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Extensional Relaxation Times and Pinch-off Dynamics of Dilute Polymer Solutions JELENA DINIC, YIRAN ZHANG, LEIDY JIMENEZ, VIVEK SHARMA, Chemical Engineering, University of Illinois at Chicago — We show that visualization and analysis of capillary-driven thinning and pinch-off dynamics of the columnar neck in an asymmetric liquid bridge created by dripping-onto-substrate can be used for characterizing the extensional rheology of complex fluids. Using a particular example of dilute, aqueous PEO solutions, we show the measurement of both the extensional relaxation time and extensional viscosity of weakly elastic, polymeric complex fluids with low shear viscosity $\eta < 20$ mPa·s and relatively short relaxation time, λ <1 ms. Characterization of elastic effects and extensional relaxation times in these dilute solutions is beyond the range measurable in the standard geometries used in commercially available shear and extensional rheometers (including CaBER, capillary breakup extensional rheometer). As the radius of the neck that connects a sessile drop to a nozzle is detected optically, and the extensional response for viscoelastic fluids is characterized by analyzing their elasto-capillary self-thinning, we refer to this technique as optically-detected elastocapillary self-thinning dripping-onto-substrate (ODES-DOS) extensional rheometry.

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