Abstract Submitted
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Continuous dielectrophoretic centering of compound droplets GREG RANDALL, BRENT BLUE, General Atomics — Compound droplets, or droplets-within-droplets, are traditionally key components in applications ranging from drug delivery to the food industry. Presently, millimeter-sized compound droplets are precursors for foam shell targets in inertial fusion energy work. A key constraint is a uniform foam shell thickness, which in turn requires a centered core in the compound droplet precursor. Previously, Bei et al. (2009, 2010) have shown that compound droplets could be centered in a static fluid using an electric field of 0.7 kV/cm at 20 MHz. To apply centering to existing or future applications, it is imperative to develop a continuous droplet centering process by overcoming the additional complications from motion. Here, we present analysis and experimental data of a continuous droplet centering device that uses an electric field to force a core droplet to the center of a moving compound drop. Our analysis focuses on how interfacial rheology and electrohydrodynamic flows affect the centering dynamics and droplet deformation. Proof-of-principle experiments are performed in a vertical channel using buoyancy to drive a solution of compound droplets stabilized with phospholipid and protein emulsifiers through a kV/cm electric field.

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