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Experimental Investigation of Extensional Deformation of Immiscible Droplets in a Laminar, Converging Flow ADITYA SANGLI, MARCELO ARISPE-GUZMAN, CONNOR ARMSTRONG, DAVID BIGIO, University of Maryland, College Park — The deformation of an immiscible droplet in an extensional flow has been widely studied by researchers using experimental four-roll mills where the bulk liquid imposes a stagnation extensional deformation on the droplet. However, it is of vital interest to study the behavior of an immiscible droplet in a non-stagnant extensional flow which can be produced using a converging channel. A hyperbolic converging channel was built, which could produce a constant extensional rate in the center of the channel, and deformation of droplets of Castor oil injected in a matrix of Silicone oil was observed. Droplets injected in the center of the channel experienced a pure extensional deformation while the droplets injected at an offset position attained the affine state. The nature of the droplet deformation and the critical Capillary numbers are compared with the four-roll mill experiments. Additional experiments were performed with the initial position of the droplet being vertically off center. Higher strain rates were exhibited compared to the pure extensional flow condition. An analysis of the flow field helps explaining the phenomenon and provides insight into the droplet behavior.

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