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Dynamics of contracting viscoelastic filaments MICHAEL HARRIS, SANTOSH APPATHURAI, PRADEEP BHAT, OSMAN BASARAN, Purdue University — Satellite drops are detrimental to many industrial applications involving the formation of viscoelastic drops including inkjet printing, DNA microarraying, and printing of flexible solar cells. The precursor to these satellite drops is a slender liquid filament that connects an about-to-form drop to the rest of the liquid in the nozzle. Once a filament is formed, it contracts due to surface tension. A filament may undergo further breakup during recoil. Whereas the contraction of Newtonian filaments in a passive ambient fluid is well understood (Schulkes 1996 and Notz and Basaran 2004), the contraction dynamics of viscoelastic filaments remains largely unexplored and is addressed in this presentation. Here the filament shape is idealized as an axisymmetric fluid cylinder terminated by hemispherical end-caps, and the conformation tensor formalism (Pasquali & Scriven 2002) is used to model the viscoelasticity. The dynamics of contracting filaments are then analyzed by means of both a well-benchmarked two-dimensional finite element algorithm (Notz et al. 2001, Chen et al. 2002) and a one-dimensional slender-jet algorithm (Padgett et al. 1996). Regions of the parameter space are identified where recoiling filaments give rise to either a single satellite drop or multiple satellites.

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