

PRODUCTION OF DEUTERIUM-TRITIUM FUEL LAYERS FOR THE NATIONAL IGNITION FACILITY

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Smooth and uniformly thick deuterium-tritium (D-T) fuel layers are required for Inertial Confinement Fusion (ICF) experiments. The National Ignition Facility (NIF) has fielded so-called layered indirect-drive targets since 2010. These layered experiments have included targets that have plastic (CH) or high-density carbon (HDC) ablators, layered keyhole targets, and a range of hohlraum sizes. All layered targets to date have used ablators with attached fill-tubes to fill the ablator while cold. Thus, the targets are filled with D-T and the layer is prepared in the NIF facility, a process that currently requires several days to produce an acceptable layer.

An overview of the D-T layering process in the NIF, including proofing and filling the target, forming the layer, adjusting low-mode symmetry, and determination of the final layer quality will be presented. Multiple attempts at forming a layer are required to achieve a layer with acceptable quality, with layers usually rejected due to multiple grain boundaries. Our efforts to improve layer outcome have been focused on preserving single seed crystals in order to minimize the roughness due to grain boundaries. Typical NIF layered targets require approximately 7 days from target install until shot to produce a layer with acceptable surface roughness with a 90% success rate.

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