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INDC INTERNATIONAL NUCLEAR DATA COMMITTEE

NUCLEAR DATA PROGRAM AT THE INSTITUTE FOR EXPERIMENTAL PHYSICS, UNIVERSITY OF DEBRECEN, HUNGARY

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IAEA NUCLEAR DATA SECTION, KÄRNTNER RING 11, A-1010 VIENNA

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Before describing the experimental work of our laboratory and the plans for the future some general remarks should be done concerning the present status of fast neutron data.

During the past year we made a compilation of neutron reaction cross sections /published in Atomic Energy Review, IAEA, Vol. VII. /1969/ 93/ and total cross section data around 14 MeV. The spread in the total cross section data measured by different authors is approximately consistent with the given errors. There are no data for the following elements: Ru, Rh, Po, At, Rn, Fr, Ra, Ac, Pa, and for most of the isotopes. The spread in the reaction cross section data measured in different laboratories is much larger than the given errors. This problem and the sources of the inconsistencies are discussed in the above mentioned paper. At present, cross section values are known for about 30 % of neutron reactions.

The spread in the data is caused mainly by the different experimental circumstances. Therefore it would be profitable to recommend standardized conditions for the irradiations and activity measurements, and to organize a group of specialists from different countries under the auspices of the Agency. This group could develop the best methods for the cross section measurements at an institute which has the necessary equipments and experiences in this line. An other possibility would be to organize a close cooperation between institutes that have traditions and current work for neutron data measurements. First, this group should select a few standard reactions and determine their cross sections at well defined and reproducible circumstances. These cross sections would be recommended as international standards for relative measurements. Second, the need for neutron data in fields of basic and applied sciences suggests to repeat and complete the cross section measurements of high reliability and resonable accuracy.

Experimental facilities.

The Institute has a home made neutron generator of 200 KeV, an other lent by the Agency in connection with a research contract and an open air type Van de Graaff generator of 700 KeV. The neutron generators are equipped by a.p.m. systems for ^{3}He and ^{4}He and also with a pneumatic line for quick sample transfer. As measuring instruments we have a 4000 ch. DIDAC analyser, two 128 ch. analyzers, a 28 cm³ Ge/Li/ detector, $^{6}LiJ/Eu/$ crystal, ^{3}He proportional counters and the usual GM, Si/Li/ and scintillation detectors with the necessary electronics. The Institute has good results in development and application of solid state track detectors. For data handling we can use the University's computer.

Results in the past year and plans for the future.

a./ Total neutron cross sections have been measured at 14 MeV for the following elements: Be, B, C, N, O, F, Na, Mg, Al, Si, P, S, Cl, A, K, Ca, Mn, Fe, Co, Ni, Cu, Zn, Ga, Ga, Ge, Rb, Te, I, Cs, Ce, Pb, Bi. The aim of this investigation was to search for the possible fine trends or systematic behaviour in the cross sections. In addition to the experimental work a survey of literature data was performed and using a statistical treatment, the most probable mean values and their errors were determined.

b./ Measurements are in progress on angular distributions of fission fragments from ^{232}Th and ^{238}U at 14 MeV using solid state track detectors. For the same samples gamma-spectra of the fission fragments were taken by a Ge/Li/ detector. The analysis of these spectra give information on the mass distribution of fragments and we also hope to find characteristic lines for identification of fissionable nuclei.

Equipments for the measurements of delayed neutron spectra and delayed neutron-gamma coincidences have been developed using the $^{6}LiJ/Eu/$, ^{3}He and Ge/Li/ spectrometers. Preliminary measurements are in progress.

c./ Measurements on inelastic scattering cross section for ^{115}In isomeric state have been finished using a Ge/Li/ detector, and for ^{103}Rh and ^{135}Ba are in progress using

Si/Li/ detector. /n,p/, /n,α/ and /n,2n/ cross section measurements will be performed to decrease the lack of data, and to determine a few standard cross sections.

d./ Using the a.p.m. system, measurements on prompt gamma ray spectra from inelastic scattering of 3 MeV neutrons are planned.

The aim of this work is to determine the gamma lines and yields characteristic of isotopes for fundamental purposes and practical applications.