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

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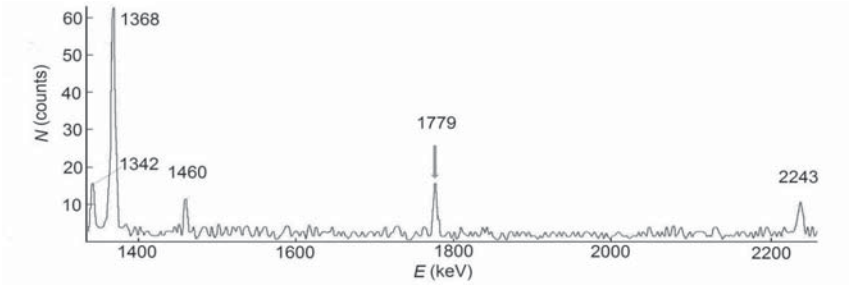
Nuclear-stable multineutrons among products of the ternary fission of ^{238}U nuclei that is induced by 62-MeV alpha particles have been sought by activation method. The beta-active isotope chain ^{28}Mg→^{28}Al→^{28}Si was used as an indicator of neutron nuclei. The ^{28}Mg with a half-life of 20.915 h could be formed in this chain in the ^{27}Al + ^{x}n → ^{28}Mg + (x–2)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 the 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}Sr + ^{x}n → (x–4)n + ^{92}Sr →^{92}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}n) 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.