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The $^{241}Am(n,\gamma)$ reaction leading to the spontaneously fissioning ^{242}Am isomer ($T_{1/2}$ = 0.014 sec) was studied in the neutron energy range 0.2 - 7.0 MeV /1/. The neutrons were obtained from the $^{7}Li(p,n)^{7}Be$ reaction by the irradiation of metal lithium with proton beam from the cyclotron of the Institute of Atomic Physics in Bucharest.

At the ^{7}Be nuclei formation in the ground state we obtained the main neutron group with the energy E_n^0. There are also other groups corresponding to the ^{7}Be excited states (0.43 MeV and 4.54 MeV). Besides, the neutron emission in the $^{7}Li + p \rightarrow n + {}^{3}He + {}^{4}He$ reaction is possible. Thus when E_n^0 makes a few MeV, there is in the spectrum some impurity of "soft" neutrons with the energy considerably less than E_n^0. This impurity may distort the excitation function of the $^{241}Am(n,\gamma)^{242mf}Am$ reaction. The $^{7}Li(p,n)$ reaction in the used energy range is hardly investigated. Up to the proton energy E_p = 9 MeV the yield of the neutron group corresponding to the 4.54 MeV excited state of ^{7}Be has been established to be equal to ≈ 20% of the sum of two neutron groups: the ground state one and the first excited state neutron group /4/. The published data about neutron yield in the $^{7}Li(p,n\,{}^{4}He)^{3}He$ reaction /2-4/ are somewhat contradictory. In more recent R.Borcher's work /4/ (1963) there is a conclusion that the yield from this reaction makes only a small part of the main neutron group. In the work of G.F.Bogdanov et al. /2/ (1957), on the contrary, there is a statement that the neutron yield in the $^{7}Li(p, n\ ^{4}He)\ ^{8}He$ reaction is close to that of the main group. Due to this we performed a special measurements of neutron energy spectra at $E_p = 8 - 9.5$ MeV. To obtain the neutron spectra, we measured the recoil proton range in nuclear emulsions.

At calculating the spectra we took into consideration the energy dependence of the $(n - p)$ scattering reaction cross section /5/. At $E_n < 1$ MeV the used method is not reliable enough so we extrapolated the curves arbitrarily to the zero (in dotted lines). Evidentely the average energy of the main group corresponds to the proton energy (Fig.1). The width of the peak is caused by the Li target thickness (0.5 MeV), the struggling of the recoil proton range and the presence of the first excited state neutron group; the last one cannot be resolved in our experiments. The yields of the "soft" neutrons $(E_n = 0 - 3\ \mathrm{MeV})$ and of the neutrons of the main group are comparable in value. This result corraborates the conclusion made by G.F.Bogdanov et al. /2/. Thus the calculation of the "soft" neutron impurity is important at the development of the data in the neutron energy range of 5-7 MeV. Knowing the neutron spectra shapes and the excitation function of the $^{241}Am(n, \gamma)^{242mf}Am$ reaction in the neutron energy range 0.2 - 3.0 MeV we may quantitatively estimate the influence of the "soft" neutron impurity in 5 - 7 MeV range. The obtained result is represented on Fig.2, where the circles represent the cross section values after background substracting. The increase of the $^{242mf}Am$ yield, shown by the dotted line, with the increase of the proton energy is caused by the "soft" neutron impurity.

The cross section increase at the 0.2 - 1.3 MeV neutron energy is, perhaps, connected with overcoming of some potential barrier separating the ground state from the isomeric one. The further decrease of the cross section is mostly induced by the competition of the inelastic neutron scattering and fission.

