----	----	55.477	55.477	----	----		
550.000	4077.996	4597.885	1350.025	1353.118	63.746	63.746	----	----		
555.000	----	----	----	----	72.104	72.104	----	----		
560.000	----	----	1377.226	1382.002	80.540	80.540	----	----		
565.000	----	----	----	----	89.043	89.043	----	----		
570.000	----	----	1403.168	1409.979	97.602	97.602	----	----		
575.000	----	----	----	----	106.207	106.207	----	----		
580.000	----	----	1427.907	1437.097	114.850	114.850	----	----		
590.000	----	----	1451.497	1463.401	132.214	132.214	----	----		
600.000	4082.570	4744.937	1473.988	1488.934	149.631	149.631	----	----		
600.510	----	----	----	----	----	----	0.000	0.000		
601.000	----	----	----	----	----	----	0.387	0.387		
602.000	----	----	----	----	----	----	1.185	1.185		
603.000	----	----	----	----	----	----	1.990	1.990		
604.000	----	----	----	----	----	----	2.802	2.802		
605.000	----	----	----	----	----	----	3.622	3.622		
606.000	----	----	----	----	----	----	4.448	4.448		
607.000	----	----	----	----	----	----	5.282	5.282		
608.000	----	----	----	----	----	----	6.122	6.122		
609.000	----	----	----	----	----	----	6.968	6.968		
610.000	----	----	----	----	167.047	167.047	7.822	7.822		
615.000	----	----	----	----	----	----	12.183	12.183		
620.000	----	----	----	----	184.414	184.414	16.695	16.695		
625.000	----	----	----	----	----	----	21.346	21.346		
630.000	----	----	----	----	201.691	201.691	26.125	26.125		
635.000	----	----	----	----	----	----	31.022	31.022		
640.000	----	----	----	----	218.842	218.842	36.029	36.029		
645.000	----	----	----	----	----	----	41.135	41.135		
650.000	4070.696	4876.199	1571.601	1606.310	235.837	235.837	46.332	46.332		
655.000	----	----	----	----	----	----	51.613	51.613		
660.000	----	----	----	----	252.649	252.649	56.970	56.970		
670.000	----	----	----	----	269.255	269.255	67.881	67.881		
680.000	----	----	----	----	285.636	285.636	79.014	79.014		

Pb, Lead

A=207.200

Z=82

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 2.020		2T _s 4.040		4T _s 8.080		5T _s 10.100			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
690.000	-----	-----	-----	-----	301.775	301.775	90.320	90.320		
700.000	4047.761	4995.249	1648.203	1709.319	317.660	317.660	101.757	101.757		
710.000	-----	-----	-----	-----	333.278	333.278	113.287	113.287		
720.000	-----	-----	-----	-----	348.621	348.621	124.877	124.877		
730.000	-----	-----	-----	-----	363.682	363.682	136.495	136.495		
740.000	-----	-----	-----	-----	378.454	378.454	148.114	148.114		
750.000	4017.447	5104.603	1708.010	1800.920	392.934	392.934	159.712	159.712		
760.000	-----	-----	-----	-----	407.119	407.119	171.266	171.266		
770.000	-----	-----	-----	-----	421.007	421.007	182.759	182.759		
780.000	-----	-----	-----	-----	434.597	434.597	194.172	194.172		
790.000	-----	-----	-----	-----	447.890	447.890	205.493	205.493		
800.000	3982.308	5206.080	1754.346	1883.304	460.885	460.885	216.707	216.707		
810.000	-----	-----	-----	-----	-----	-----	227.803	227.803		
820.000	-----	-----	-----	-----	-----	-----	238.773	238.773		
830.000	-----	-----	-----	-----	-----	-----	249.607	249.607		
840.000	-----	-----	-----	-----	-----	-----	260.298	260.298		
850.000	3944.137	5301.027	1789.843	1958.129	521.482	521.512	270.840	270.840		
860.000	-----	-----	-----	-----	-----	-----	281.227	281.227		
870.000	-----	-----	-----	-----	-----	-----	291.456	291.456		
880.000	-----	-----	-----	-----	-----	-----	301.523	301.523		
890.000	-----	-----	-----	-----	-----	-----	311.424	311.424		
900.000	3904.206	5390.466	1816.588	2026.666	575.080	576.016	321.159	321.159		
950.000	3863.421	5475.186	1836.247	2089.907	622.213	625.547	367.275	367.275		
1000.000	3822.425	5555.806	1850.151	2148.639	663.482	670.837	409.130	409.198		
1050.000	3781.678	5632.821	1859.376	2203.489	699.492	712.485	446.857	447.596		
1100.000	3741.503	5706.633	1864.787	2254.968	730.823	750.980	480.689	482.985		
1150.000	3702.130	5777.575	1867.090	2303.496	758.006	786.726	510.909	515.746		
1200.000	3663.714	5845.925	1866.859	2349.418	781.527	820.062	537.818	546.200		
1250.000	3626.359	5911.917	1864.565	2393.024	801.820	851.272	561.715	574.619		
1300.000	3590.129	5975.751	1860.593	2434.560	819.269	880.595	582.887	601.231		
1350.000	3555.056	6037.596	1855.262	2474.232	834.216	908.235	601.603	626.232		
1400.000	3521.152	6097.600	1848.836	2512.218	846.961	934.368	618.111	649.791		
1450.000	3488.412	6155.889	1841.532	2548.673	857.768	959.144	632.637	672.054		
1500.000	3456.821	6212.579	1833.530	2583.729	866.870	982.693	645.385	693.146		

Bi, Bismuth

A = 208.981

Z = 83

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	2.170		4.340		8.680		10.850			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
176.210	0.000	0.000	----	----	----	----	----	----	----	
177.000	39.376	39.376	----	----	----	----	----	----	----	
178.000	88.515	88.515	----	----	----	----	----	----	----	
179.000	136.744	136.744	----	----	----	----	----	----	----	
180.000	184.088	184.088	----	----	----	----	----	----	----	
185.000	408.394	408.394	----	----	----	----	----	----	----	
190.000	613.996	613.996	----	----	----	----	----	----	----	
195.000	803.223	803.223	----	----	----	----	----	----	----	
200.000	978.019	978.019	----	----	----	----	----	----	----	
205.000	1140.015	1140.015	----	----	----	----	----	----	----	
210.000	1290.588	1290.588	----	----	----	----	----	----	----	
215.000	1430.913	1430.913	----	----	----	----	----	----	----	
220.000	1561.996	1561.996	----	----	----	----	----	----	----	
225.000	1684.705	1684.705	----	----	----	----	----	----	----	
230.000	1799.793	1799.793	----	----	----	----	----	----	----	
235.000	1907.919	1907.919	----	----	----	----	----	----	----	
240.000	2009.661	2009.661	----	----	----	----	----	----	----	
250.000	2195.972	2195.972	----	----	----	----	----	----	----	
260.000	2362.168	2362.168	----	----	----	----	----	----	----	
270.000	2511.004	2511.004	----	----	----	----	----	----	----	
280.000	2644.725	2644.725	----	----	----	----	----	----	----	
290.000	2765.186	2765.186	----	----	----	----	----	----	----	
300.000	2873.942	2873.942	----	----	----	----	----	----	----	
310.000	2972.304	2972.304	----	----	----	----	----	----	----	
315.670	----	----	0.000	0.000	----	----	----	----	----	
316.000	----	----	2.442	2.442	----	----	----	----	----	
317.000	----	----	10.033	10.033	----	----	----	----	----	
318.000	----	----	17.597	17.597	----	----	----	----	----	
319.000	----	----	25.136	25.136	----	----	----	----	----	
320.000	3061.398	3061.671	32.648	32.648	----	----	----	----	----	
325.000	----	----	69.827	69.827	----	----	----	----	----	
330.000	3142.190	3145.072	106.374	106.374	----	----	----	----	----	
335.000	----	----	142.296	142.296	----	----	----	----	----	
340.000	3215.520	3223.513	177.601	177.601	----	----	----	----	----	
345.000	----	----	212.296	212.296	----	----	----	----	----	

Bi, Bismuth

A = 208.981

Z = 83

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	2.170		4.340		8.680		10.850			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
350.000	3282.122	3297.453	246.385	246.385	-.----	-.----	-.----	-.----		
355.000	-.----	-.----	279.875	279.875	-.----	-.----	-.----	-.----		
360.000	3342.638	3367.300	312.770	312.770	-.----	-.----	-.----	-.----		
365.000	-.----	-.----	345.076	345.076	-.----	-.----	-.----	-.----		
370.000	3397.639	3433.416	376.796	376.796	-.----	-.----	-.----	-.----		
375.000	-.----	-.----	407.936	407.936	-.----	-.----	-.----	-.----		
380.000	3447.628	3496.126	438.502	438.502	-.----	-.----	-.----	-.----		
390.000	3493.053	3555.719	497.929	497.929	-.----	-.----	-.----	-.----		
400.000	3534.316	3612.456	555.124	555.124	-.----	-.----	-.----	-.----		
410.000	3571.775	3666.568	610.133	610.133	-.----	-.----	-.----	-.----		
420.000	3605.753	3718.267	663.010	663.010	-.----	-.----	-.----	-.----		
430.000	3636.540	3767.740	713.808	713.808	-.----	-.----	-.----	-.----		
440.000	3664.398	3815.157	762.586	762.586	-.----	-.----	-.----	-.----		
450.000	3689.567	3860.673	809.401	809.401	-.----	-.----	-.----	-.----		
460.000	3712.260	3904.426	854.314	854.314	-.----	-.----	-.----	-.----		
470.000	3732.674	3946.544	897.386	897.386	-.----	-.----	-.----	-.----		
480.000	3750.987	3987.140	938.678	938.678	-.----	-.----	-.----	-.----		
490.000	3767.362	4026.320	978.253	978.253	-.----	-.----	-.----	-.----		
500.000	3781.947	4064.179	1016.171	1016.171	-.----	-.----	-.----	-.----		
510.000	-.----	-.----	1052.493	1052.493	-.----	-.----	-.----	-.----		
520.000	-.----	-.----	1087.277	1087.277	-.----	-.----	-.----	-.----		
530.000	-.----	-.----	1120.581	1120.581	-.----	-.----	-.----	-.----		
540.000	-.----	-.----	1152.464	1152.464	-.----	-.----	-.----	-.----		
540.500	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
541.000	-.----	-.----	-.----	-.----	0.595	0.595	-.----	-.----		
542.000	-.----	-.----	-.----	-.----	1.815	1.815	-.----	-.----		
543.000	-.----	-.----	-.----	-.----	3.042	3.042	-.----	-.----		
544.000	-.----	-.----	-.----	-.----	4.279	4.279	-.----	-.----		
545.000	-.----	-.----	-.----	-.----	5.524	5.524	-.----	-.----		
546.000	-.----	-.----	-.----	-.----	6.777	6.777	-.----	-.----		
547.000	-.----	-.----	-.----	-.----	8.039	8.039	-.----	-.----		
548.000	-.----	-.----	-.----	-.----	9.308	9.308	-.----	-.----		
549.000	-.----	-.----	-.----	-.----	10.586	10.586	-.----	-.----		
550.000	3832.401	4236.451	1182.979	1183.115	11.871	11.871	-.----	-.----		
555.000	-.----	-.----	-.----	-.----	18.408	18.408	-.----	-.----		

Bi, Bismuth**A=208.981****Z=83**

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	2.170		4.340		8.680		10.850			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
560.000	-.----	-.----	1212.181	1212.758	25.120	25.120	-.----	-.----		
565.000	-.----	-.----	-.----	-.----	31.991	31.991	-.----	-.----		
570.000	-.----	-.----	1240.121	1241.448	39.006	39.006	-.----	-.----		
575.000	-.----	-.----	-.----	-.----	46.151	46.151	-.----	-.----		
580.000	-.----	-.----	1266.851	1269.234	53.413	53.413	-.----	-.----		
585.000	-.----	-.----	-.----	-.----	60.781	60.781	-.----	-.----		
590.000	-.----	-.----	1292.419	1296.165	68.242	68.242	-.----	-.----		
595.000	-.----	-.----	-.----	-.----	75.787	75.787	-.----	-.----		
600.000	3854.368	4386.073	1316.873	1322.283	83.403	83.403	-.----	-.----		
610.000	-.----	-.----	-.----	-.----	98.818	98.818	-.----	-.----		
620.000	-.----	-.----	-.----	-.----	114.415	114.415	-.----	-.----		
630.000	-.----	-.----	-.----	-.----	130.134	130.134	-.----	-.----		
636.520	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
637.000	-.----	-.----	-.----	-.----	-.----	-.----	0.324	0.324		
638.000	-.----	-.----	-.----	-.----	-.----	-.----	1.007	1.007		
639.000	-.----	-.----	-.----	-.----	-.----	-.----	1.697	1.697		
640.000	-.----	-.----	-.----	-.----	145.921	145.921	2.394	2.394		
645.000	-.----	-.----	-.----	-.----	-.----	-.----	5.979	5.979		
650.000	3856.747	4518.721	1423.948	1442.052	161.727	161.727	9.724	9.724		
655.000	-.----	-.----	-.----	-.----	-.----	-.----	13.618	13.618		
660.000	-.----	-.----	-.----	-.----	177.511	177.511	17.650	17.650		
665.000	-.----	-.----	-.----	-.----	-.----	-.----	21.811	21.811		
670.000	-.----	-.----	-.----	-.----	193.235	193.235	26.092	26.092		
675.000	-.----	-.----	-.----	-.----	-.----	-.----	30.483	30.483		
680.000	-.----	-.----	-.----	-.----	208.868	208.868	34.978	34.978		
685.000	-.----	-.----	-.----	-.----	-.----	-.----	39.566	39.566		
690.000	-.----	-.----	-.----	-.----	224.382	224.382	44.242	44.242		
695.000	-.----	-.----	-.----	-.----	-.----	-.----	48.998	48.998		
700.000	3845.582	4638.274	1509.270	1546.708	239.751	239.751	53.828	53.828		
710.000	-.----	-.----	-.----	-.----	254.956	254.956	63.681	63.681		
720.000	-.----	-.----	-.----	-.----	269.977	269.977	73.754	73.754		
730.000	-.----	-.----	-.----	-.----	284.801	284.801	84.005	84.005		
740.000	-.----	-.----	-.----	-.----	299.412	299.412	94.395	94.395		
750.000	3825.055	4747.467	1576.962	1639.376	313.801	313.801	104.890	104.890		
760.000	-.----	-.----	-.----	-.----	327.957	327.957	115.459	115.459		

