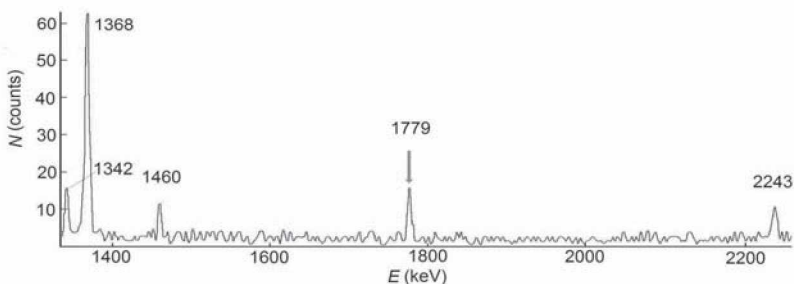


DETECTION OF LIGHT NEUTRON NUCLEI IN ALPHA-PARTICLE-INDUCED FISSION OF ^{238}U BY ACTIVATION METHOD WITH ^{27}Al

Novatsky B.G., Sakuta S.B., Stepanov D.N.
National Research Center "Kurchatov Institute", Moscow, Russia
E-mail: sbsakuta@mail.ru

Nuclear-stable multineutrons among products of the ternary fission of ^{238}U nuclei that is induced by 62-MeV alpha particles have been sought by activation method. The beta-active isotope chain $^{28}\text{Mg} \rightarrow ^{28}\text{Al} \rightarrow ^{28}\text{Si}$ was used as an indicator of neutron nuclei. The ^{28}Mg with a half-life of 20.915 h could be formed in this chain in the $^{27}\text{Al} + x\text{n} \rightarrow ^{28}\text{Mg} + (x-2)\text{np}$ process induced by multineutrons in the secondary ^{27}Al target. The gamma lines 1342 and 1779-keV (as it is shown in the Figure) accompanying the beta decay of the ^{28}Mg and ^{28}Al



nuclei, respectively, have been observed in the spectra of the irradiated ^{27}Al sample (after its preliminary diffusion cleaning from sodium) [1]. The decay time of the indicated lines is in agreement within the measurement accuracy with the known half-life of ^{28}Mg . Thus, the reported measurements confirm the results of our previous work [2], where the possible emission of multineutrons from the ternary fission of ^{238}U was established by characteristic 1384-keV gamma rays from the $^{88}\text{Sr} + x\text{n} \rightarrow (x-4)\text{n} + ^{92}\text{Sr} \rightarrow ^{92}\text{Y}$ process in the activated strontium sample. Comparison showed that the yield of ^{28}Mg in the case of the interaction of multineutrons with ^{27}Al is an order of magnitude higher than the yield of ^{92}Sr .

The results of two independent experiments indicate that nuclear-stable multineutrons (most likely, ^6_0n) are emitted from the alpha-particle-induced ternary fission of ^{238}U . In the future, we are going to improve the statistics of the measurements by increasing the intensity of the beam and irradiation time of samples.

1. B.G.Novatsky, S.B.Sakuta, D.N.Stepanov // JETP Letters. 2013. V.98. P.656.
2. B.G.Novatsky, E.Yu.Nikolsky, S.B.Sakuta, D.N.Stepanov // JETP Letters. 2012. V.96. P.280.