Characterization and Fabrication of Target Materials for RIB Generation.*

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This report discusses two techniques developed at the Holifield Radioactive Ion Beam Facility (HRIBF) and the Metals and Ceramics Division at ORNL and used for target material fabrication and characterization. Our method of in-house fabrication of uranium carbide targets is discussed followed by a description of a newly developed target material test stand for investigating effusive and diffusive transport processes within target materials. We have found that remarkably uniform coatings of UC_2 (1-20 μm thick) can be expeditiously formed on the microstructure of porous C matrices. This technique has been used to form UC_2 coatings on highly thermally conductive graphitic foams. Targets fabricated in this fashion have been tested under low-intensity proton bombardment and yields of selected RIB species are reported. This report also describes an off-line test stand for measuring mass transfer rates of atoms through (across) the bulk (surface) of candidate RIB target materials. Permeation rates of gases and vapors through a high temperature membrane or a small effusive channel constructed from candidate target materials are measured allowing diffusion coefficients and particle surface sticking times to be independently determined. Measurements of the interaction between F and several metal and ceramic surfaces are reported.

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