Fabrication of a Full Density Polyvinylphenol Overcoat for IFE Targets

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We are performing research and development to evaluate methods of overcoating divinylbenzene (DVB) foam shells with a full density polyvinylphenol (PVP) overcoat approximately 3–5 µm thick for use as inertial fusion energy (IFE) targets. We have focused our initial efforts on optimizing the chemistry of the PVP polycondensation reaction to better link the full density overcoat with the DVB foam shell, as well as improving the smoothness of the overcoat surface. Initial study is focused on the fluid exchange process utilized in the polycondensation reaction to create the PVP overcoat and the supercritical CO_2 drying process.

Additionally, we have applied chemical engineering principals and techniques to begin to increase the scale and improve the yield of the overcoat process. These techniques include the use of optical imaging devices and flow control monitors to control rate and dimensions of shell formation, as well as advancing the current laboratory bench scale process used for fluid exchange for both the DVB foam shell and PVP overcoat into a continuous process via a flow through tube design, under development in collaboration with Schafer Corporation at Sandia National Laboratory. This research is intended to develop the basis for high yield, high reproducibility IFE target mass production.

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