Bi, Bismuth

A = 208.981

Z = 83

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d			
	T _s	2T _s			4T _s	5T _s						
	2.170	4.340			8.680	10.850						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)		
770.000	----	----	----	----	341.874	341.874	126.074	126.074				
780.000	----	----	----	----	355.546	355.546	136.710	136.710				
790.000	----	----	----	----	368.967	368.967	147.346	147.346				
800.000	3798.111	4848.280	1630.357	1722.376	382.134	382.134	157.960	157.960				
810.000	----	----	----	----	395.044	395.044	168.535	168.535				
820.000	----	----	----	----	407.696	407.696	179.056	179.056				
830.000	----	----	----	----	420.089	420.089	189.508	189.508				
840.000	----	----	----	----	432.223	432.223	199.879	199.879				
850.000	3766.844	4942.177	1672.134	1797.460	444.097	444.097	210.158	210.158				
860.000	----	----	----	----	455.714	455.714	220.335	220.335				
870.000	----	----	----	----	467.074	467.074	230.403	230.403				
880.000	----	----	----	----	478.181	478.181	240.352	240.352				
890.000	----	----	----	----	489.035	489.038	250.178	250.178				
900.000	3732.764	5030.267	1704.450	1865.976	499.639	499.676	259.874	259.874				
910.000	----	----	----	----	----	----	269.436	269.436				
920.000	----	----	----	----	----	----	278.860	278.860				
930.000	----	----	----	----	----	----	288.143	288.143				
940.000	----	----	----	----	----	----	297.281	297.281				
950.000	3696.963	5113.409	1729.041	1928.974	549.030	549.887	306.272	306.272				
960.000	----	----	----	----	----	----	315.116	315.116				
970.000	----	----	----	----	----	----	323.809	323.809				
980.000	----	----	----	----	----	----	332.353	332.353				
990.000	----	----	----	----	----	----	340.745	340.745				
1000.000	3660.239	5192.276	1747.313	1987.285	592.699	595.670	348.987	348.987				
1050.000	3623.169	5267.403	1760.406	2041.573	631.140	637.654	387.938	387.978				
1100.000	3586.176	5339.224	1769.247	2092.378	664.861	676.355	423.214	423.770				
1150.000	3549.563	5408.095	1774.595	2140.142	694.351	712.198	454.998	456.823				
1200.000	3513.553	5474.314	1777.071	2185.228	720.069	745.540	483.520	487.475				
1250.000	3478.302	5538.133	1777.187	2227.943	742.436	776.678	509.033	516.010				
1300.000	3443.919	5599.763	1775.365	2268.542	761.830	805.865	531.791	542.669				
1350.000	3410.475	5659.386	1771.955	2307.242	778.593	833.315	552.043	567.660				
1400.000	3378.013	5717.159	1767.247	2344.231	793.027	859.212	570.024	591.158				
1450.000	3346.554	5773.217	1761.483	2379.667	805.403	883.714	585.951	613.317				
1500.000	3316.104	5827.679	1754.865	2413.690	815.959	906.958	600.028	634.269				

Po, Polonium

A = 209.000

Z = 84

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		1.444	2.888		5.776	7.220					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
122.740	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
123.000	41.465	41.465	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
124.000	201.460	201.460	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
125.000	356.273	356.273	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
126.000	506.133	506.133	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
127.000	651.255	651.255	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
128.000	791.844	791.844	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
129.000	928.093	928.093	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
130.000	1060.185	1060.185	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
135.000	1664.034	1664.034	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
140.000	2186.433	2186.433	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
145.000	2641.769	2641.769	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
150.000	3041.299	3041.299	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
155.000	3393.934	3393.934	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
160.000	3706.804	3706.804	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
165.000	3985.675	3985.675	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
170.000	4235.256	4235.256	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
175.000	4459.427	4459.427	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
180.000	4661.414	4661.414	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
190.000	5009.222	5009.222	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
200.000	5295.712	5295.712	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
210.000	5533.340	5533.340	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
220.000	5731.436	5731.436	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
225.300	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
226.000	-.----	-.----	16.689	16.689	-.----	-.----	-.----	-.----	-.----	-.----	
227.000	-.----	-.----	40.498	40.498	-.----	-.----	-.----	-.----	-.----	-.----	
228.000	-.----	-.----	64.032	64.032	-.----	-.----	-.----	-.----	-.----	-.----	
229.000	-.----	-.----	87.298	87.298	-.----	-.----	-.----	-.----	-.----	-.----	
230.000	5897.139	5898.481	110.301	110.301	-.----	-.----	-.----	-.----	-.----	-.----	
235.000	-.----	-.----	221.548	221.548	-.----	-.----	-.----	-.----	-.----	-.----	
240.000	6036.013	6048.184	326.946	326.946	-.----	-.----	-.----	-.----	-.----	-.----	
245.000	-.----	-.----	427.010	427.010	-.----	-.----	-.----	-.----	-.----	-.----	
250.000	6152.460	6184.428	522.188	522.188	-.----	-.----	-.----	-.----	-.----	-.----	
255.000	-.----	-.----	612.868	612.868	-.----	-.----	-.----	-.----	-.----	-.----	
260.000	6250.012	6308.940	699.388	699.388	-.----	-.----	-.----	-.----	-.----	-.----	

Po, Polonium

A = 209.000

Z = 84

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	1.444		2.888		5.776		7.220			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
265.000	-----	-----	782.046	782.046	-----	-----	-----	-----		
270.000	6331.537	6423.197	861.105	861.105	-----	-----	-----	-----		
275.000	-----	-----	936.798	936.798	-----	-----	-----	-----		
280.000	6399.387	6528.464	1009.337	1009.337	-----	-----	-----	-----		
290.000	6455.512	6625.827	1145.681	1145.681	-----	-----	-----	-----		
300.000	6501.538	6716.217	1271.440	1271.440	-----	-----	-----	-----		
310.000	6538.831	6800.438	1387.695	1387.695	-----	-----	-----	-----		
320.000	6568.548	6879.185	1495.360	1495.360	-----	-----	-----	-----		
330.000	6591.673	6953.059	1595.219	1595.219	-----	-----	-----	-----		
340.000	6609.048	7022.583	1687.952	1687.952	-----	-----	-----	-----		
350.000	6621.396	7088.213	1774.156	1774.156	-----	-----	-----	-----		
360.000	6629.341	7150.346	1854.359	1854.359	-----	-----	-----	-----		
370.000	6633.424	7209.332	1929.032	1929.032	-----	-----	-----	-----		
380.000	6634.115	7265.476	1998.598	1998.598	-----	-----	-----	-----		
390.000	6631.823	7319.048	2063.437	2063.437	-----	-----	-----	-----		
396.280	-----	-----	-----	-----	0.000	0.000	-----	-----		
397.000	-----	-----	-----	-----	2.663	2.663	-----	-----		
398.000	-----	-----	-----	-----	6.401	6.401	-----	-----		
399.000	-----	-----	-----	-----	10.144	10.144	-----	-----		
400.000	6626.908	7370.287	2123.895	2123.978	13.890	13.890	-----	-----		
405.000	-----	-----	-----	-----	32.682	32.682	-----	-----		
410.000	-----	-----	2180.287	2181.389	51.549	51.549	-----	-----		
415.000	-----	-----	-----	-----	70.464	70.464	-----	-----		
420.000	-----	-----	2232.899	2236.130	89.402	89.402	-----	-----		
425.000	-----	-----	-----	-----	108.342	108.342	-----	-----		
430.000	-----	-----	2281.994	2288.397	127.260	127.260	-----	-----		
435.000	-----	-----	-----	-----	146.139	146.139	-----	-----		
440.000	-----	-----	2327.812	2338.371	164.960	164.960	-----	-----		
445.000	-----	-----	-----	-----	183.707	183.707	-----	-----		
450.000	6572.760	7598.094	2370.574	2386.215	202.364	202.364	-----	-----		
455.000	-----	-----	-----	-----	220.918	220.918	-----	-----		
460.000	-----	-----	2410.484	2432.080	239.356	239.356	-----	-----		
470.000	-----	-----	2447.731	2476.100	275.839	275.839	-----	-----		
470.670	-----	-----	-----	-----	-----	-----	0.000	0.000		
471.000	-----	-----	-----	-----	-----	-----	0.678	0.678		

Po, Polonium

A = 209.000

Z = 84

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.444		2.888		5.776		7.220			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
472.000	-.----	-.----	-.----	-.----	-.----	-.----	2.754	2.754		
473.000	-.----	-.----	-.----	-.----	-.----	-.----	4.840	4.840		
474.000	-.----	-.----	-.----	-.----	-.----	-.----	6.935	6.935		
475.000	-.----	-.----	-.----	-.----	-.----	-.----	9.038	9.038		
476.000	-.----	-.----	-.----	-.----	-.----	-.----	11.151	11.151		
477.000	-.----	-.----	-.----	-.----	-.----	-.----	13.273	13.273		
478.000	-.----	-.----	-.----	-.----	-.----	-.----	15.403	15.403		
479.000	-.----	-.----	-.----	-.----	-.----	-.----	17.542	17.542		
480.000	-.----	-.----	2482.487	2518.400	311.734	311.734	19.688	19.688		
485.000	-.----	-.----	-.----	-.----	-.----	-.----	30.537	30.537		
490.000	-.----	-.----	2514.914	2559.096	346.975	346.975	41.562	41.562		
495.000	-.----	-.----	-.----	-.----	-.----	-.----	52.740	52.740		
500.000	6487.309	7791.066	2545.159	2598.291	381.510	381.510	64.051	64.051		
505.000	-.----	-.----	-.----	-.----	-.----	-.----	75.477	75.477		
510.000	-.----	-.----	-.----	-.----	415.298	415.298	86.999	86.999		
515.000	-.----	-.----	-.----	-.----	-.----	-.----	98.601	98.601		
520.000	-.----	-.----	-.----	-.----	448.307	448.307	110.267	110.267		
525.000	-.----	-.----	-.----	-.----	-.----	-.----	121.983	121.983		
530.000	-.----	-.----	-.----	-.----	480.513	480.513	133.736	133.736		
535.000	-.----	-.----	-.----	-.----	-.----	-.----	145.512	145.512		
540.000	-.----	-.----	-.----	-.----	511.899	511.899	157.301	157.301		
550.000	6386.098	7960.422	2668.170	2774.858	542.456	542.456	180.872	180.872		
560.000	-.----	-.----	-.----	-.----	572.178	572.178	204.373	204.373		
570.000	-.----	-.----	-.----	-.----	601.064	601.064	227.736	227.736		
580.000	-.----	-.----	-.----	-.----	629.116	629.116	250.903	250.903		
590.000	-.----	-.----	-.----	-.----	656.342	656.342	273.827	273.827		
600.000	6277.958	8112.976	2753.689	2925.486	682.748	682.748	296.466	296.466		
610.000	-.----	-.----	-.----	-.----	708.347	708.347	318.786	318.786		
620.000	-.----	-.----	-.----	-.----	733.149	733.149	340.756	340.756		
630.000	-.----	-.----	-.----	-.----	757.170	757.170	362.353	362.353		
640.000	-.----	-.----	-.----	-.----	780.424	780.424	383.559	383.559		
650.000	6168.011	8253.047	2811.617	3056.620	802.927	802.927	404.355	404.355		
660.000	-.----	-.----	-.----	-.----	824.697	824.697	424.732	424.732		
670.000	-.----	-.----	-.----	-.----	845.749	845.760	444.679	444.679		
680.000	-.----	-.----	-.----	-.----	866.102	866.231	464.189	464.189		

