

Mixed Californium Electrodeposition Target Update

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Unique decay-enriched ^{251}Cf material was recovered from aged ^{252}Cf sources stored at Oak Ridge National Laboratory, purified, and electrodeposited onto thin Ti foils for use as targets in the study of $\text{Cf}+^{48}\text{Ca}$ fusion-evaporation reaction. The electrodeposition unit was designed with the assembled segment (Ti foil and frame) fitting into the side of the deposition well. Silicon gaskets were placed on both sides of the well with the front edge of the segment up against the gasket to create a liquid-tight seal. The Cf was electrodeposited using the isobutyl alcohol method, which was conducted at 0.3 mA/cm^2 for 4 hours with the voltage limited to 150 V. Twelve target segments were produced with an average areal deposition of $309\text{ }\mu\text{g/cm}^2$ of mixed Cf. The segments were shipped to the Joint Institute for Nuclear Research in Dubna, Russia, and assembled onto a target wheel. Irradiation of the target initiated in the U-400 M heavy ion cyclotron using a beam of ^{48}Ca ions on October 1, 2015. One decay chain of $^{294}\text{118}$ was observed during the first three months of irradiations. The alpha rate from target material was monitored at the final focus of the Dubna Gas Filled Recoil Separator (DGFRS) during the experiment. Alpha spectra were evaluated for each target segment on a regular basis. The stability of alpha rate over time indicated that the Cf content in the target was not changing. Typically broad alpha spectra are observed in the first measurements of the target but, after some beam dose, the spectra become narrower indicating possible burn out of organic content. Similar alpha spectra behavior was observed with the mixed ^{251}Cf targets; however, during the experiment an unexpected increase in the low-energy tail of the alpha spectra developed over time. Visual inspection of the target indicated a film covering part of the surface of the electrodeposited material. This presentation will address the current status of the investigations into the identity of the film and the remake of the mixed Cf target segments.

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