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Pinching dynamics and rheology of polymer-surfactant complexes

CARINA MARTINEZ, VIVEK SHARMA, University of Illinois at Chicago — The rheological properties of polymer-surfactant mixtures play a significant role in applications ranging from enhanced oil recovery, pharmaceutical and biological fluids, cosmetics, food, soft adhesives and coating. Addition of an ionic surfactant to an aqueous solution of neutral polymer like polyethylene oxide is known to result in a shear rheological response with non-monotonic concentration dependent variation, attributed to association complexes formed by hydrophobic interactions between surfactant monomers and polymers chains, as well as charge effects. Furthermore, the formation of association complexes changes both dynamic and equilibrium surface tension. However, due to a lack of suitable techniques, extensional rheology response of polymer-surfactant mixtures has not been characterized in adequate detail, even though drop formation or liquid transfer applications are influenced by extensional rheology and pinching dynamics. In this study, we examine how pinch-off dynamics and rheological response of polymer solutions are modified by the addition of ionic surfactants, and we discuss the implications for dispensing of multicomponent complex fluids.

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