S2.3.1 - *Additive Manufacturing Assisted Aerogel Media for Separation of Water in-ULSD Emulsions*

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Aerogels are highly porous functional materials with excellent thermal insulation properties but are also useful as media for gas and liquid absorption, liquid-liquid separation, and filtration of airborne nanoparticles. This work evaluates adsorption-based separation of water droplets from an emulsion in ultralow sulfur diesel (ULSD) fuel using high surface area (>200 m2/g), high open pore volume (>90%) polyimide (PI), and syndiotactic polystyrene (sPS) gels. These high porosity gels are mechanically weak and cannot support the hydrodynamic stress encountered in high flux liquid flow. In this context, the active surface area SPS and PI gels are grown on mechanically strong gyroid-type template materials, 3D-printed with high impact polystyrene (HIPS), and used in the separation of surfactant-stabilized water-in-ULSD emulsions. The infill percentage of the 3D printed part is used to influence the flux and filtration efficiencies. Filtration efficiency of greater than 90% is easily obtained using this approach.

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