Po, Polonium

A=209.000

Z=84

Displacement		Surface Sputtering Regime				Bulk Displacement Regime				T _d
Energy(eV)=	T _s		2T _s		4T _s		5T _s			
	1.444		2.888		5.776		7.220			
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)
690.000	-----	-----	-----	-----	885.774	886.159	483.259	483.259		
700.000	6059.253	8383.486	2849.045	3172.732	904.783	905.566	501.885	501.885		
710.000	-----	-----	-----	-----	-----	-----	520.066	520.066		
720.000	-----	-----	-----	-----	-----	-----	537.805	537.805		
730.000	-----	-----	-----	-----	-----	-----	555.101	555.101		
740.000	-----	-----	-----	-----	-----	-----	571.960	571.960		
750.000	5953.418	8506.242	2871.127	3277.004	990.500	995.540	588.383	588.383		
760.000	-----	-----	-----	-----	-----	-----	604.377	604.377		
770.000	-----	-----	-----	-----	-----	-----	619.947	619.947		
780.000	-----	-----	-----	-----	-----	-----	635.099	635.099		
790.000	-----	-----	-----	-----	-----	-----	649.839	649.872		
800.000	5851.469	8622.684	2881.663	3371.757	1062.264	1075.398	664.174	664.310		
850.000	5753.896	8733.802	2883.484	3458.720	1122.086	1146.971	730.044	731.877		
900.000	5660.904	8840.337	2878.724	3539.206	1171.747	1211.674	786.958	792.692		
950.000	5572.518	8942.859	2869.001	3614.232	1212.787	1270.620	835.912	847.838		
1000.000	5488.659	9041.817	2855.556	3684.594	1246.522	1324.691	877.859	898.176		
1050.000	5409.171	9137.565	2839.341	3750.927	1274.071	1374.594	913.674	944.405		
1100.000	5333.861	9230.386	2821.098	3813.745	1296.377	1420.905	944.143	987.093		
1150.000	5262.515	9320.516	2801.400	3873.469	1314.241	1464.094	969.960	1026.707		
1200.000	5194.912	9408.152	2780.696	3930.445	1328.336	1504.552	991.736	1063.634		
1250.000	5130.835	9493.464	2759.336	3984.962	1339.232	1542.602	1010.002	1098.198		
1300.000	5070.075	9576.602	2737.593	4037.265	1347.412	1578.519	1025.222	1130.671		
1350.000	5012.431	9657.699	2715.681	4087.559	1353.283	1612.533	1037.795	1161.286		
1400.000	4957.712	9736.871	2693.767	4136.023	1357.194	1644.841	1048.070	1190.237		
1450.000	4905.738	9814.222	2671.981	4182.812	1359.438	1675.612	1056.350	1217.696		
1500.000	4856.341	9889.847	2650.426	4228.060	1360.267	1704.993	1062.896	1243.806		

At, Astatine

A = 210.000

Z = 85

Displacement		Surface Sputtering Regime		Bulk Displacement Regime		Displacement		Regime		T _d	
Energy(eV)=		T _s	2T _s		4T _s		5T _s				
		0.936	1.872		3.744		4.680				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
82.830	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---			
83.000	95.468	95.468	-.---	-.---	-.---	-.---	-.---	-.---			
84.000	648.572	648.572	-.---	-.---	-.---	-.---	-.---	-.---			
85.000	1171.992	1171.992	-.---	-.---	-.---	-.---	-.---	-.---			
86.000	1667.718	1667.718	-.---	-.---	-.---	-.---	-.---	-.---			
87.000	2137.582	2137.582	-.---	-.---	-.---	-.---	-.---	-.---			
88.000	2583.268	2583.268	-.---	-.---	-.---	-.---	-.---	-.---			
89.000	3006.330	3006.330	-.---	-.---	-.---	-.---	-.---	-.---			
90.000	3408.202	3408.202	-.---	-.---	-.---	-.---	-.---	-.---			
95.000	5142.712	5142.712	-.---	-.---	-.---	-.---	-.---	-.---			
100.000	6509.380	6509.380	-.---	-.---	-.---	-.---	-.---	-.---			
105.000	7600.645	7600.645	-.---	-.---	-.---	-.---	-.---	-.---			
110.000	8481.809	8481.809	-.---	-.---	-.---	-.---	-.---	-.---			
115.000	9199.968	9199.968	-.---	-.---	-.---	-.---	-.---	-.---			
120.000	9789.747	9789.747	-.---	-.---	-.---	-.---	-.---	-.---			
125.000	10277.049	10277.049	-.---	-.---	-.---	-.---	-.---	-.---			
130.000	10681.564	10681.564	-.---	-.---	-.---	-.---	-.---	-.---			
135.000	11018.480	11018.480	-.---	-.---	-.---	-.---	-.---	-.---			
140.000	11299.670	11299.670	-.---	-.---	-.---	-.---	-.---	-.---			
150.000	11730.585	11730.585	-.---	-.---	-.---	-.---	-.---	-.---			
155.440	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---			
156.000	-.---	-.---	45.237	45.237	-.---	-.---	-.---	-.---			
157.000	-.---	-.---	125.768	125.768	-.---	-.---	-.---	-.---			
158.000	-.---	-.---	204.438	204.438	-.---	-.---	-.---	-.---			
159.000	-.---	-.---	281.311	281.311	-.---	-.---	-.---	-.---			
160.000	12029.464	12035.311	356.447	356.447	-.---	-.---	-.---	-.---			
165.000	-.---	-.---	708.011	708.011	-.---	-.---	-.---	-.---			
170.000	12232.903	12285.378	1023.839	1023.839	-.---	-.---	-.---	-.---			
175.000	-.---	-.---	1309.069	1309.069	-.---	-.---	-.---	-.---			
180.000	12366.004	12498.544	1567.892	1567.892	-.---	-.---	-.---	-.---			
185.000	-.---	-.---	1803.748	1803.748	-.---	-.---	-.---	-.---			
190.000	12446.470	12681.457	2019.491	2019.491	-.---	-.---	-.---	-.---			
195.000	-.---	-.---	2217.505	2217.505	-.---	-.---	-.---	-.---			
200.000	12487.081	12839.528	2399.794	2399.794	-.---	-.---	-.---	-.---			
205.000	-.---	-.---	2568.062	2568.062	-.---	-.---	-.---	-.---			

At, Astatine

A = 210.000

Z = 85

Displacement		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->				Displacement		Regime----->		T _d	
Energy(eV)=		T _s	2T _s		4T _s		5T _s				
		0.936	1.872		3.744		4.680				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
210.000	12497.240	12977.139	2723.763	2723.763	-----	-----	-----	-----			
215.000	-----	-----	2868.146	2868.146	-----	-----	-----	-----			
220.000	12483.986	13097.844	3002.292	3002.292	-----	-----	-----	-----			
230.000	12452.658	13204.528	3243.524	3243.524	-----	-----	-----	-----			
240.000	12407.355	13299.540	3453.691	3453.691	-----	-----	-----	-----			
250.000	12351.259	13384.800	3637.660	3637.660	-----	-----	-----	-----			
260.000	12286.857	13461.880	3799.307	3799.307	-----	-----	-----	-----			
270.000	12216.109	13532.077	3941.762	3941.762	-----	-----	-----	-----			
280.000	12140.572	13596.461	4067.595	4067.595	-----	-----	-----	-----			
280.950	-----	-----	-----	-----	0.000	0.000	-----	-----			
281.000	-----	-----	-----	-----	0.621	0.621	-----	-----			
282.000	-----	-----	-----	-----	12.968	12.968	-----	-----			
283.000	-----	-----	-----	-----	25.239	25.239	-----	-----			
284.000	-----	-----	-----	-----	37.436	37.436	-----	-----			
285.000	-----	-----	-----	-----	49.558	49.558	-----	-----			
286.000	-----	-----	-----	-----	61.608	61.608	-----	-----			
287.000	-----	-----	-----	-----	73.585	73.585	-----	-----			
288.000	-----	-----	-----	-----	85.491	85.491	-----	-----			
289.000	-----	-----	-----	-----	97.326	97.326	-----	-----			
290.000	12061.484	13655.919	4178.937	4181.028	109.092	109.092	-----	-----			
295.000	-----	-----	-----	-----	166.897	166.897	-----	-----			
300.000	11979.838	13711.191	4277.576	4286.375	223.061	223.061	-----	-----			
305.000	-----	-----	-----	-----	277.662	277.662	-----	-----			
310.000	11896.432	13762.896	4365.024	4384.509	330.766	330.766	-----	-----			
315.000	-----	-----	-----	-----	382.435	382.435	-----	-----			
320.000	11811.905	13811.551	4442.574	4476.176	432.723	432.723	-----	-----			
325.000	-----	-----	-----	-----	481.680	481.680	-----	-----			
330.000	11726.776	13857.592	4511.333	4562.030	529.350	529.350	-----	-----			
335.000	-----	-----	-----	-----	575.777	575.777	-----	-----			
336.760	-----	-----	-----	-----	-----	-----	0.000	0.000			
337.000	-----	-----	-----	-----	-----	-----	1.620	1.620			
338.000	-----	-----	-----	-----	-----	-----	8.409	8.409			
339.000	-----	-----	-----	-----	-----	-----	15.184	15.184			
340.000	11641.462	13901.386	4572.263	4642.648	620.997	620.997	21.944	21.944			
345.000	-----	-----	-----	-----	-----	-----	55.529	55.529			

At, Astatine

A = 210.000

Z = 85

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	0.936		1.872		3.744		4.680			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
350.000	11556.299	13943.246	4626.198	4718.540	707.962	707.962	88.742	88.742		
355.000	-----	-----	-----	-----	-----	-----	121.574	121.574		
360.000	11471.558	13983.434	4673.865	4790.154	790.511	790.511	154.013	154.013		
365.000	-----	-----	-----	-----	-----	-----	186.050	186.050		
370.000	11387.457	14022.176	4715.905	4857.890	868.882	868.882	217.678	217.678		
375.000	-----	-----	-----	-----	-----	-----	248.886	248.886		
380.000	11304.168	14059.663	4752.882	4922.100	943.292	943.292	279.669	279.669		
385.000	-----	-----	-----	-----	-----	-----	310.021	310.021		
390.000	11221.830	14096.059	4785.294	4983.099	1013.945	1013.945	339.935	339.935		
395.000	-----	-----	-----	-----	-----	-----	369.408	369.408		
400.000	11140.551	14131.503	4813.583	5041.166	1081.028	1081.028	398.435	398.435		
410.000	-----	-----	4838.143	5096.550	1144.720	1144.720	455.144	455.144		
420.000	-----	-----	4859.325	5149.477	1205.189	1205.189	510.048	510.048		
430.000	-----	-----	4877.444	5200.145	1262.593	1262.593	563.145	563.145		
440.000	-----	-----	4892.780	5248.735	1317.086	1317.086	614.441	614.441		
450.000	10752.359	14298.128	4905.587	5295.409	1368.809	1368.809	663.954	663.954		
460.000	-----	-----	4916.094	5340.312	1417.900	1417.900	711.704	711.704		
470.000	-----	-----	4924.505	5383.578	1464.488	1464.488	757.722	757.722		
480.000	-----	-----	4931.006	5425.324	1508.699	1508.699	802.040	802.040		
490.000	-----	-----	4935.767	5465.659	1550.648	1550.648	844.696	844.696		
500.000	10396.909	14453.401	4938.939	5504.682	1590.448	1590.996	885.730	885.730		
510.000	-----	-----	-----	-----	1628.206	1629.774	925.184	925.184		
520.000	-----	-----	-----	-----	1664.021	1667.123	963.102	963.102		
530.000	-----	-----	-----	-----	1697.991	1703.131	999.530	999.530		
540.000	-----	-----	-----	-----	1730.206	1737.876	1034.513	1034.513		
550.000	10073.888	14602.279	4935.410	5682.983	1760.752	1771.430	1068.098	1068.098		
560.000	-----	-----	-----	-----	1789.711	1803.862	1100.330	1100.330		
570.000	-----	-----	-----	-----	1817.163	1835.235	1131.256	1131.256		
580.000	-----	-----	-----	-----	1843.179	1865.607	1160.921	1160.975		
590.000	-----	-----	-----	-----	1867.831	1895.032	1189.368	1189.723		
600.000	9780.955	14747.183	4908.465	5839.065	1891.184	1923.562	1216.643	1217.566		
610.000	-----	-----	-----	-----	-----	-----	1242.786	1244.551		
620.000	-----	-----	-----	-----	-----	-----	1267.841	1270.722		
630.000	-----	-----	-----	-----	-----	-----	1291.848	1296.118		
640.000	-----	-----	-----	-----	-----	-----	1314.846	1320.777		

