

Effusive Flow Characterization of Targets for RIB Generation

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Worldwide interest in the use of accelerated radioactive ion beams (RIBs) for exploring reactions important in understanding the structure of the nucleus and nuclear astrophysical phenomena has motivated the construction of facilities dedicated to their production and acceleration. Many facilities utilize the Isotope-Separator-On-Line (ISOL) method in which species of interest are generated within a solid or liquid target matrix. Experimentally useful RIBs are often difficult to generate by this technique because of the times required for diffusion from the interior of the target material, and to effusively transport the species of interest to the ion source following diffusion release in relation to the lifetime of the species of interest. Therefore, these delay times must be minimized. We developed experimental methods, based on the use of a fast valve that can be used to measure effusive flow times as short as 0.1 ms for any chemically active or inactive species through any target system, independent of size, geometry and materials of construction. In this report, we describe the effusive flow experimental arrangement and provide time spectra for noble gases through RIB production target systems.

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