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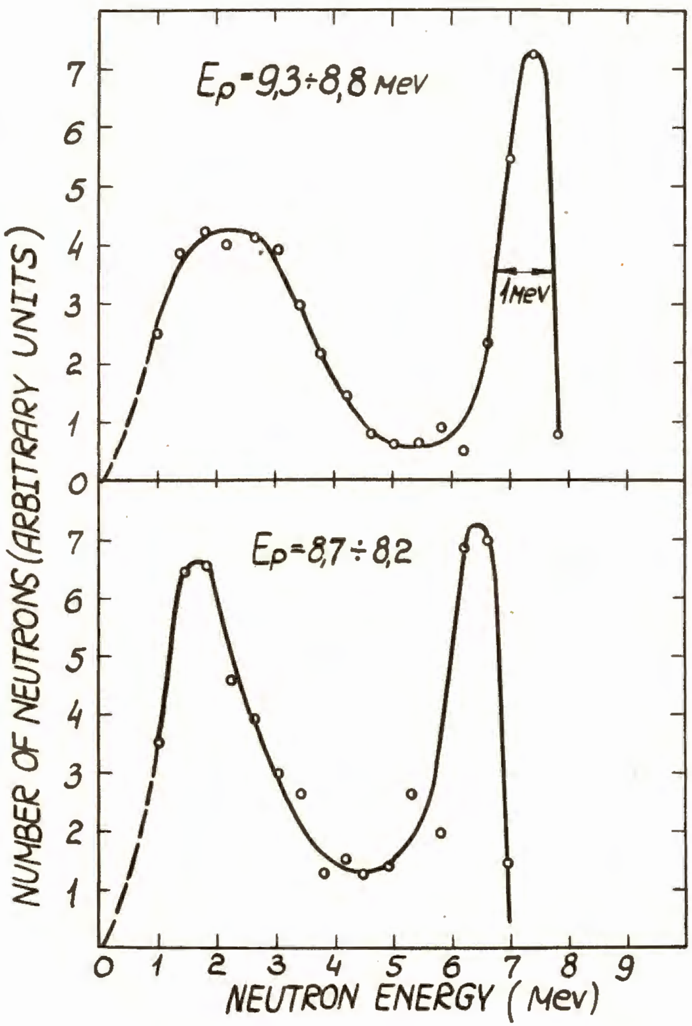

Fig.1 Neutron spectra from $Li^7(p,n)$ reaction

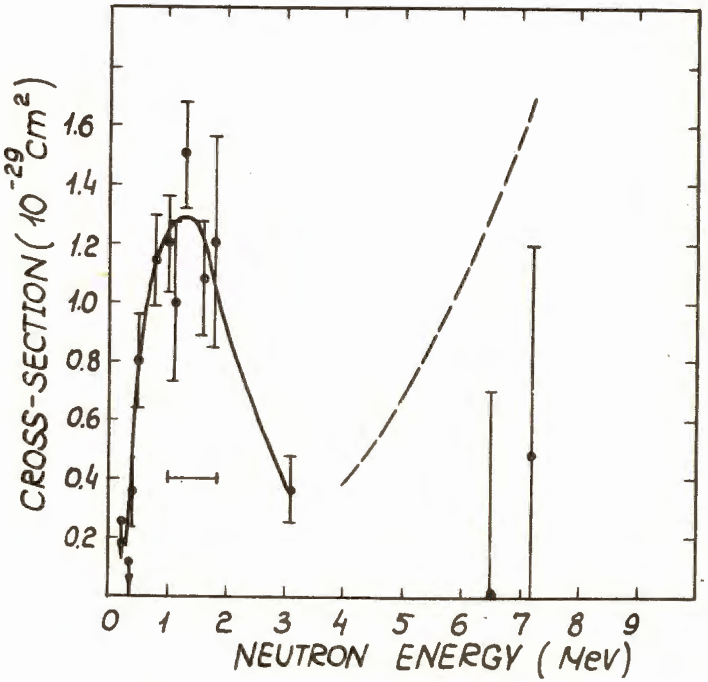

Fig.2 $^{241}Am\ (n, \gamma)^{242\ mf}Am$ reaction