

Glass Permeation Barrier Characterization by Mass Spectrometry[□]

E.L. Alfonso, J.S. Jaquez, and A. Nikroo

General Atomics, P.O. Box 85608, San Diego, California 92186-5608

Due to the complexity of some ICF target designs, gas-filled targets may need to be handled for a few hours to several days outside of a pressure cell before shot time. A permeation barrier layer is required to retain fuel in the targets. Sputtered glass was chosen as the permeation barrier layer due to its low hydrogen permeability at room temperature, ease of fabrication, and surface smoothness and uniformity. It is critically important to be able to measure the quality of the permeation barrier (i.e., permeability of the gases of interest) so that the target fill is assured at shot time. A mass spectrometer-based system was developed to assess the permeation barrier quality. The mass spectrometer's high sensitivity and ability to detect specific gases make it an ideal candidate to measure gas permeation through slowly-leaking ICF targets. The ion current resulting from collected gas permeating through a spherical ICF target was used to calculate the material's permeability and half-life. This novel technique is simple, non-destructive, and suitable for measuring targets with short or long half-lives, i.e., very permeable or impermeable target materials, typically in less than 30 minutes. The results acquired with the mass spectrometer measurements agreed well with those from destructive techniques.

[□]Work supported by U.S. Department of Energy under Contract No. DE-AC03-01SF22260