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Characterizing Printability of Complex Fluids using Dripping-Onto-Substrate Extensional Rheometry VIVEK SHARMA, JELENA DINIC, LEIDY N. JIMENEZ, MADELEINE BIAGIOLI, ALEXANDRO ESTRADA, Chemical Engineering, University of Illinois at Chicago — Liquid transfer and drop formation/deposition processes involved in printing, jetting, spraying and coating involve the formation of columnar necks that undergo spontaneous surface tension-driven instability, thinning and pinch-off. The thinning and pinch-off dynamics are determined by the relative magnitude of capillary forces, and inertial, viscous stresses for simple (Newtonian and inelastic) fluids. Stream-wise velocity gradients that arise within the thinning columnar neck create an extensional flow field, which induces micro-structural changes within complex fluids, contributing extra elastic stresses that change thinning and pinch-off dynamics. Though it is well-established that the quantitative analysis of neck thinning can provide a measure of extensional rheology response and arguably printability, such measurements require bespoke instrumentation not available, or easily replicated, in most laboratories. In this contribution, we describe a method that relies on understanding, visualization and analysis of capillary-driven self-thinning dynamics in an asymmetric liquid bridge formed by dripping a finite volume of fluid from a nozzle onto a substrate.

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