At, Astatine

A = 210.000

Z=85

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	0.936		1.872		3.744		4.680			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
650.000	9515.162	14889.279	4866.698	5978.627	1990.581	2054.316	1336.873	1344.736		
660.000	-----	-----	-----	-----	-----	-----	1357.966	1368.027		
670.000	-----	-----	-----	-----	-----	-----	1378.161	1390.682		
680.000	-----	-----	-----	-----	-----	-----	1397.493	1412.731		
690.000	-----	-----	-----	-----	-----	-----	1415.995	1434.201		
700.000	9273.578	15029.137	4815.726	6105.514	2065.733	2168.566	1433.699	1455.119		
750.000	9053.495	15167.022	4759.280	6222.398	2121.871	2269.818	1511.296	1552.231		
800.000	8852.475	15303.027	4699.874	6331.195	2163.040	2360.648	1573.135	1638.680		
850.000	8668.357	15437.148	4639.213	6433.311	2192.379	2442.987	1622.060	1716.438		
900.000	8499.248	15569.354	4578.459	6529.802	2212.341	2518.306	1660.399	1787.015		
950.000	8343.513	15699.610	4518.393	6621.478	2224.853	2587.744	1690.045	1851.587		
1000.000	8199.737	15827.896	4459.538	6708.969	2231.436	2652.197	1712.544	1911.082		
1050.000	8066.691	15954.201	4402.238	6792.775	2233.299	2712.379	1729.159	1966.239		
1100.000	7943.301	16078.522	4346.711	6873.306	2231.405	2768.865	1740.924	2017.659		
1150.000	7828.625	16200.858	4293.086	6950.898	2226.526	2822.126	1748.687	2065.828		
1200.000	7721.834	16321.215	4241.427	7025.830	2219.285	2872.548	1753.147	2111.150		
1250.000	7622.193	16439.605	4191.752	7098.335	2210.182	2920.453	1754.883	2153.960		
1300.000	7529.055	16556.049	4144.044	7168.609	2199.626	2966.111	1754.370	2194.539		
1350.000	7441.844	16670.568	4098.266	7236.820	2187.946	3009.753	1752.008	2233.124		
1400.000	7360.053	16783.191	4054.363	7303.114	2175.412	3051.572	1748.124	2269.919		
1450.000	7283.227	16893.949	4012.275	7367.620	2162.242	3091.738	1742.996	2305.096		
1500.000	7210.961	17002.879	3971.935	7430.451	2148.616	3130.394	1736.854	2338.805		

Ra, Radium

A = 226.025

Z = 88

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.678		3.356		6.712		8.390			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
150.590	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
151.000	42.780	42.780	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
152.000	146.001	146.001	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
153.000	246.661	246.661	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
154.000	344.850	344.850	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
155.000	440.658	440.658	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
156.000	534.167	534.167	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
157.000	625.458	625.458	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
158.000	714.607	714.607	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
159.000	801.686	801.686	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
160.000	886.765	886.765	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
165.000	1284.397	1284.397	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
170.000	1640.888	1640.888	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
175.000	1962.155	1962.155	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
180.000	2253.021	2253.021	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
185.000	2517.447	2517.447	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
190.000	2758.717	2758.717	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
195.000	2979.576	2979.576	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
200.000	3182.336	3182.336	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
205.000	3368.959	3368.959	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
210.000	3541.122	3541.122	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
215.000	3700.267	3700.267	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
220.000	3847.643	3847.643	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
230.000	4111.306	4111.306	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
240.000	4339.322	4339.322	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
250.000	4537.328	4537.328	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
260.000	4709.817	4709.817	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
270.000	4860.422	4860.422	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
272.760	-.---	-.---	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---
273.000	-.---	-.---	3.728	3.728	-.---	-.---	-.---	-.---	-.---	-.---
274.000	-.---	-.---	19.538	19.538	-.---	-.---	-.---	-.---	-.---	-.---
275.000	-.---	-.---	35.237	35.237	-.---	-.---	-.---	-.---	-.---	-.---
276.000	-.---	-.---	50.826	50.826	-.---	-.---	-.---	-.---	-.---	-.---
277.000	-.---	-.---	66.309	66.309	-.---	-.---	-.---	-.---	-.---	-.---
278.000	-.---	-.---	81.684	81.684	-.---	-.---	-.---	-.---	-.---	-.---

Ra, Radium

A = 226.025

Z = 88

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T _s		2T _s		4T _s		5T _s		T _d	
Energy(eV)=	1.678		3.356		6.712		8.390			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
279.000	-,-,-	-,-,-	96.955	96.955	-,-,-	-,-,-	-,-,-	-,-,-		
280.000	4992.124	4993.894	112.123	112.123	-,-,-	-,-,-	-,-,-	-,-,-		
285.000	-,-,-	-,-,-	186.454	186.454	-,-,-	-,-,-	-,-,-	-,-,-		
290.000	5107.397	5116.901	258.380	258.380	-,-,-	-,-,-	-,-,-	-,-,-		
295.000	-,-,-	-,-,-	328.036	328.036	-,-,-	-,-,-	-,-,-	-,-,-		
300.000	5208.315	5230.832	395.537	395.537	-,-,-	-,-,-	-,-,-	-,-,-		
305.000	-,-,-	-,-,-	460.986	460.986	-,-,-	-,-,-	-,-,-	-,-,-		
310.000	5296.631	5336.665	524.476	524.476	-,-,-	-,-,-	-,-,-	-,-,-		
315.000	-,-,-	-,-,-	586.090	586.090	-,-,-	-,-,-	-,-,-	-,-,-		
320.000	5373.841	5435.256	645.902	645.902	-,-,-	-,-,-	-,-,-	-,-,-		
325.000	-,-,-	-,-,-	703.982	703.982	-,-,-	-,-,-	-,-,-	-,-,-		
330.000	5441.229	5527.357	760.391	760.391	-,-,-	-,-,-	-,-,-	-,-,-		
335.000	-,-,-	-,-,-	815.190	815.190	-,-,-	-,-,-	-,-,-	-,-,-		
340.000	5499.903	5613.630	868.431	868.431	-,-,-	-,-,-	-,-,-	-,-,-		
350.000	5550.824	5694.655	970.443	970.443	-,-,-	-,-,-	-,-,-	-,-,-		
360.000	5594.832	5770.947	1066.799	1066.799	-,-,-	-,-,-	-,-,-	-,-,-		
370.000	5632.661	5842.958	1157.836	1157.836	-,-,-	-,-,-	-,-,-	-,-,-		
380.000	5664.957	5911.088	1243.859	1243.859	-,-,-	-,-,-	-,-,-	-,-,-		
390.000	5692.290	5975.695	1325.151	1325.151	-,-,-	-,-,-	-,-,-	-,-,-		
400.000	5715.164	6037.093	1401.973	1401.973	-,-,-	-,-,-	-,-,-	-,-,-		
410.000	5734.026	6095.566	1474.570	1474.570	-,-,-	-,-,-	-,-,-	-,-,-		
420.000	5749.277	6151.364	1543.172	1543.172	-,-,-	-,-,-	-,-,-	-,-,-		
430.000	5761.269	6204.712	1607.993	1607.993	-,-,-	-,-,-	-,-,-	-,-,-		
440.000	5770.322	6255.811	1669.239	1669.239	-,-,-	-,-,-	-,-,-	-,-,-		
450.000	5776.719	6304.843	1727.100	1727.100	-,-,-	-,-,-	-,-,-	-,-,-		
460.000	5780.717	6351.970	1781.757	1781.757	-,-,-	-,-,-	-,-,-	-,-,-		
470.000	5782.545	6397.339	1833.382	1833.382	-,-,-	-,-,-	-,-,-	-,-,-		
472.590	-,-,-	-,-,-	-,-,-	-,-,-	0.000	0.000	-,-,-	-,-,-		
473.000	-,-,-	-,-,-	-,-,-	-,-,-	1.027	1.027	-,-,-	-,-,-		
474.000	-,-,-	-,-,-	-,-,-	-,-,-	3.546	3.546	-,-,-	-,-,-		
475.000	-,-,-	-,-,-	-,-,-	-,-,-	6.077	6.077	-,-,-	-,-,-		
476.000	-,-,-	-,-,-	-,-,-	-,-,-	8.619	8.619	-,-,-	-,-,-		
477.000	-,-,-	-,-,-	-,-,-	-,-,-	11.174	11.174	-,-,-	-,-,-		
478.000	-,-,-	-,-,-	-,-,-	-,-,-	13.739	13.739	-,-,-	-,-,-		
479.000	-,-,-	-,-,-	-,-,-	-,-,-	16.315	16.315	-,-,-	-,-,-		

Ra, Radium

A = 226.025

Z = 88

-----Surface Sputtering Regime-----> -----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	1.678		3.356		6.712		8.390			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
480.000	5782.410	6441.081	1882.136	1882.327	18.902	18.902	-.----	-.----		
485.000	-.----	-.----	-.----	-.----	31.987	31.987	-.----	-.----		
490.000	5780.500	6483.318	1928.172	1929.220	45.301	45.301	-.----	-.----		
495.000	-.----	-.----	-.----	-.----	58.816	58.816	-.----	-.----		
500.000	5776.982	6524.158	1971.634	1974.217	72.505	72.505	-.----	-.----		
505.000	-.----	-.----	-.----	-.----	86.342	86.342	-.----	-.----		
510.000	-.----	-.----	2012.659	2017.438	100.305	100.305	-.----	-.----		
515.000	-.----	-.----	-.----	-.----	114.371	114.371	-.----	-.----		
520.000	-.----	-.----	2051.375	2058.994	128.521	128.521	-.----	-.----		
525.000	-.----	-.----	-.----	-.----	142.736	142.736	-.----	-.----		
530.000	-.----	-.----	2087.905	2098.989	156.998	156.998	-.----	-.----		
535.000	-.----	-.----	-.----	-.----	171.291	171.291	-.----	-.----		
540.000	-.----	-.----	2122.363	2137.516	185.599	185.599	-.----	-.----		
550.000	5740.165	6710.549	2154.859	2174.664	214.208	214.208	-.----	-.----		
558.590	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
559.000	-.----	-.----	-.----	-.----	-.----	-.----	0.568	0.568		
560.000	-.----	-.----	2185.496	2210.514	242.723	242.723	1.976	1.976		
565.000	-.----	-.----	-.----	-.----	-.----	-.----	9.181	9.181		
570.000	-.----	-.----	2214.369	2245.142	271.059	271.059	16.645	16.645		
575.000	-.----	-.----	-.----	-.----	-.----	-.----	24.347	24.347		
580.000	-.----	-.----	2241.572	2278.617	299.141	299.141	32.266	32.266		
585.000	-.----	-.----	-.----	-.----	-.----	-.----	40.383	40.383		
590.000	-.----	-.----	2267.191	2311.004	326.908	326.908	48.680	48.680		
595.000	-.----	-.----	-.----	-.----	-.----	-.----	57.139	57.139		
600.000	5680.978	6873.604	2291.309	2342.363	354.305	354.305	65.744	65.744		
605.000	-.----	-.----	-.----	-.----	-.----	-.----	74.481	74.481		
610.000	-.----	-.----	-.----	-.----	381.290	381.290	83.335	83.335		
615.000	-.----	-.----	-.----	-.----	-.----	-.----	92.293	92.293		
620.000	-.----	-.----	-.----	-.----	407.825	407.825	101.341	101.341		
630.000	-.----	-.----	-.----	-.----	433.880	433.880	119.664	119.664		
640.000	-.----	-.----	-.----	-.----	459.430	459.430	138.217	138.217		
650.000	5608.622	7019.495	2391.937	2485.568	484.456	484.456	156.922	156.922		
660.000	-.----	-.----	-.----	-.----	508.943	508.943	175.714	175.714		
670.000	-.----	-.----	-.----	-.----	532.880	532.880	194.531	194.531		
680.000	-.----	-.----	-.----	-.----	556.259	556.259	213.322	213.322		

Ra, Radium

A = 226.025

Z = 88

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	1.678		3.356		6.712		8.390			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
690.000	-----	-----	-----	-----	579.074	579.074	232.040	232.040		
700.000	5528.972	7152.336	2465.021	2610.038	601.325	601.325	250.646	250.646		
710.000	-----	-----	-----	-----	623.010	623.010	269.105	269.105		
720.000	-----	-----	-----	-----	644.131	644.131	287.386	287.386		
730.000	-----	-----	-----	-----	664.691	664.691	305.464	305.464		
740.000	-----	-----	-----	-----	684.695	684.695	323.314	323.314		
750.000	5445.830	7274.960	2516.836	2719.877	704.150	704.150	340.920	340.920		
760.000	-----	-----	-----	-----	723.061	723.061	358.263	358.263		
770.000	-----	-----	-----	-----	741.436	741.436	375.330	375.330		
780.000	-----	-----	-----	-----	759.284	759.284	392.110	392.110		
790.000	-----	-----	-----	-----	776.614	776.635	408.593	408.593		
800.000	5361.675	7389.372	2552.166	2818.077	793.436	793.555	424.772	424.772		
810.000	-----	-----	-----	-----	-----	-----	440.642	440.642		
820.000	-----	-----	-----	-----	-----	-----	456.196	456.196		
830.000	-----	-----	-----	-----	-----	-----	471.434	471.434		
840.000	-----	-----	-----	-----	-----	-----	486.351	486.351		
850.000	5278.124	7497.035	2574.681	2906.864	870.264	872.306	500.948	500.948		
860.000	-----	-----	-----	-----	-----	-----	515.225	515.225		
870.000	-----	-----	-----	-----	-----	-----	529.181	529.181		
880.000	-----	-----	-----	-----	-----	-----	542.819	542.819		
890.000	-----	-----	-----	-----	-----	-----	556.141	556.141		
900.000	5196.220	7599.032	2587.211	2987.920	935.926	942.572	569.148	569.148		
950.000	5116.620	7696.188	2591.955	3062.539	991.733	1005.778	629.593	629.897		
1000.000	5039.719	7789.136	2590.628	3131.731	1038.927	1063.057	682.769	684.676		
1050.000	4965.740	7878.385	2584.577	3196.298	1078.638	1115.313	729.284	734.413		
1100.000	4894.789	7964.342	2574.865	3256.881	1111.873	1163.277	769.780	779.839		
1150.000	4826.887	8047.343	2562.331	3313.999	1139.516	1207.546	804.887	821.551		
1200.000	4762.001	8127.663	2547.645	3368.079	1162.338	1248.610	835.200	860.046		
1250.000	4700.057	8205.529	2531.338	3419.474	1181.006	1286.877	861.268	895.734		
1300.000	4640.954	8281.132	2513.837	3468.479	1196.097	1322.687	883.584	928.960		
1350.000	4584.578	8354.635	2495.483	3515.344	1208.109	1356.326	902.595	960.014		
1400.000	4530.811	8426.183	2476.548	3560.278	1217.470	1388.036	918.697	989.142		
1450.000	4479.529	8495.901	2457.250	3603.463	1224.549	1418.023	932.238	1016.554		
1500.000	4430.613	8563.902	2437.765	3645.053	1229.666	1446.466	943.531	1042.432		

