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Pinch-off dynamics, extensional viscosity and relaxation time of dilute and ultradilute aqueous polymer solutions MADELEINE BIAGIOLI, JELENA DINIC, LEIDY NALLELY JIMENEZ, VIVEK SHARMA, Chemical Engineering, University of Illinois at Chicago — Free surface flows and drop formation processes present in printing, jetting, spraying, and coating involve the development of columnar necks that undergo spontaneous surface-tension driven instability, thinning, and pinch-off. Stream-wise velocity gradients that arise within the thinning neck create and extensional flow field, which induces micro-structural changes within complex fluids that contribute elastic stresses, changing the thinning and pinch-off dynamics. In this contribution, we use dripping-onto-substrate (DoS) extensional rheometry technique for visualization and analysis of the pinch-off dynamics of dilute and ultra-dilute aqueous polyethylene oxide (PEO) solutions. Using a range of molecular weights, we study the effect of both elasticity and finite extensibility. Both effective relaxation time and the transient extensional viscosity are found to be strongly concentration-dependent even for highly dilute solutions.

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