Improving the Wall Uniformity of High Density Resorcinol Formaldehyde Foam Shells for Direct Drive Experiments by Modifying Emulsion Components*

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Previously we have developed a production process for both low density (100 mg/cc) and high density (180–250 mg/cc) resorcinol formaldehyde (R/F) foam shells with a triple orifice droplet generator. These foam shells are needed for direct drive inertial confinement laser fusion experiments on the OMEGA laser facility at the University of Rochester. Although this process has been developed into production mode, the yield of high-density shells with acceptable wall uniformity has been poor (~ 10%). We have made improvements in the yield of these shells that meet the wall uniformity specification by modifying the composition of the outer oil solution (O2) in the microencapsulation emulsion. This was achieved by a small addition (0.75 wt%) of a styrene-butadine-styrene (SBS) block copolymer into the O2 solution. This modification was aimed at increasing the interfacial surface tension in the emulsion but also appears to play a role in the viscosity of the O2 solution. These modifications along with a slight density mismatch between the inner oil (O1) and the R/F precursor solution (W1) improved the out of round (OOR) and non-concentricity (NC) of the R/F foam shells resulting in as increase in the yield of shells that meet the target wall uniformity specifications.

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