Ac, Actinium

A = 227.028

Z = 89

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Displacement	T _s	2T _s		4T _s	5T _s						
Energy(eV)=	3.988	7.976		15.952	19.940						
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)		Cascade CS (barns)
315.230	0.000	0.000	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
316.000	7.976	7.976	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
317.000	18.316	18.316	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
318.000	28.618	28.618	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
319.000	38.883	38.883	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
320.000	49.109	49.109	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
325.000	99.683	99.683	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
330.000	149.336	149.336	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
335.000	198.082	198.082	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
340.000	245.932	245.932	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
345.000	292.896	292.896	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
350.000	338.983	338.983	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
355.000	384.201	384.201	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
360.000	428.559	428.559	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
365.000	472.063	472.063	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
370.000	514.722	514.722	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
375.000	556.542	556.542	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
380.000	597.533	597.533	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
390.000	677.057	677.057	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
400.000	753.364	753.364	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
410.000	826.528	826.528	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
420.000	896.627	896.627	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
430.000	963.747	963.747	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
440.000	1027.974	1027.974	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
450.000	1089.398	1089.398	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
460.000	1148.111	1148.111	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
470.000	1204.206	1204.206	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
480.000	1257.775	1257.775	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
490.000	1308.911	1308.911	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
500.000	1357.707	1357.707	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
510.000	1404.253	1404.253	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
520.000	1448.637	1448.637	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
530.000	1490.948	1490.948	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	
539.800	-,-,-,-	-,-,-,-	0.000	0.000	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	-,-,-,-	

Ac, Actinium

A = 227.028

Z = 89

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s 3.988		2T _s 7.976		4T _s 15.952		5T _s 19.940			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
540.000	1531.268	1531.268	0.325	0.325	-.----	-.----	-.----	-.----		
541.000	-.----	-.----	1.994	1.994	-.----	-.----	-.----	-.----		
542.000	-.----	-.----	3.676	3.676	-.----	-.----	-.----	-.----		
543.000	-.----	-.----	5.370	5.370	-.----	-.----	-.----	-.----		
544.000	-.----	-.----	7.076	7.076	-.----	-.----	-.----	-.----		
545.000	-.----	-.----	8.793	8.793	-.----	-.----	-.----	-.----		
546.000	-.----	-.----	10.522	10.522	-.----	-.----	-.----	-.----		
547.000	-.----	-.----	12.263	12.263	-.----	-.----	-.----	-.----		
548.000	-.----	-.----	14.015	14.015	-.----	-.----	-.----	-.----		
549.000	-.----	-.----	15.777	15.777	-.----	-.----	-.----	-.----		
550.000	1569.682	1569.898	17.550	17.550	-.----	-.----	-.----	-.----		
555.000	-.----	-.----	26.570	26.570	-.----	-.----	-.----	-.----		
560.000	1606.268	1607.121	35.829	35.829	-.----	-.----	-.----	-.----		
565.000	-.----	-.----	45.303	45.303	-.----	-.----	-.----	-.----		
570.000	1641.104	1643.017	54.973	54.973	-.----	-.----	-.----	-.----		
575.000	-.----	-.----	64.818	64.818	-.----	-.----	-.----	-.----		
580.000	1674.264	1677.661	74.818	74.818	-.----	-.----	-.----	-.----		
585.000	-.----	-.----	84.958	84.958	-.----	-.----	-.----	-.----		
590.000	1705.821	1711.123	95.219	95.219	-.----	-.----	-.----	-.----		
595.000	-.----	-.----	105.586	105.586	-.----	-.----	-.----	-.----		
600.000	1735.844	1743.466	116.046	116.046	-.----	-.----	-.----	-.----		
610.000	-.----	-.----	137.186	137.186	-.----	-.----	-.----	-.----		
620.000	-.----	-.----	158.541	158.541	-.----	-.----	-.----	-.----		
630.000	-.----	-.----	180.021	180.021	-.----	-.----	-.----	-.----		
640.000	-.----	-.----	201.551	201.551	-.----	-.----	-.----	-.----		
650.000	1865.181	1890.390	223.063	223.063	-.----	-.----	-.----	-.----		
660.000	-.----	-.----	244.499	244.499	-.----	-.----	-.----	-.----		
670.000	-.----	-.----	265.808	265.808	-.----	-.----	-.----	-.----		
680.000	-.----	-.----	286.945	286.945	-.----	-.----	-.----	-.----		
690.000	-.----	-.----	307.873	307.873	-.----	-.----	-.----	-.----		
700.000	1965.072	2016.900	328.558	328.558	-.----	-.----	-.----	-.----		
710.000	-.----	-.----	348.972	348.972	-.----	-.----	-.----	-.----		
720.000	-.----	-.----	369.092	369.092	-.----	-.----	-.----	-.----		
730.000	-.----	-.----	388.896	388.896	-.----	-.----	-.----	-.----		

Ac, Actinium

A = 227.028

Z = 89

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
Displacement		T _s	2T _s		4T _s	5T _s					
Energy(eV)=		3.988	7.976		15.952	19.940					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
740.000	-.----	-.----	408.370	408.370	-.----	-.----	-.----	-.----	-.----	-.----	
750.000	2041.457	2127.476	427.498	427.498	-.----	-.----	-.----	-.----	-.----	-.----	
760.000	-.----	-.----	446.269	446.269	-.----	-.----	-.----	-.----	-.----	-.----	
770.000	-.----	-.----	464.675	464.675	-.----	-.----	-.----	-.----	-.----	-.----	
780.000	-.----	-.----	482.709	482.709	-.----	-.----	-.----	-.----	-.----	-.----	
790.000	-.----	-.----	500.366	500.366	-.----	-.----	-.----	-.----	-.----	-.----	
800.000	2099.072	2225.399	517.642	517.642	-.----	-.----	-.----	-.----	-.----	-.----	
810.000	-.----	-.----	534.535	534.535	-.----	-.----	-.----	-.----	-.----	-.----	
820.000	-.----	-.----	551.045	551.045	-.----	-.----	-.----	-.----	-.----	-.----	
830.000	-.----	-.----	567.172	567.172	-.----	-.----	-.----	-.----	-.----	-.----	
840.000	-.----	-.----	582.917	582.917	-.----	-.----	-.----	-.----	-.----	-.----	
850.000	2141.684	2313.114	598.283	598.283	-.----	-.----	-.----	-.----	-.----	-.----	
860.000	-.----	-.----	613.273	613.273	-.----	-.----	-.----	-.----	-.----	-.----	
870.000	-.----	-.----	627.889	627.889	-.----	-.----	-.----	-.----	-.----	-.----	
880.000	-.----	-.----	642.136	642.136	-.----	-.----	-.----	-.----	-.----	-.----	
884.430	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	
885.000	-.----	-.----	-.----	-.----	0.156	0.156	-.----	-.----	-.----	-.----	
886.000	-.----	-.----	-.----	-.----	0.437	0.437	-.----	-.----	-.----	-.----	
887.000	-.----	-.----	-.----	-.----	0.723	0.723	-.----	-.----	-.----	-.----	
888.000	-.----	-.----	-.----	-.----	1.014	1.014	-.----	-.----	-.----	-.----	
889.000	-.----	-.----	-.----	-.----	1.310	1.310	-.----	-.----	-.----	-.----	
890.000	-.----	-.----	656.019	656.026	1.611	1.611	-.----	-.----	-.----	-.----	
895.000	-.----	-.----	-.----	-.----	3.184	3.184	-.----	-.----	-.----	-.----	
900.000	2172.287	2392.478	669.543	669.602	4.868	4.868	-.----	-.----	-.----	-.----	
905.000	-.----	-.----	-.----	-.----	6.659	6.659	-.----	-.----	-.----	-.----	
910.000	-.----	-.----	-.----	-.----	8.551	8.551	-.----	-.----	-.----	-.----	
915.000	-.----	-.----	-.----	-.----	10.539	10.539	-.----	-.----	-.----	-.----	
920.000	-.----	-.----	-.----	-.----	12.618	12.618	-.----	-.----	-.----	-.----	
925.000	-.----	-.----	-.----	-.----	14.784	14.784	-.----	-.----	-.----	-.----	
930.000	-.----	-.----	-.----	-.----	17.031	17.031	-.----	-.----	-.----	-.----	
935.000	-.----	-.----	-.----	-.----	19.357	19.357	-.----	-.----	-.----	-.----	
940.000	-.----	-.----	-.----	-.----	21.756	21.756	-.----	-.----	-.----	-.----	
950.000	2193.264	2464.919	731.961	733.192	26.759	26.759	-.----	-.----	-.----	-.----	
960.000	-.----	-.----	-.----	-.----	32.010	32.010	-.----	-.----	-.----	-.----	

Ac, Actinium

A = 227.028

Z = 89

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 3.988		2T _s 7.976		4T _s 15.952		5T _s 19.940			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
970.000	-.----	-.----	-.----	-.----	37.483	37.483	-.----	-.----		
980.000	-.----	-.----	-.----	-.----	43.151	43.151	-.----	-.----		
990.000	-.----	-.----	-.----	-.----	48.992	48.992	-.----	-.----		
1000.000	2206.520	2531.554	786.273	790.482	54.982	54.982	-.----	-.----		
1010.000	-.----	-.----	-.----	-.----	61.103	61.103	-.----	-.----		
1020.000	-.----	-.----	-.----	-.----	67.336	67.336	-.----	-.----		
1028.080	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1029.000	-.----	-.----	-.----	-.----	-.----	-.----	0.144	0.144		
1030.000	-.----	-.----	-.----	-.----	73.663	73.663	0.305	0.305		
1035.000	-.----	-.----	-.----	-.----	-.----	-.----	1.157	1.157		
1040.000	-.----	-.----	-.----	-.----	80.070	80.070	2.089	2.089		
1045.000	-.----	-.----	-.----	-.----	-.----	-.----	3.096	3.096		
1050.000	2213.579	2593.264	833.275	842.441	86.541	86.541	4.177	4.177		
1055.000	-.----	-.----	-.----	-.----	-.----	-.----	5.326	5.326		
1060.000	-.----	-.----	-.----	-.----	93.064	93.064	6.542	6.542		
1065.000	-.----	-.----	-.----	-.----	-.----	-.----	7.822	7.822		
1070.000	-.----	-.----	-.----	-.----	99.625	99.625	9.163	9.163		
1075.000	-.----	-.----	-.----	-.----	-.----	-.----	10.562	10.562		
1080.000	-.----	-.----	-.----	-.----	106.215	106.215	12.016	12.016		
1090.000	-.----	-.----	-.----	-.----	112.821	112.821	15.082	15.082		
1100.000	2215.666	2650.758	873.757	889.853	119.436	119.436	18.342	18.342		
1110.000	-.----	-.----	-.----	-.----	126.050	126.050	21.778	21.778		
1120.000	-.----	-.----	-.----	-.----	132.655	132.655	25.374	25.374		
1130.000	-.----	-.----	-.----	-.----	139.244	139.244	29.113	29.113		
1140.000	-.----	-.----	-.----	-.----	145.810	145.810	32.983	32.983		
1150.000	2213.771	2704.607	908.466	933.360	152.348	152.348	36.968	36.968		
1160.000	-.----	-.----	-.----	-.----	158.851	158.851	41.058	41.058		
1170.000	-.----	-.----	-.----	-.----	165.314	165.314	45.240	45.240		
1180.000	-.----	-.----	-.----	-.----	171.733	171.733	49.503	49.503		
1190.000	-.----	-.----	-.----	-.----	178.104	178.104	53.837	53.837		
1200.000	2208.692	2755.281	938.088	973.488	184.422	184.422	58.234	58.234		
1210.000	-.----	-.----	-.----	-.----	-.----	-.----	62.684	62.684		
1220.000	-.----	-.----	-.----	-.----	-.----	-.----	67.178	67.178		
1230.000	-.----	-.----	-.----	-.----	-.----	-.----	71.710	71.710		

Ac, Actinium

A = 227.028

Z = 89

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	3.988		7.976		15.952		19.940			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1240.000	----	----	----	----	----	----	76.273	76.273		
1250.000	2201.079	2803.165	963.240	1010.676	215.125	215.125	80.860	80.860		
1260.000	----	----	----	----	----	----	85.464	85.464		
1270.000	----	----	----	----	----	----	90.080	90.080		
1280.000	----	----	----	----	----	----	94.703	94.703		
1290.000	----	----	----	----	----	----	99.328	99.328		
1300.000	2191.460	2848.582	984.476	1045.290	244.140	244.140	103.951	103.951		
1350.000	2180.265	2891.803	1002.283	1077.636	271.300	271.300	126.890	126.890		
1400.000	2167.846	2933.056	1017.094	1107.974	296.540	296.541	149.255	149.255		
1450.000	2154.492	2972.537	1029.286	1136.527	319.862	319.979	170.771	170.771		
1500.000	2140.438	3010.415	1039.192	1163.484	341.314	341.835	191.262	191.262		

