

Intermetallic Actinides Target Approach for Intensive Heavy Ion-Beam Irradiations

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Currently, the synthesis of new superheavy elements in nuclear fusion reactions requires long-term irradiations of actinide targets with high-intensity heavy ion-beams. For more intense ion beams construction of the Superheavy Element Factory (SHE Factory) of the Flerov Laboratory of Nuclear Reactions FLNR JINR, was recently completed and now it is fully operational. Whereas more intense ion beams were developed, the improvement of target technology is of current interest. Production of thin intermetallic actinide targets (Pu, Am, Cm, Bk, Cf) is a promising way for the preparation of high-power radioactive targets. We propose the approach to the preparation of intermetallic actinide compound targets based on a combination of physical vapor deposition and molecular electroplating, followed by coupled reduction. At the first step, our goal was to predict the behavior of americium with various metals under co-heating. We made a calculation of enthalpy solutions by using the Eichler-Miedema model. Based on the obtained results, the following combinations were selected: as a metal foil (backing material) - titanium; as a diffusion layer - palladium, platinum, iridium. The first targets were prepared by using an intermetallic target approach. The plan is to test targets under the conditions of actual irradiation. The targets are going to be examined analysis before and after the irradiation by AFM, SEM, EDX, XRF, XRD analyses.

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