The Challenge of an IFE Foam Capsule Overcoat

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The baseline design for the laser-driven Inertial Fusion Energy (IFE) target is a ~4 mm low-density foam capsule with a hydrocarbon overcoat of less than ~ 5 μm. For a shell surface composed of large foam cells (greater than ~1 μm), the overcoating cannot be deposited directly onto the surface. We instead plan to form a wall using interfacial polymerization at the edge of the foam surface. This is done by filling the foam shell with an organic solvent containing a reactant, then placing the shell into water containing another reactant. The reaction occurs only at the interface of the two solutions. This technique was pioneered at the Institute for Laser Energetics in Osaka with 1 mm diameter methacrylate shells. Lawrence Livermore National Laboratory extended this process to 2 mm diameter resorcinol-formaldehyde shells. Both these foams have pore sizes smaller than 0.1 μm. We are developing the process for 4 mm diameter divinyl benzene (DVB) foam, with pores in the range from 1 to 3 μm. The properties of the DVB foam and the larger diameter and pores of the shell make the process more difficult. The presentation will explain how we are adapting the process, the chemistries that are being tried and the results to date.

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