Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Pinch-off of threads of nonhomogeneous Polymer solutions VISHRUT GARG, SUMEET THETE, SANTOSH APPATHURAI, Purdue Univ, PRADEEP BHAT, The 3M Company, OSMAN BASARAN, Purdue Univ — Motivated by applications involving inkjet printing of complex fluids, we analyze the nonlinear dynamics of the deformation and breakup of polymeric liquid threads. Virtually all previous such studies have been restricted to situations in which the polymer concentration is uniform within the threads. Recently, Eggers (2014) has proposed that non-uniform polymer concentration can account for the blistering pattern that is sometimes seen during breakup of polymeric threads where at the incipience of pinch-off, the thread has the morphology of small drops that are separated by threads of highly concentrated polymer solution. Following Eggers's approach but one in which he restricted his study to a linear stability analysis, we analyze the full nonlinear dynamics by solving simultaneously Cauchy's momentum equation, the continuity equation, a convection-diffusion equation for the number density of polymers, and a constitutive equation for stress. The latter two equations account for the coupling between polymer concentration and the flow. As the thread profiles seen in experiments are typically quite slender, we expedite the analysis by solving these equations in the slender-jet limit by an approach based on the finite element method.

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Date submitted: 30 Jul 2014 Electronic form version 1.4