- IFSA2025 –

Deuterium filling and phase transition in LMJ ICF targets

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Target design and recent results achieved by the target fabrication and testing facility at Valduc CEA Center are presented. The emphasis is placed on cryogenic targets and in particular filling of capsules by gaseous deuterium followed by controlled phase transitions of the deuterium.

A typical experiment involves (1) a cryostat, (2) a target for indirect laser drive with an holhraum to fill with helium as a thermal bridge and a capsule inside it to fill with deuterium, and (3) an observation setup in white visible unpolarized light shadowscopy.

In particular, controlled cooling down of the overall target triggers either deuterium (1) liquefaction then solidification, or (2) condensation in the capsule, depending on the initial gaseous deuterium pressure.

Future work focuses on (1) the quantitative characterization on the overall process by experimental means in terms of amount of deuterium in the capsule and temperature inside the capsule, and (2) replication with possible adjustments of these protocols to attain the same results on deuterium-tritium.