

**AN EXPERIMENTAL METHOD FOR MEASURING THE RESPONSE OF A
TARGET TO THE THERMAL ENVIRONMENT OF THE FUSION REACTION
CHAMBER***

M. Bobeica, R.Q. Gram, and D. R. Harding
Laboratory for Laser Energetics, University of Rochester, 250 East River Road,
Rochester, NY, 14623
mbob@lle.rochester.edu

An experiment has been designed to measure what happens to the ice layer inside an inertial fusion energy target when it is accelerated into the reactor. This experiment uses a stationary planar D₂ ice layer equipped with several diagnostics and directs a flux of high-temperature, high-velocity Xe atoms (and/or charged D atoms) at the surface. This mimics the effect of a cryogenic target moving at high velocity (up to 400 m/s) into a low-pressure, high-temperature furnace.

The change in the temperature of the ice and the extent of melting will be measured for different heat loads. The rate of condensation of xenon on the surface of the target is measured to determine the sticking and accommodation coefficients of xenon on the target, which are critical parameters for assessing the temperature profile around the target.

The experimental setup includes a cryocooler, a compound molecular pump, and an *e*-beam-heated nozzle that produces an atomic beam of xenon or a charged beam of deuterium ions. The high-temperature gas beam (2000°+ C at the target) simulates the heat flux inside the fusion chamber (10 to 20 × 10³ W/m²) at a flow rate 7.8 × 10⁻⁴ g/min, and the properties of the beam were experimentally characterized in terms of temperature distribution, beam divergence, and energy flux at the target. Reflection high-energy electron diffraction (RHEED) is used to monitor the layer growth of the Xe film on the target's surface, which gives an estimate of the heat of condensation from the Xe atoms. A different method, based on a Pt sensor placed inside the D₂ target, detects the ice/liquid fraction contacting it and can provide an estimation of the total heat flux through the target.

*This work was supported by the U.S. Department of Energy Office of Inertial Confinement Fusion under Cooperative Agreement No. DE-FC52-92SF19460, the University of Rochester, and the New York State Energy Research and Development Authority. The support of DOE does not constitute an endorsement by DOE of the views expressed in this article.