Th, Thorium

A = 232.038

Z = 90

Displacement		Surface Sputtering Regime			Bulk Displacement Regime					T _d
Energy(eV)=		T _s	2T _s		4T _s	5T _s				
		5.962	11.924		23.848	29.810				
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
440.420	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
441.000	2.026	2.026	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
442.000	5.584	5.584	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
443.000	9.153	9.153	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
444.000	12.735	12.735	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
445.000	16.328	16.328	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
446.000	19.931	19.931	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
447.000	23.545	23.545	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
448.000	27.170	27.170	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
449.000	30.804	30.804	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
450.000	34.448	34.448	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
455.000	52.802	52.802	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
460.000	71.352	71.352	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
465.000	90.064	90.064	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
470.000	108.905	108.905	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
475.000	127.846	127.846	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
480.000	146.860	146.860	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
485.000	165.919	165.919	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
490.000	185.002	185.002	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
495.000	204.086	204.086	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
500.000	223.150	223.150	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
510.000	261.148	261.148	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
520.000	298.863	298.863	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
530.000	336.184	336.184	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
540.000	373.017	373.017	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
550.000	409.285	409.285	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
560.000	444.922	444.922	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
570.000	479.877	479.877	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
580.000	514.107	514.107	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
590.000	547.581	547.581	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
600.000	580.272	580.272	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
610.000	612.162	612.162	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
620.000	643.238	643.238	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
630.000	673.493	673.493	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---
640.000	702.923	702.923	-.---	-.---	-.---	-.---	-.---	-.---	-.---	-.---

Th, Thorium

A = 232.038

Z = 90

		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->									
Displacement		T_s	$2T_s$		$4T_s$	$5T_s$				T_d	
Energy(eV)=		5.962	11.924		23.848	29.810					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
650.000	731.530	731.530	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
660.000	759.315	759.315	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
670.000	786.285	786.285	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
680.000	812.449	812.449	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
690.000	837.817	837.817	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
700.000	862.401	862.401	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
710.000	886.213	886.213	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
720.000	909.267	909.267	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
730.000	931.580	931.580	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----	
733.710	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	
734.000	-.----	-.----	0.168	0.168	-.----	-.----	-.----	-.----	-.----	-.----	
735.000	-.----	-.----	0.756	0.756	-.----	-.----	-.----	-.----	-.----	-.----	
736.000	-.----	-.----	1.352	1.352	-.----	-.----	-.----	-.----	-.----	-.----	
737.000	-.----	-.----	1.956	1.956	-.----	-.----	-.----	-.----	-.----	-.----	
738.000	-.----	-.----	2.568	2.568	-.----	-.----	-.----	-.----	-.----	-.----	
739.000	-.----	-.----	3.188	3.188	-.----	-.----	-.----	-.----	-.----	-.----	
740.000	953.166	953.188	3.815	3.815	-.----	-.----	-.----	-.----	-.----	-.----	
745.000	-.----	-.----	7.062	7.062	-.----	-.----	-.----	-.----	-.----	-.----	
750.000	974.041	974.197	10.486	10.486	-.----	-.----	-.----	-.----	-.----	-.----	
755.000	-.----	-.----	14.076	14.076	-.----	-.----	-.----	-.----	-.----	-.----	
760.000	994.222	994.640	17.822	17.822	-.----	-.----	-.----	-.----	-.----	-.----	
765.000	-.----	-.----	21.715	21.715	-.----	-.----	-.----	-.----	-.----	-.----	
770.000	1013.726	1014.541	25.745	25.745	-.----	-.----	-.----	-.----	-.----	-.----	
775.000	-.----	-.----	29.903	29.903	-.----	-.----	-.----	-.----	-.----	-.----	
780.000	1032.570	1033.922	34.180	34.180	-.----	-.----	-.----	-.----	-.----	-.----	
785.000	-.----	-.----	38.569	38.569	-.----	-.----	-.----	-.----	-.----	-.----	
790.000	1050.770	1052.805	43.063	43.063	-.----	-.----	-.----	-.----	-.----	-.----	
795.000	-.----	-.----	47.652	47.652	-.----	-.----	-.----	-.----	-.----	-.----	
800.000	1068.343	1071.212	52.332	52.332	-.----	-.----	-.----	-.----	-.----	-.----	
810.000	-.----	-.----	61.934	61.934	-.----	-.----	-.----	-.----	-.----	-.----	
820.000	-.----	-.----	71.818	71.818	-.----	-.----	-.----	-.----	-.----	-.----	
830.000	-.----	-.----	81.939	81.939	-.----	-.----	-.----	-.----	-.----	-.----	
840.000	-.----	-.----	92.258	92.258	-.----	-.----	-.----	-.----	-.----	-.----	
850.000	1147.401	1156.729	102.735	102.735	-.----	-.----	-.----	-.----	-.----	-.----	
860.000	-.----	-.----	113.338	113.338	-.----	-.----	-.----	-.----	-.----	-.----	

Th, Thorium

A = 232.038

Z = 90

Displacement		Surface Sputtering Regime				Bulk Displacement Regime				T _d
Energy(eV)=		T _s	2T _s		4T _s		5T _s			
		5.962	11.924		23.848		29.810			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
870.000	-.----	-.----	124.036	124.036	-.----	-.----	-.----	-.----		
880.000	-.----	-.----	134.802	134.802	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	145.610	145.610	-.----	-.----	-.----	-.----		
900.000	1213.247	1232.843	156.438	156.438	-.----	-.----	-.----	-.----		
910.000	-.----	-.----	167.265	167.265	-.----	-.----	-.----	-.----		
920.000	-.----	-.----	178.073	178.073	-.----	-.----	-.----	-.----		
930.000	-.----	-.----	188.845	188.845	-.----	-.----	-.----	-.----		
940.000	-.----	-.----	199.566	199.566	-.----	-.----	-.----	-.----		
950.000	1267.746	1301.185	210.224	210.224	-.----	-.----	-.----	-.----		
960.000	-.----	-.----	220.805	220.805	-.----	-.----	-.----	-.----		
970.000	-.----	-.----	231.300	231.300	-.----	-.----	-.----	-.----		
980.000	-.----	-.----	241.699	241.699	-.----	-.----	-.----	-.----		
990.000	-.----	-.----	251.993	251.993	-.----	-.----	-.----	-.----		
1000.000	1312.549	1363.034	262.175	262.175	-.----	-.----	-.----	-.----		
1010.000	-.----	-.----	272.239	272.239	-.----	-.----	-.----	-.----		
1020.000	-.----	-.----	282.178	282.178	-.----	-.----	-.----	-.----		
1030.000	-.----	-.----	291.988	291.988	-.----	-.----	-.----	-.----		
1040.000	-.----	-.----	301.664	301.664	-.----	-.----	-.----	-.----		
1050.000	1349.094	1419.408	311.203	311.203	-.----	-.----	-.----	-.----		
1060.000	-.----	-.----	320.602	320.602	-.----	-.----	-.----	-.----		
1070.000	-.----	-.----	329.857	329.857	-.----	-.----	-.----	-.----		
1080.000	-.----	-.----	338.967	338.967	-.----	-.----	-.----	-.----		
1090.000	-.----	-.----	347.931	347.931	-.----	-.----	-.----	-.----		
1100.000	1378.619	1471.125	356.746	356.746	-.----	-.----	-.----	-.----		
1150.000	1402.183	1518.848	398.578	398.578	-.----	-.----	-.----	-.----		
1173.480	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
1174.000	-.----	-.----	-.----	-.----	0.051	0.051	-.----	-.----		
1175.000	-.----	-.----	-.----	-.----	0.152	0.152	-.----	-.----		
1176.000	-.----	-.----	-.----	-.----	0.256	0.256	-.----	-.----		
1177.000	-.----	-.----	-.----	-.----	0.362	0.362	-.----	-.----		
1178.000	-.----	-.----	-.----	-.----	0.470	0.470	-.----	-.----		
1179.000	-.----	-.----	-.----	-.----	0.581	0.581	-.----	-.----		
1180.000	-.----	-.----	-.----	-.----	0.694	0.694	-.----	-.----		
1185.000	-.----	-.----	-.----	-.----	1.294	1.294	-.----	-.----		
1190.000	-.----	-.----	-.----	-.----	1.951	1.951	-.----	-.----		

Th, Thorium

A = 232.038

Z = 90

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d
Displacement	T _s		2T _s		4T _s		5T _s			
Energy(eV)=	5.962		11.924		23.848		29.810			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1195.000	-.----	-.----	-.----	-.----	2.662	2.662	-.----	-.----		
1200.000	1420.690	1563.120	436.680	436.734	3.425	3.425	-.----	-.----		
1205.000	-.----	-.----	-.----	-.----	4.239	4.239	-.----	-.----		
1210.000	-.----	-.----	-.----	-.----	5.101	5.101	-.----	-.----		
1215.000	-.----	-.----	-.----	-.----	6.010	6.010	-.----	-.----		
1220.000	-.----	-.----	-.----	-.----	6.964	6.964	-.----	-.----		
1225.000	-.----	-.----	-.----	-.----	7.960	7.960	-.----	-.----		
1230.000	-.----	-.----	-.----	-.----	8.999	8.999	-.----	-.----		
1235.000	-.----	-.----	-.----	-.----	10.077	10.077	-.----	-.----		
1240.000	-.----	-.----	-.----	-.----	11.193	11.193	-.----	-.----		
1250.000	1434.905	1604.388	471.164	471.719	13.533	13.533	-.----	-.----		
1260.000	-.----	-.----	-.----	-.----	16.008	16.008	-.----	-.----		
1270.000	-.----	-.----	-.----	-.----	18.607	18.607	-.----	-.----		
1280.000	-.----	-.----	-.----	-.----	21.319	21.319	-.----	-.----		
1290.000	-.----	-.----	-.----	-.----	24.134	24.134	-.----	-.----		
1300.000	1445.481	1643.026	502.212	503.958	27.044	27.044	-.----	-.----		
1310.000	-.----	-.----	-.----	-.----	30.040	30.040	-.----	-.----		
1320.000	-.----	-.----	-.----	-.----	33.113	33.113	-.----	-.----		
1330.000	-.----	-.----	-.----	-.----	36.256	36.256	-.----	-.----		
1340.000	-.----	-.----	-.----	-.----	39.462	39.462	-.----	-.----		
1350.000	1452.974	1679.345	530.047	533.784	42.724	42.724	-.----	-.----		
1354.890	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1355.000	-.----	-.----	-.----	-.----	-.----	-.----	0.006	0.006		
1356.000	-.----	-.----	-.----	-.----	-.----	-.----	0.063	0.063		
1357.000	-.----	-.----	-.----	-.----	-.----	-.----	0.121	0.121		
1358.000	-.----	-.----	-.----	-.----	-.----	-.----	0.181	0.181		
1359.000	-.----	-.----	-.----	-.----	-.----	-.----	0.243	0.243		
1360.000	-.----	-.----	-.----	-.----	46.035	46.035	0.306	0.306		
1365.000	-.----	-.----	-.----	-.----	-.----	-.----	0.646	0.646		
1370.000	-.----	-.----	-.----	-.----	49.391	49.391	1.024	1.024		
1375.000	-.----	-.----	-.----	-.----	-.----	-.----	1.438	1.438		
1380.000	-.----	-.----	-.----	-.----	52.786	52.786	1.888	1.888		
1385.000	-.----	-.----	-.----	-.----	-.----	-.----	2.372	2.372		
1390.000	-.----	-.----	-.----	-.----	56.213	56.213	2.890	2.890		
1395.000	-.----	-.----	-.----	-.----	-.----	-.----	3.440	3.440		

Th, Thorium

A = 232.038

Z=90

Displacement Energy(eV)=		<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d
T _s 5.962		2T _s 11.924		4T _s 23.848		5T _s 29.810				
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)
1400.000	1457.853	1713.608	554.908	561.481	59.669	59.669	4.020	4.020		
1405.000	-.----	-.----	-.----	-.----	-.----	-.----	4.631	4.631		
1410.000	-.----	-.----	-.----	-.----	63.149	63.149	5.271	5.271		
1415.000	-.----	-.----	-.----	-.----	-.----	-.----	5.939	5.939		
1420.000	-.----	-.----	-.----	-.----	66.648	66.648	6.634	6.634		
1430.000	-.----	-.----	-.----	-.----	70.163	70.163	8.101	8.101		
1440.000	-.----	-.----	-.----	-.----	73.689	73.689	9.666	9.666		
1450.000	1460.519	1746.041	577.039	587.293	77.224	77.224	11.321	11.321		
1460.000	-.----	-.----	-.----	-.----	80.764	80.764	13.060	13.060		
1470.000	-.----	-.----	-.----	-.----	84.306	84.306	14.877	14.877		
1480.000	-.----	-.----	-.----	-.----	87.847	87.847	16.766	16.766		
1490.000	-.----	-.----	-.----	-.----	91.384	91.384	18.722	18.722		
1500.000	1461.314	1776.833	596.676	611.425	94.915	94.915	20.740	20.740		

