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DT FUSION NEUTRON IRRADIATION OF LLL STAINLESS STEEL TENSILE SPECIMENS - February 23, 1978

Susan C. MacLean

May 17, 1978

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ABSTRACT

The DT fusion neutron irradiation of nine LLL stainless steel tensile specimens is described. The sample position, beam-on time and dose record are given. The maximum neutron fluence on any sample was 2.20×10^{17} neutrons/cm².

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Drs. Richard R. Vandervoort and Alfred Goldberg reserved the LLL Rotating Target Neutron Source (RTNS) beginning November 7, 1977 in order to irradiate nine stainless steel (vim var) tensile specimens.

The samples measured approximately 28.6 mm long, 9.5 mm wide and 0.5 mm thick, with gauge sections about 6 mm long and 1.6 mm wide. The tensile specimens were stacked in an epoxy-fiberglass laminate sample holder with niobium dosimetry foils of the same size and shape but only 0.14 mm thick. The order of stacking was as follows:

Nb-1015

Front mylar-0.18 mm thick

Nb-1005

S.S.-40

Nb-1006

S.S.-41

Nb-1007

S.S.-42

Nb-1008

S.S.-43

Nb-1009

S.S.-44

Nb-1010

S.S.-45

Nb-1011

S.S.-46

Nb-1012

S.S.-47

Nb-1013

S.S.-48

Nb-1014

Back mylar-0.18 mm thick

Nb-1016

Two niobium dosimetry foils (1015 and 1016) were centered on the outside of the sample package as indicated. This was in anticipation of the need to move the package to change the rotating target. The outside foils were replaced with new ones when the samples were moved on November 14, 1977 and November 28, 1977.

The neutron irradiation was carried out November 7 to 30, 1977. Neutron production was monitored continuously with a proton recoil counter and recorded each hour. The dose record is attached. The total beam-on time was 153.2 hours.

Following the irradiation the sample package was stored for a few weeks to allow short lived isotopes to decay. Then the stainless steel tensile specimens were returned to R. Vandervoort and A. Goldberg. The dosimetry foils were cut and weighed so that only the gauge sections were used for gamma ray counting. These were delivered to Ruth Anderson in the LLL Nuclear Chemistry Division where she carried out the counting.

The average fluence of each dosimetry foil was calculated using the method described in UCRL-51393, Rev. 1. However, the cross section used for the activation of the 10.16 day isomer of niobium by 14.8 MeV neutrons was changed to 463 millibarns (UCRL-80097). The proton recoil count for the entire run was adjusted using the outside foil fluences for the change in sample position. The results were as follows:

<u>Dosimetry Foil</u>	<u>Fluence (neutrons/cm²)</u>
November 7-11, 1977	
Nb-1015	1.19×10^{17}
Nb-1016	2.45×10^{16}
November 14-23, 1977	
Nb-1017	1.07×10^{17}
Nb-1018	2.92×10^{16}
November 28-30, 1977	
Nb-1019	3.06×10^{16}
Nb-1020	7.89×10^{15}
November 7-30, 1977	
Nb-1005	2.20×10^{17}
Nb-1006	1.82×10^{17}
Nb-1007	1.59×10^{17}

Dosimetry FoilFluence (neutrons/cm²)

Nb-1008	1.38×10^{17}
Nb-1009	1.21×10^{17}
Nb-1010	1.08×10^{17}
Nb-1011	9.58×10^{16}
Nb-1012	8.74×10^{16}
Nb-1013	7.65×10^{16}
Nb-1014	6.90×10^{16}

The estimated overall uncertainty of these results is $\pm 7.5\%$. The relative uncertainty between any two values is about $\pm 2\%$. The fluences given here represent average fluences over the volume of each dosimetry foil.

RTNS IRRADIATION OF DECEMBER 5 TO 16, 1977

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