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LINEAR ACCELERATOR PROJECT

AEC Contract No. AT(11-1)-3058

PROGRESS REPORT

for

January 1, 1974 - March 31, 1974

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TABLE OF CONTENTS

	Page
<u>NEUTRON CROSS SECTIONS</u>	1
KEV NEUTRON CAPTURE CROSS SECTION OF ^{242}Pu - A. J. Sanislo, N. N. Kaushal and R. W. Hockenbury.....	2
Figures	2
CAPTURE AND TOTAL CROSS-SECTION MEASUREMENTS ON $^{54,58}\text{Fe}$ AND ^{61}Ni - M. Pandey, N. N. Kaushal, J. Garg, H. D. Knox, R. C. Block and R. W. Hockenbury.....	5
Figures	5
KEV NEUTRON CAPTURE CROSS SECTION OF ^{105}Pd , ^{151}Eu AND ^{153}Eu - H. D. Knox, R. W. Hockenbury, N. N. Kaushal and R. C. Block.....	8
<u>REACTOR PHYSICS AND ENGINEERING - THEORETICAL</u>	9
REACTOR THEORY AND ANALYSIS - M. Becker, J. Biffer, M. Danchak, S. Kang and W. R. Moyer.....	10
Table.....	11

NEUTRON CROSS SECTIONS

KEV NEUTRON CAPTURE CROSS SECTION OF ^{242}Pu

A. J. Sanislo,* N. N. Kaushal and R. W. Hockenbury

The high-low bias data (used to separate the capture and fission contributions) have been corrected for deadtime and background effects. The blank sample data are being normalized to the foreground data in order to remove the effects of the relatively small amount of capture in the sample container.

Figures 1 and 2 show the net low and high bias data for the 800 eV and keV region, respectively. The difference in resonance structure in Fig. 1 is characteristic of a subthreshold fission cluster near 800 eV.

The relative flux data has been processed through the usual deadtime, background, path compression, airpath attenuation, and relative efficiency codes.

The next step will be to obtain an absolute normalization of the capture and fission data.

FIGURE CAPTIONS

Fig. 1 Net Low and High Bias Data for ^{242}Pu .

Fig. 2 Net Low and High Bias Data for ^{242}Pu .

*Based in part on the Master of Science Thesis of A. J. Sanislo.

Figure 1

Figure 2

CAPTURE AND TOTAL CROSS-SECTION MEASUREMENTS ON $^{54,58}\text{Fe}$ AND ^{61}Ni

M. Pandey,^{*} N. N. Kaushal, J. Garg,[#] H. D. Knox,⁺
 R. C. Block[‡] and R. W. Hockenbury

High resolution transmission measurements were made on ^{54}Fe and ^{61}Ni from about 15 keV to 100 keV. A channel width of 8 ns and a linac pulse width of 11 ns were used; with a $^{10}\text{B-NaI}$ detector at 28 m. The transmission of a ^{58}Fe sample was measured with a time channel of 31.25 ns since the level spacing is such that the higher resolution was unnecessary.

The capture and transmission data are being processed for deadtime and background corrections. Net counts vs energy are shown in Figs. 1 and 2 for ^{54}Fe and ^{61}Ni , respectively.

FIGURE CAPTIONS

Fig. 1 Net Capture Counts for ^{54}Fe .

Fig. 2 Net Capture Counts for ^{61}Ni .

^{*}Based in part on the Ph.D. Thesis of M. Pandey, State University of New York at Albany.

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⁺Now at Texas A&M University, College Station, Texas.

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Figure 1

Figure 2

KEV NEUTRON CAPTURE CROSS SECTION OF ^{105}Pd , ^{151}Eu AND ^{153}Eu
H. D. Knox,^{*} R. W. Hockenbury, N. N. Kaushal and R. C. Block⁺

The capture analysis has been checked from raw data to relative capture yields. Multiple scattering corrections have been made to some low energy resonances using a Monte Carlo code. These calculations are still in progress.

A comparison of our ^{151}Eu capture results in the keV region to those of Czirr¹ shows good agreement with the exception of the region near 4 keV where our data are lower.

REFERENCE:

1. J. B. Czirr, UCRL-50804.

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REACTOR PHYSICS AND ENGINEERING - THEORETICAL

REACTOR THEORY AND ANALYSIS

M. Becker, J. Biffer,^{*} M. Danchak,[#]
S. Kang[#] and W. R. Moyer

Effort has been spent in both completing technical objectives and in documenting technical results. In the specific technical objectives, the following has transpired --

(1) Continued review of experiment-theory comparison with depleted uranium indicates that the unresolved capture in ENDF/B-III is preferable to that in earlier files. Variation in the self-shielded capture cross sections among the files is indicated in Table 1. It may be seen that the ENDF/B-III data tend to be lower than those of the earlier ENDF/B files and to be similar to an ANL file used early in our studies. The current magnitude of unresolved capture appears to be about right. The low-energy calculated and measured spectral shapes in reasonably good agreement, indicating an appropriate level of attenuation.

(2) The Rensselaer Interactive Graphics System, while not yet fully developed, has come far enough along to get some preliminary usage. To date, experience with interactively modifying continuous slowing down parameters to bring analysis and measurement into better agreement has been encouraging. We are optimistic about the potential for the interactive approach to facilitate sensitivity and survey analyses.

(3) The basic feasibility objective of the continuous slowing down integral transport approach to space-dependent spectra has been achieved. The approach appears to be viable based on applications in single-region and two-region applications. The equations have now been reformulated to improve computational efficiency, in preparation for phasing into the anticipated applications to fast reactor problems in the coming fiscal year.

(4) The time-dependent slowing down and transport effort is now in its final stage. The fertile material option has been applied to depleted uranium, and the agreement and disagreement

^{*}Based in part on the Master of Engineering Thesis of J. Biffer.

[#]Based in part on the Ph.D. Theses of M. Danchak and S. Kang.

with preliminary measurements are felt to be understood. An approach to slowing down theory based on polynomial flux interpolation has been introduced, which is particularly efficient in single materials. This approach is being utilized to analyze slowing down in lead, one of the more difficult materials to treat.

(5) In the last report, we indicated how conventional group-constant methods could lead to difficulty when sharp cross-section fluctuations occur. Some potential alternative approaches which account for the influence of leakage have been identified and are under consideration.

Documentation has been proceeding through preparation of papers describing program accomplishments. Both comprehensive papers and brief notes on specialized topics are involved.

Table 1
Unresolved Self-Shielded Capture in Uranium-Selected Groups

Lower Energy (keV)	Data Files				
	ENDF/B I	ENDF/B II	ENDF/B III ^a	ENDF/B III ^b	Early ANL File ^c
46.31	.3291	.3437	.3381	.3378	.3150
31.83	.4050	.4114	.3911	.3901	.3994
19.31	.4841	.4863	.4591	.4574	.4691
13.27	.5542	.5695	.5312	.5309	.5095
10.33	.5846	.5931	.5479	.5468	.5378

a. Processed with SUPERTOG at ORNL. Results transmitted by R. Q. Wright.

b. Processed with MC²-II at ANL. Results transmitted by H. Henryson II.

c. Processed with MC². Results transmitted by A. Travelli.