

Actinide target development for RIB production at TRIUMF's ISAC facility

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The use of actinide targets for the production of radioactive ion beams at ISOL facilities is required to provide access to nuclides of high masses and with extreme neutron-to-proton ratios. The latter, in particular, are of great interest due to the role they play in certain astrophysical processes. Such a target is being developed for use at TRIUMF's Isotope Separator and Accelerator (ISAC) facility.

The heaviest target material that can currently be used at ISAC is ^{181}Ta , producing nuclides with masses below approximately 170 at rates useful for study. To produce nuclides of higher masses heavier target materials, such as actinide compounds, are needed. Calculations using Silberberg-Tsao semiempirical cross-sections suggest that significant gains in the production yields of neutron-rich nuclides can also be achieved using such materials. At ISAC, it is proposed to use a composite target consisting of UC_2 layered onto a flexible graphite substrate. However, the use of a UC_2 target presents significant challenges in the development of target handling and radiation safety procedures to prevent the contamination of target handling areas with long-lived α -particle emitters. While many of these issues have been addressed at other laboratories, some difficulties unique to ISAC remain due to the intensity of the proton beam available from TRIUMF's main cyclotron and the existing target and ion source handling facilities.

It is planned to carry out an on-line test using a thin target and low proton beam current as a first step towards the development of actinide targets for production purposes. The progress towards this test and the outlook for future target development at ISAC will be discussed.