Effusive-flow of Pure Elemental Species in Tubular Transport Systems: Radioactive Ion Beam Applications*

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Maximum practically achievable intensities are required for research with accelerated radioactive ion beams (RIBs). The principal means whereby short-lived radioactive species are lost between their formation and their acceleration are time delays due to diffusion from solid or liquid target materials and effusive-flow transport time to the ion source. Then, these delay times must be minimized. We developed an analytical formula that can be used to calculate characteristic effusive-flow times through tubular transport systems, independent of species, tube material, and operational temperature for entirely ideal cases. This equation permits choice of materials of construction on a relative basis that minimize the transport times, independent of transport system geometry and size.

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*Research at the Oak Ridge National Laboratory is supported by the U.S. Department of Energy under contract DE-AC05-00OR22725 with UT-Battelle, LLC.