Hydrodynamic Issues in PAMS Mandrel Target Fabrication*

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The surface finish of a full thickness ICF target depends on the initial symmetry of the PAMS mandrel upon which the ablator layer was coated. Long wavelength surface modulations are reproduced in the final coated shell while short wavelength bump defects generally grow in width during the coating process. The surface finish and symmetry requirements for target quality NIF capsules are exceptionally demanding, thus we are focusing significant resources on perfecting the microencapsulation process that is used to produce the initial PAMS mandrel.

The origins of many of the flaws of PAMS mandrels are puzzling to explain and thereby control. We now understand that the simple picture of solvent leaving the shells by diffusion is a flawed model. Complex fluid dynamics plays a critical role, and can be the origin of defects as well as the source of the high level of symmetry that we observe. Two areas have attracted our attention:

1. Marangoni convection, (an analog of Rayleigh-Taylor convection, but only found in thin films), may well be the origin of a "mode 10" bumpiness. This convection may also contribute to other mode roughness.
2. We don't fully understand why the interior water ball moves into the very center of the "oil" droplet. Some experiments have shown that various additives on the outside of the oil droplet seem to effect the centering of the water drop on the inside of the oil droplet.

This poster will summarize the flaws we see in microencapsulated shells and our current view of possible hydrodynamic sources.

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