

Abstract Submitted
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**Elasticity and Extensibility
Determine Printability and Spinnability of Polymer Solutions**

JELENA DINIC, LEIDY JIMENEZ, VIVEK SHARMA, Univ of Illinois - Chicago — Many advanced manufacturing technologies like inkjet and 3D printing, nano-fiber spinning involve complex free-surface flows, and the formation of columnar necks that undergo spontaneous capillary-driven thinning and pinch-off. The progressive self-thinning of neck is often characterized by self-similar profiles and scaling laws that depend on the relative magnitude of capillary, inertial and viscous stresses for simple (Newtonian and inelastic) fluids. Stream-wise velocity gradients that arise within the thinning columnar neck create an extensional flow field that can orient and stretch macromolecules, contributing extra elastic stresses and extensional viscosity that change thinning and pinch-off dynamics for polymeric complex fluids. Characterizing the filament thinning and break-up kinetics in jetting, dripping and stretching liquid bridge provides invaluable insight into the interplay of elastic, viscous, capillary and inertial stresses relevant for these applications. We elucidate how polymer composition, flexibility and molecular weight determine the thinning and pinch-off kinetics in our experiments. Both effective relaxation time and transient extensional viscosity are found to be strongly concentration dependent even for dilute solutions.

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