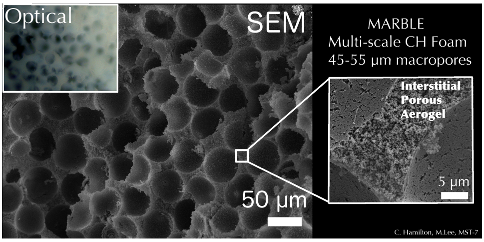
# PROGRESS IN THE DEVELOPMENT OF THE MARBLE PLATFORM FOR STUDYING THERMONUCLEAR BURN IN THE PRESENCE OF HETEROGENEOUS MIX ON OMEGA AND THE NATIONAL IGNITION FACILITY[1]

T. J. Murphy, M. R. Douglas, J. R. Fincke,
J. A. Cobble, B. M. Haines, C. E. Hamilton, M. N. Lee, J. A. Oertel, R. E. Olson,
R. B. Randolph, D. W. Schmidt, R. C. Shah, J. M. Smidt, I. L. Tregillis
Los Alamos National Laboratory, Los Alamos, New Mexico, USA
tjmurphy@lanl.gov

Mix of ablator material into fuel of an ICF capsule adds non-burning material, diluting the fuel and reducing burn. The amount of the reduction is dependent in part on the morphology of the mix. A PDF burn model has been developed [1] that utilizes the average concentration of mixed materials as well as the variance in this quantity across cells provided by the BHR turbulent transport model [2] and its revisions [3] to describe the mix in terms of a probability distribution function of concentrations of fuel and ablator material, and provides the burn rate in mixed material

Work is underway to develop the MARBLE ICF platform for use on OMEGA and the National Ignition Facility in experiments to quantify the influence of heterogeneous mix on fusion burn. This platform consists of a plastic (CH) capsule filled with a deuterated plastic foam (CD) with a density of a few tens of milligrams per cubic centimeter, with tritium gas filling the voids in the foam. This capsule will be driven using either laser or x-ray drive, and the resulting shocks will induce turbulent mix that will result in the mixing of deuterium from the foam with the tritium gas. In order to affect the morphology of the mix, engineered foams with voids of diameter up to 100 microns will be utilized. The degree of mix will be determined from the ratio of DT to DD neutron yield. As the mix increases, the yield from reactions between the deuterium of the CD foam with tritium from the gas will increase. The ratio of DT to DD neutrons will be compared to a variation of the PDF burn model that quantifies reactions from initially separated reactants.




[1] J. R. Fincke, unpublished.
[2] D. Besnard, F. H. Harlow, R. M. Rauenzahn, and C. Zemach, "Turbulence Transport Equations for Variable-Density Turbulence and Their Relationship to Two-Field Models," Los Alamos National Laboratory Report No. LA-UR-12303, 1992 (unpublished).
[3] K. Stalsberg-Zarling and R. Gore, "The BHR-2 Turbulence Model," LA-UR-11-04773 (unpublished).

[1] This work is supported by US DOE/NNSA, performed at LANL, operated by LANS LLC under contract DE-AC52-06NA25396.