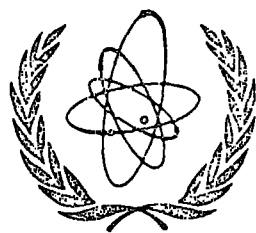


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INTERNATIONAL NUCLEAR DATA COMMITTEE

PROGRESS REPORT

BULGARIA 1970

May 1971

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

PROGRESS REPORT

Bulgaria 1970

The activities are going on at the Institute of Physics with Nuclear Research Centre, Bulgarian Academy of Sciences, Sofia

I. A group /N.Kashukeev, N.Kalinkova et al./ is developing a programme of photo-fission studies at the IRT-1000 reactor in Sofia /see Progress Report, Bulgaria 1969/. Test results on correlation measurements of energy, mass and angular fission fragment distributions after neutron irradiation have been obtained. A double pulse ionization chamber with grids and electronic collimation has been applied. Minsk-2 electronic computer data processing has been used.

The energy distribution results are the following ones:

	Time-of-flight method	Present experiment
Light fragment energy	99.4 ± 1.0 MeV	100.14 MeV
Heavy fragment energy	68.2 ± 0.7 MeV	69.64 MeV
Width at $I/2h$, L	13.8 MeV	12 MeV
Width at $I/2h$, H	20 MeV	19 MeV
Ratio of most probable energies	1.46	1.46

The total kinetic energy distributions of fission fragments for all fragment masses and fixed mass ratios m_1/m_2 have been obtained. The average total kinetic energy for all m_1/m_2 is 168.5 MeV, distribution width - 26 MeV. The total kinetic energy decrease in the symmetric fission region is estimated to 21.5 MeV.

The most probable mass ratio $m_1/m_2 = 1.48$. The min/max ratio in the mass distribution has an order of magnitude 1/400.

The fragment ranges for Ar + 4% CO₂ and Ar + 4% CH₄ have been studied. The angular distribution has been found to be isotropic, which is a check for angular distribution measurement possibilities.

2. A group /V.Hristov, A.Stanolov, L.Alexandrov/ continues its investigations on neutron diffusion and thermalization in heterogeneous water lattices by pulse methods, using a fast chopper at the IRT-1000 reactor in Sofia.

Several series of experiments on thermal neutron heterogeneous absorption by non-stationary diffusion /parameters D and C/ have been performed, and the data are under processing. The purpose is to verify recent theoretical results by Kazarnovsky, Ilieva /Institute of Physics, USSR Academy of Sciences, Moscow, to be published/. Cubic light water lattices with a geometric parameter $B^2 = 0.0695 - 0.3965 \text{ cm}^{-2}$ have been used, containing cylindrical aluminium tubes /lattice spacing 1.8 cm, tube radius 0.5 cm/ with water solution of H_3BO_3 , $\Sigma_a \approx 0.2 \text{ cm}^{-1}$.

Experiments on the dependence of neutron temperature on B^2 , and experiments on M_2 /thermalization parameter/ by the moderator poisoning method with a non- I/V absorber are under preparation.

3. A group /N.Antonov, D.Damianov, V.Hristov, T.Troshev/ has performed experiments on two-group fast neutron diffusion parameters for a heterogeneous water medium with empty cylindrical tubes /lattice spacing 1.8 cm, tube radius = 0.5 cm and ratio of tube to water volumes $p = 0.3198$ / at the IRT-1000 reactor in Sofia.

The first group relaxation lengths $\lambda_{||}, \lambda_{\perp}$ have been determined by the removal cross-section method. The second group coefficients $L_{||}^2/L_o^2, L_{\perp}^2/L_o^2$ and the coefficient of anisotropy $L_{||}^2/L_{\perp}^2$ have been obtained by the exponential method.

The results are as follows:

	Experiment	Theory /Behrens/
3 MeV < E	$\lambda_{ }$ 16.75 cm	-
	λ_{\perp} 16.75 cm	-
	$\bar{\lambda}$ 16.75 cm	14.18 cm
	$L_{ }^2 / L_o^2$ 2.16	1.95
1.44 eV < E < 3 MeV	L_{\perp}^2 / L_o^2 1.79	1.79
	$L_{ }^2 / L_{\perp}^2$ 1.20	1.09

compared with the theory by Behrens D.I. /Proc.Phys.Soc.A62,607,1949/.

One observes that the $\lambda_{||} \approx \lambda_{\perp}$ measured values are slightly higher than the calculated homogeneous value $\bar{\lambda}$. This could be explained as a diffusion prolongation according to the theory of Behrens. One also observes that the $L_{||}^2 / L_o^2$ value/ and accordingly $L_{||}^2 / L_{\perp}^2 /$ is slightly higher than the calculated one. The measured and calculated L_{\perp}^2 / L_o^2 values coincide.

4. A group /Z.Zhelev et al./ is working on decay properties and level schemes of neutron deficient isotopes obtained on a 660-MeV proton accelerator /in Dubna/.

5. A group /E.Nadjakov et al./ is working on decay properties and level schemes of neutron deficient isotopes obtained on heavy ion accelerators /U-300 and U-200 in Dubna/.

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