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PHYSICS

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Fig. 1

Figure 1: Fig. 1

Abstract**Full Text**

PHYSICS

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FISSION CROSS SECTIONS OF Pa^{231} AND Pu^{239} BY NEUTRONS IN THE ENERGY INTERVAL $1.5 \div 1500$ keV*(Presented by Academician A. P. Aleksandrov, April 7, 1964)*

For a number of fissioning nuclei (such as Th^{230} , Th^{232} , U^{234}) ⁽¹⁾, significant irregularities were found in the behavior of the fission cross section as a function of neutron energy near the fission threshold. For odd-even nuclei Np^{237} , Am^{241} , a smooth increase of the fission cross section is observed as the neutron energy increases, and no appreciable irregularities are present. It seemed of interest to us to determine whether the absence of irregularities is characteristic of all odd-even nuclei. To this end we studied the behavior of the fission cross section of the odd-even nucleus Pa^{231} . Measurements of the fission cross section of Pa^{231} were carried out by us in the neutron-energy interval 140-1740 keV. Along with these measurements, we also carried out measurements of the fission cross section of Pu^{239} in the neutron-energy interval $1.5 \div 1250$ keV.

The measurements were performed on an electrostatic accelerator. The experimental method is analogous to that described earlier ⁽²⁾.

Fig. 1

Figures 1 and 2 show the fission cross sections of Pa^{231} and Pu^{239} obtained by us. The errors in determining the relative behavior of the fission cross section are also shown there. The absolute value of the fission cross section was determined, in the case of Pa^{231} , with an accuracy of 15%, and in the case of Pu^{239} , 10%.

The neutron-energy dispersion in measuring the fission cross section of Pa^{231} was ± 20 keV; in measuring the fission cross section of Pu^{239} it was $\pm 20 \div 30$ keV at neutron energies ≥ 200 keV, while at neutron energies of 100, 30, 6, and 1.6 keV it was respectively 10, 8, 3, and 0.8 keV.

The results we obtained for Pu^{239} , within the limits of measurement errors, agree with the results of other authors ⁽³⁾.

Fig. 2

Figure 2: Fig. 2

The measurements we carried out indicate a substantial difference between the behavior of the fission cross section of Pa^{231} and the behavior of the cross sections of Np^{237} and Am^{241} .

In the behavior of the fission cross section of Pa^{231} , three maxima were found at neutron energies of 330, 550, and 880 keV (which had not been observed by other authors ⁽³⁾).

Fig. 2

The considerable decreases in the fission cross section of Pa^{231} following these maxima are apparently caused by competition from newly opening channels of inelastic neutron scattering. However, identification of these channels proves difficult, since the positions and characteristics of the corresponding excitation levels of Pa^{231} have not been studied sufficiently.

Thus, the results of our measurements show that irregularities in the behavior of the fission cross section are also observed in odd-even nuclei.

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CITED LITERATURE

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2. G. V. Gorlov, B. M. Gokhberg et al., *Atomic Energy*, **6**, issue 4, 453 (1959); B. M. Gokhberg, G. A. Otroshchenko, V. A. Shigin, *DAN*, **128**, No. 5, 911 (1959).
3. D. J. Hughes, R. B. Schwartz, *Neutron Cross Sections*, N. Y.—London, 1958.

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