Pa, Protactinium

A = 231.036

Z = 91

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	4.769		9.538		19.076		23.845			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
368.830	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
369.000	1.126	1.126	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
370.000	7.938	7.938	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
375.000	41.961	41.961	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
380.000	75.896	75.896	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
385.000	109.705	109.705	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
390.000	143.354	143.354	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
395.000	176.811	176.811	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
400.000	210.047	210.047	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
405.000	243.035	243.035	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
410.000	275.751	275.751	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
415.000	308.173	308.173	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
420.000	340.281	340.281	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
430.000	403.483	403.483	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
440.000	465.236	465.236	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
450.000	525.443	525.443	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
460.000	584.033	584.033	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
470.000	640.952	640.952	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
480.000	696.166	696.166	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
490.000	749.655	749.655	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
500.000	801.409	801.409	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
510.000	851.433	851.433	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
520.000	899.736	899.736	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
530.000	946.338	946.338	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
540.000	991.262	991.262	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
550.000	1034.539	1034.539	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
560.000	1076.201	1076.201	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
570.000	1116.284	1116.284	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
580.000	1154.828	1154.828	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
590.000	1191.871	1191.871	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
600.000	1227.457	1227.457	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
610.000	1261.626	1261.626	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
620.000	1294.422	1294.422	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
623.500	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
624.000	-.----	-.----	0.553	0.553	-.----	-.----	-.----	-.----	-.----	-.----

Pa, Protactinium

A=231.036

Z=91

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s 4.769		2T _s 9.538		4T _s 19.076		5T _s 23.845			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
625.000	-.----	-.----	1.669	1.669	-.----	-.----	-.----	-.----		
626.000	-.----	-.----	2.797	2.797	-.----	-.----	-.----	-.----		
627.000	-.----	-.----	3.936	3.936	-.----	-.----	-.----	-.----		
628.000	-.----	-.----	5.086	5.086	-.----	-.----	-.----	-.----		
629.000	-.----	-.----	6.248	6.248	-.----	-.----	-.----	-.----		
630.000	1325.887	1325.940	7.420	7.420	-.----	-.----	-.----	-.----		
635.000	-.----	-.----	13.437	13.437	-.----	-.----	-.----	-.----		
640.000	1356.065	1356.407	19.701	19.701	-.----	-.----	-.----	-.----		
645.000	-.----	-.----	26.194	26.194	-.----	-.----	-.----	-.----		
650.000	1384.997	1385.892	32.898	32.898	-.----	-.----	-.----	-.----		
655.000	-.----	-.----	39.797	39.797	-.----	-.----	-.----	-.----		
660.000	1412.725	1414.443	46.874	46.874	-.----	-.----	-.----	-.----		
665.000	-.----	-.----	54.116	54.116	-.----	-.----	-.----	-.----		
670.000	1439.291	1442.108	61.507	61.507	-.----	-.----	-.----	-.----		
675.000	-.----	-.----	69.034	69.034	-.----	-.----	-.----	-.----		
680.000	1464.735	1468.930	76.686	76.686	-.----	-.----	-.----	-.----		
690.000	1489.096	1494.949	92.314	92.314	-.----	-.----	-.----	-.----		
700.000	1512.413	1520.204	108.304	108.304	-.----	-.----	-.----	-.----		
710.000	-.----	-.----	124.577	124.577	-.----	-.----	-.----	-.----		
720.000	-.----	-.----	141.063	141.063	-.----	-.----	-.----	-.----		
730.000	-.----	-.----	157.700	157.700	-.----	-.----	-.----	-.----		
740.000	-.----	-.----	174.432	174.432	-.----	-.----	-.----	-.----		
750.000	1614.622	1636.214	191.211	191.211	-.----	-.----	-.----	-.----		
760.000	-.----	-.----	207.992	207.992	-.----	-.----	-.----	-.----		
770.000	-.----	-.----	224.735	224.735	-.----	-.----	-.----	-.----		
780.000	-.----	-.----	241.408	241.408	-.----	-.----	-.----	-.----		
790.000	-.----	-.----	257.980	257.980	-.----	-.----	-.----	-.----		
800.000	1695.933	1737.733	274.423	274.423	-.----	-.----	-.----	-.----		
810.000	-.----	-.----	290.715	290.715	-.----	-.----	-.----	-.----		
820.000	-.----	-.----	306.834	306.834	-.----	-.----	-.----	-.----		
830.000	-.----	-.----	322.764	322.764	-.----	-.----	-.----	-.----		
840.000	-.----	-.----	338.488	338.488	-.----	-.----	-.----	-.----		
850.000	1760.008	1827.616	353.994	353.994	-.----	-.----	-.----	-.----		
860.000	-.----	-.----	369.271	369.271	-.----	-.----	-.----	-.----		
870.000	-.----	-.----	384.307	384.307	-.----	-.----	-.----	-.----		

Pa, Protactinium

A = 231.036

Z = 91

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	4.769		9.538		19.076		23.845			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
880.000	-.----	-.----	399.097	399.097	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	413.632	413.632	-.----	-.----	-.----	-.----		
900.000	1809.901	1908.028	427.908	427.908	-.----	-.----	-.----	-.----		
950.000	1848.139	1980.636	495.286	495.286	-.----	-.----	-.----	-.----		
1000.000	1876.800	2046.741	555.917	555.917	-.----	-.----	-.----	-.----		
1009.870	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
1010.000	-.----	-.----	-.----	-.----	0.024	0.024	-.----	-.----		
1011.000	-.----	-.----	-.----	-.----	0.212	0.212	-.----	-.----		
1012.000	-.----	-.----	-.----	-.----	0.404	0.404	-.----	-.----		
1013.000	-.----	-.----	-.----	-.----	0.600	0.600	-.----	-.----		
1014.000	-.----	-.----	-.----	-.----	0.799	0.799	-.----	-.----		
1015.000	-.----	-.----	-.----	-.----	1.003	1.003	-.----	-.----		
1016.000	-.----	-.----	-.----	-.----	1.210	1.210	-.----	-.----		
1017.000	-.----	-.----	-.----	-.----	1.421	1.421	-.----	-.----		
1018.000	-.----	-.----	-.----	-.----	1.636	1.636	-.----	-.----		
1019.000	-.----	-.----	-.----	-.----	1.854	1.854	-.----	-.----		
1020.000	-.----	-.----	-.----	-.----	2.076	2.076	-.----	-.----		
1025.000	-.----	-.----	-.----	-.----	3.240	3.240	-.----	-.----		
1030.000	-.----	-.----	-.----	-.----	4.490	4.490	-.----	-.----		
1035.000	-.----	-.----	-.----	-.----	5.824	5.824	-.----	-.----		
1040.000	-.----	-.----	-.----	-.----	7.236	7.236	-.----	-.----		
1045.000	-.----	-.----	-.----	-.----	8.724	8.724	-.----	-.----		
1050.000	1897.594	2107.370	609.965	610.234	10.284	10.284	-.----	-.----		
1055.000	-.----	-.----	-.----	-.----	11.913	11.913	-.----	-.----		
1060.000	-.----	-.----	-.----	-.----	13.608	13.608	-.----	-.----		
1065.000	-.----	-.----	-.----	-.----	15.365	15.365	-.----	-.----		
1070.000	-.----	-.----	-.----	-.----	17.182	17.182	-.----	-.----		
1075.000	-.----	-.----	-.----	-.----	19.056	19.056	-.----	-.----		
1080.000	-.----	-.----	-.----	-.----	20.984	20.984	-.----	-.----		
1090.000	-.----	-.----	-.----	-.----	24.993	24.993	-.----	-.----		
1100.000	1911.926	2163.344	657.803	659.391	29.187	29.187	-.----	-.----		
1110.000	-.----	-.----	-.----	-.----	33.549	33.549	-.----	-.----		
1120.000	-.----	-.----	-.----	-.----	38.061	38.061	-.----	-.----		
1130.000	-.----	-.----	-.----	-.----	42.707	42.707	-.----	-.----		
1140.000	-.----	-.----	-.----	-.----	47.471	47.471	-.----	-.----		

Pa, Protactinium

A = 231.036

Z = 91

Displacement Energy(eV)=	<-----Surface Sputtering Regime----->				<-----Bulk Displacement Regime----->				T _d	
	T _s		2T _s		4T _s		5T _s			
	4.769		9.538		19.076		23.845			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1150.000	1920.951	2215.325	699.900	704.141	52.340	52.340	-.----	-.----		
1160.000	-.----	-.----	-.----	-.----	57.301	57.301	-.----	-.----		
1170.000	-.----	-.----	-.----	-.----	62.342	62.342	-.----	-.----		
1170.080	-.----	-.----	-.----	-.----	-.----	-.----	0.000	0.000		
1171.000	-.----	-.----	-.----	-.----	-.----	-.----	0.098	0.098		
1172.000	-.----	-.----	-.----	-.----	-.----	-.----	0.207	0.207		
1173.000	-.----	-.----	-.----	-.----	-.----	-.----	0.318	0.318		
1174.000	-.----	-.----	-.----	-.----	-.----	-.----	0.432	0.432		
1175.000	-.----	-.----	-.----	-.----	-.----	-.----	0.548	0.548		
1176.000	-.----	-.----	-.----	-.----	-.----	-.----	0.667	0.667		
1177.000	-.----	-.----	-.----	-.----	-.----	-.----	0.789	0.789		
1178.000	-.----	-.----	-.----	-.----	-.----	-.----	0.913	0.913		
1179.000	-.----	-.----	-.----	-.----	-.----	-.----	1.040	1.040		
1180.000	-.----	-.----	-.----	-.----	67.452	67.452	1.169	1.169		
1185.000	-.----	-.----	-.----	-.----	-.----	-.----	1.850	1.850		
1190.000	-.----	-.----	-.----	-.----	72.619	72.619	2.590	2.590		
1195.000	-.----	-.----	-.----	-.----	-.----	-.----	3.387	3.387		
1200.000	1925.620	2263.853	736.764	745.096	77.835	77.835	4.238	4.238		
1205.000	-.----	-.----	-.----	-.----	-.----	-.----	5.141	5.141		
1210.000	-.----	-.----	-.----	-.----	83.090	83.090	6.095	6.095		
1215.000	-.----	-.----	-.----	-.----	-.----	-.----	7.097	7.097		
1220.000	-.----	-.----	-.----	-.----	88.376	88.376	8.146	8.146		
1225.000	-.----	-.----	-.----	-.----	-.----	-.----	9.239	9.239		
1230.000	-.----	-.----	-.----	-.----	93.686	93.686	10.375	10.375		
1235.000	-.----	-.----	-.----	-.----	-.----	-.----	11.552	11.552		
1240.000	-.----	-.----	-.----	-.----	99.011	99.011	12.769	12.769		
1250.000	1926.718	2309.372	768.901	782.764	104.346	104.346	15.313	15.313		
1260.000	-.----	-.----	-.----	-.----	109.685	109.685	17.997	17.997		
1270.000	-.----	-.----	-.----	-.----	115.021	115.021	20.808	20.808		
1280.000	-.----	-.----	-.----	-.----	120.349	120.349	23.735	23.735		
1290.000	-.----	-.----	-.----	-.----	125.665	125.665	26.768	26.768		
1300.000	1924.895	2352.251	796.797	817.565	130.964	130.964	29.897	29.897		
1310.000	-.----	-.----	-.----	-.----	-.----	-.----	33.114	33.114		
1320.000	-.----	-.----	-.----	-.----	-.----	-.----	36.410	36.410		
1330.000	-.----	-.----	-.----	-.----	-.----	-.----	39.776	39.776		

Pa, Protactinium

A = 231.036

Z=91

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										T _d	
Displacement		T _s	2T _s		4T _s	5T _s					
Energy(eV)=		4.769	9.538		19.076	23.845					
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	
1340.000	-.----	-.----	-.----	-.----	-.----	-.----	43.205	43.205			
1350.000	1920.687	2392.797	820.903	849.855	157.070	157.070	46.691	46.691			
1360.000	-.----	-.----	-.----	-.----	-.----	-.----	50.227	50.227			
1370.000	-.----	-.----	-.----	-.----	-.----	-.----	53.806	53.806			
1380.000	-.----	-.----	-.----	-.----	-.----	-.----	57.423	57.423			
1390.000	-.----	-.----	-.----	-.----	-.----	-.----	61.072	61.072			
1400.000	1914.541	2431.271	841.637	879.933	182.258	182.258	64.749	64.749			
1410.000	-.----	-.----	-.----	-.----	-.----	-.----	68.448	68.448			
1420.000	-.----	-.----	-.----	-.----	-.----	-.----	72.165	72.165			
1430.000	-.----	-.----	-.----	-.----	-.----	-.----	75.896	75.896			
1440.000	-.----	-.----	-.----	-.----	-.----	-.----	79.637	79.637			
1450.000	1906.826	2467.892	859.375	908.054	206.268	206.268	83.385	83.385			
1460.000	-.----	-.----	-.----	-.----	-.----	-.----	87.135	87.135			
1470.000	-.----	-.----	-.----	-.----	-.----	-.----	90.885	90.885			
1480.000	-.----	-.----	-.----	-.----	-.----	-.----	94.632	94.632			
1490.000	-.----	-.----	-.----	-.----	-.----	-.----	98.373	98.373			
1500.000	1897.851	2502.848	874.457	934.433	228.949	228.949	102.106	102.106			

