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Progress in development of the γ -ray emission cross-section database for reactions with 14 MeV neutrons

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Information about the elemental composition of various objects is in demand in various industries. One way to obtain it is elemental analysis using fast or high-energy neutrons. The main advantage of this method is the high penetrating power of fast neutrons. The usage of compact D-T neutron generators with an energy of 14.1 MeV makes it possible to create compact portable setups, as well as to implement the method of tagged neutrons by detecting the accompanying alpha particle emitted in the T(D,n) α reaction.

To date, one of the main obstacles to the wide application of this technique is the lack of a relevant database on the radiation cross sections of the characteristic gamma lines from the nuclei of various elements. The currently available information is replete with inaccuracies and incomplete (Simakov S.P. et al. IAEA, 1998): the uncertainty in the emission cross section of the most intense gamma line can reach 300%, data for low-intensity (<6 mb) gamma lines are not available. A large number of chemical elements, remain unexplored.

In 2023 in FLNP JINR we have started a project dedicated to measurements of γ -ray emission cross sections and angular distributions in neutron-induced reactions for 55 elements. To date, data for 27 elements is acquired. Also software development is going on for EXFOR processing and estimation of γ -quanta emission cross-sections from already existed data.

In proposed report a review of achieved results will be presented.

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