U, Uranium

A = 238.029

Z = 92

Displacement		Surface Sputtering Regime		Bulk Displacement Regime		Displacement Regime				T _d
Energy(eV)=	T _s		2T _s		4T _s		5T _s			
	5.460		10.920		21.840		27.300			
Accel. Voltage (kV)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)	Cross-section (barns)	Cascade CS (barns)
419.700	0.000	0.000	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
420.000	1.360	1.360	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
421.000	6.001	6.001	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
422.000	10.652	10.652	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
423.000	15.314	15.314	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
424.000	19.987	19.987	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
425.000	24.670	24.670	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
426.000	29.362	29.362	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
427.000	34.063	34.063	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
428.000	38.773	38.773	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
429.000	43.492	43.492	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
430.000	48.218	48.218	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
435.000	71.960	71.960	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
440.000	95.852	95.852	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
445.000	119.854	119.854	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
450.000	143.929	143.929	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
455.000	168.043	168.043	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
460.000	192.165	192.165	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
465.000	216.265	216.265	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
470.000	240.317	240.317	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
475.000	264.295	264.295	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
480.000	288.179	288.179	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
490.000	335.578	335.578	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
500.000	382.370	382.370	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
510.000	428.434	428.434	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
520.000	473.672	473.672	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
530.000	518.005	518.005	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
540.000	561.369	561.369	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
550.000	603.715	603.715	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
560.000	645.004	645.004	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
570.000	685.210	685.210	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
580.000	724.315	724.315	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
590.000	762.308	762.308	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
600.000	799.184	799.184	-.---	-.---	-.---	-.---	-.---	-.---	-.---	
610.000	834.946	834.946	-.---	-.---	-.---	-.---	-.---	-.---	-.---	

U, Uranium

A=238.029

Z=92

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement	T_s		$2T_s$		$4T_s$		$5T_s$		T_d	
Energy(eV)=	5.460		10.920		21.840		27.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
620.000	869.598	869.598	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
630.000	903.152	903.152	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
640.000	935.619	935.619	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
650.000	967.016	967.016	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
660.000	997.360	997.360	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
670.000	1026.672	1026.672	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
680.000	1054.972	1054.972	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
690.000	1082.284	1082.284	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
700.000	1108.629	1108.629	-.----	-.----	-.----	-.----	-.----	-.----	-.----	-.----
701.970	-.----	-.----	0.000	0.000	-.----	-.----	-.----	-.----	-.----	-.----
702.000	-.----	-.----	0.021	0.021	-.----	-.----	-.----	-.----	-.----	-.----
703.000	-.----	-.----	0.785	0.785	-.----	-.----	-.----	-.----	-.----	-.----
704.000	-.----	-.----	1.559	1.559	-.----	-.----	-.----	-.----	-.----	-.----
705.000	-.----	-.----	2.343	2.343	-.----	-.----	-.----	-.----	-.----	-.----
706.000	-.----	-.----	3.136	3.136	-.----	-.----	-.----	-.----	-.----	-.----
707.000	-.----	-.----	3.938	3.938	-.----	-.----	-.----	-.----	-.----	-.----
708.000	-.----	-.----	4.751	4.751	-.----	-.----	-.----	-.----	-.----	-.----
709.000	-.----	-.----	5.572	5.572	-.----	-.----	-.----	-.----	-.----	-.----
710.000	-.----	-.----	6.402	6.402	-.----	-.----	-.----	-.----	-.----	-.----
715.000	-.----	-.----	10.687	10.687	-.----	-.----	-.----	-.----	-.----	-.----
720.000	-.----	-.----	15.182	15.182	-.----	-.----	-.----	-.----	-.----	-.----
725.000	-.----	-.----	19.875	19.875	-.----	-.----	-.----	-.----	-.----	-.----
730.000	-.----	-.----	24.751	24.751	-.----	-.----	-.----	-.----	-.----	-.----
735.000	-.----	-.----	29.798	29.798	-.----	-.----	-.----	-.----	-.----	-.----
740.000	-.----	-.----	35.006	35.006	-.----	-.----	-.----	-.----	-.----	-.----
745.000	-.----	-.----	40.361	40.361	-.----	-.----	-.----	-.----	-.----	-.----
750.000	1226.709	1228.659	45.854	45.854	-.----	-.----	-.----	-.----	-.----	-.----
755.000	-.----	-.----	51.475	51.475	-.----	-.----	-.----	-.----	-.----	-.----
760.000	-.----	-.----	57.213	57.213	-.----	-.----	-.----	-.----	-.----	-.----
770.000	-.----	-.----	69.007	69.007	-.----	-.----	-.----	-.----	-.----	-.----
780.000	-.----	-.----	81.166	81.166	-.----	-.----	-.----	-.----	-.----	-.----
790.000	-.----	-.----	93.630	93.630	-.----	-.----	-.----	-.----	-.----	-.----
800.000	1324.277	1332.893	106.343	106.343	-.----	-.----	-.----	-.----	-.----	-.----
810.000	-.----	-.----	119.254	119.254	-.----	-.----	-.----	-.----	-.----	-.----
820.000	-.----	-.----	132.317	132.317	-.----	-.----	-.----	-.----	-.----	-.----

U, Uranium

A=238.029

Z=92

Displacement Energy(eV)=	<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->								T _d	
	T _s		2T _s		4T _s		5T _s			
	5.460		10.920		21.840		27.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
830.000	-.----	-.----	145.492	145.492	-.----	-.----	-.----	-.----		
840.000	-.----	-.----	158.742	158.742	-.----	-.----	-.----	-.----		
850.000	1404.264	1424.453	172.033	172.033	-.----	-.----	-.----	-.----		
860.000	-.----	-.----	185.335	185.335	-.----	-.----	-.----	-.----		
870.000	-.----	-.----	198.623	198.623	-.----	-.----	-.----	-.----		
880.000	-.----	-.----	211.871	211.871	-.----	-.----	-.----	-.----		
890.000	-.----	-.----	225.059	225.059	-.----	-.----	-.----	-.----		
900.000	1469.326	1505.714	238.166	238.166	-.----	-.----	-.----	-.----		
910.000	-.----	-.----	251.178	251.178	-.----	-.----	-.----	-.----		
920.000	-.----	-.----	264.077	264.077	-.----	-.----	-.----	-.----		
930.000	-.----	-.----	276.851	276.851	-.----	-.----	-.----	-.----		
940.000	-.----	-.----	289.488	289.488	-.----	-.----	-.----	-.----		
950.000	1521.794	1578.509	301.977	301.977	-.----	-.----	-.----	-.----		
960.000	-.----	-.----	314.311	314.311	-.----	-.----	-.----	-.----		
970.000	-.----	-.----	326.479	326.479	-.----	-.----	-.----	-.----		
980.000	-.----	-.----	338.477	338.477	-.----	-.----	-.----	-.----		
990.000	-.----	-.----	350.299	350.299	-.----	-.----	-.----	-.----		
1000.000	1563.668	1644.270	361.938	361.938	-.----	-.----	-.----	-.----		
1050.000	1596.651	1704.130	417.293	417.293	-.----	-.----	-.----	-.----		
1100.000	1622.179	1758.993	467.764	467.764	-.----	-.----	-.----	-.----		
1126.510	-.----	-.----	-.----	-.----	0.000	0.000	-.----	-.----		
1127.000	-.----	-.----	-.----	-.----	0.062	0.062	-.----	-.----		
1128.000	-.----	-.----	-.----	-.----	0.193	0.193	-.----	-.----		
1129.000	-.----	-.----	-.----	-.----	0.328	0.328	-.----	-.----		
1130.000	-.----	-.----	-.----	-.----	0.465	0.465	-.----	-.----		
1135.000	-.----	-.----	-.----	-.----	1.198	1.198	-.----	-.----		
1140.000	-.----	-.----	-.----	-.----	2.003	2.003	-.----	-.----		
1145.000	-.----	-.----	-.----	-.----	2.878	2.878	-.----	-.----		
1150.000	1641.463	1809.587	513.360	513.415	3.819	3.819	-.----	-.----		
1155.000	-.----	-.----	-.----	-.----	4.826	4.826	-.----	-.----		
1160.000	-.----	-.----	-.----	-.----	5.894	5.894	-.----	-.----		
1165.000	-.----	-.----	-.----	-.----	7.021	7.021	-.----	-.----		
1170.000	-.----	-.----	-.----	-.----	8.206	8.206	-.----	-.----		
1175.000	-.----	-.----	-.----	-.----	9.444	9.444	-.----	-.----		
1180.000	-.----	-.----	-.----	-.----	10.735	10.735	-.----	-.----		

U, Uranium

A = 238.029

Z = 92

<div> <div> <-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime-----> </div> <div> Displacement Energy(eV)= T_s 2T_s 4T_s 5T_s T_d </div> </div>										
<div> <div> 5.460 10.920 21.840 27.300 </div> <div> Accel. Voltage (kV) Cross-section (barns) Cascade CS (barns) Cross-section (barns) Cascade CS (barns) Cross-section (barns) Cascade CS (barns) Cross-section (barns) Cascade CS (barns) Cross-section (barns) Cascade CS (barns) </div> </div>										
1190.000	-----	-----	-----	-----	13.466	13.466	-----	-----		
1200.000	1655.520	1856.506	554.262	554.934	16.380	16.380	-----	-----		
1210.000	-----	-----	-----	-----	19.462	19.462	-----	-----		
1220.000	-----	-----	-----	-----	22.698	22.698	-----	-----		
1230.000	-----	-----	-----	-----	26.073	26.073	-----	-----		
1240.000	-----	-----	-----	-----	29.575	29.575	-----	-----		
1250.000	1665.201	1900.238	590.744	592.919	33.192	33.192	-----	-----		
1260.000	-----	-----	-----	-----	36.913	36.913	-----	-----		
1270.000	-----	-----	-----	-----	40.726	40.726	-----	-----		
1280.000	-----	-----	-----	-----	44.623	44.623	-----	-----		
1290.000	-----	-----	-----	-----	48.593	48.593	-----	-----		
1300.000	1671.225	1941.187	623.129	627.832	52.629	52.629	-----	-----		
1301.880	-----	-----	-----	-----	-----	-----	0.000	0.000		
1302.000	-----	-----	-----	-----	-----	-----	0.008	0.008		
1303.000	-----	-----	-----	-----	-----	-----	0.082	0.082		
1304.000	-----	-----	-----	-----	-----	-----	0.159	0.159		
1305.000	-----	-----	-----	-----	-----	-----	0.237	0.237		
1306.000	-----	-----	-----	-----	-----	-----	0.317	0.317		
1307.000	-----	-----	-----	-----	-----	-----	0.399	0.399		
1308.000	-----	-----	-----	-----	-----	-----	0.483	0.483		
1309.000	-----	-----	-----	-----	-----	-----	0.569	0.569		
1310.000	-----	-----	-----	-----	56.722	56.722	0.657	0.657		
1315.000	-----	-----	-----	-----	-----	-----	1.126	1.126		
1320.000	-----	-----	-----	-----	60.865	60.865	1.642	1.642		
1325.000	-----	-----	-----	-----	-----	-----	2.203	2.203		
1330.000	-----	-----	-----	-----	65.050	65.050	2.807	2.807		
1335.000	-----	-----	-----	-----	-----	-----	3.454	3.454		
1340.000	-----	-----	-----	-----	69.270	69.270	4.142	4.142		
1345.000	-----	-----	-----	-----	-----	-----	4.869	4.869		
1350.000	1674.193	1979.690	651.754	660.058	73.521	73.521	5.634	5.634		
1355.000	-----	-----	-----	-----	-----	-----	6.435	6.435		
1360.000	-----	-----	-----	-----	77.796	77.796	7.272	7.272		
1370.000	-----	-----	-----	-----	82.089	82.089	9.045	9.045		
1380.000	-----	-----	-----	-----	86.396	86.396	10.945	10.945		
1390.000	-----	-----	-----	-----	90.712	90.712	12.961	12.961		

U, Uranium

A = 238.029

Z = 92

<-----Surface Sputtering Regime-----> <-----Bulk Displacement Regime----->										
Displacement		T _s	2T _s		4T _s		5T _s		T _d	
Energy(eV)=		5.460	10.920		21.840		27.300			
Accel. Voltage (kV)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)	Cross- section (barns)	Cascade CS (barns)
1400.000	1674.614	2016.031	676.955	689.923	95.032	95.032	15.085	15.085		
1410.000	-.----	-.----	-.----	-.----	-.----	-.----	17.309	17.309		
1420.000	-.----	-.----	-.----	-.----	-.----	-.----	19.625	19.625		
1430.000	-.----	-.----	-.----	-.----	-.----	-.----	22.025	22.025		
1440.000	-.----	-.----	-.----	-.----	-.----	-.----	24.503	24.503		
1450.000	1672.913	2050.449	699.054	717.705	116.568	116.568	27.051	27.051		
1460.000	-.----	-.----	-.----	-.----	-.----	-.----	29.665	29.665		
1470.000	-.----	-.----	-.----	-.----	-.----	-.----	32.338	32.338		
1480.000	-.----	-.----	-.----	-.----	-.----	-.----	35.064	35.064		
1490.000	-.----	-.----	-.----	-.----	-.----	-.----	37.839	37.839		
1500.000	1669.451	2083.149	718.355	743.640	137.716	137.716	40.657	40.657		

Distribution for ANL-88-48

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