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Shear Banding in Polymer Solutions with a Monotonic Constitutive Curve MICHAEL CROMER, MICHAEL VILLET, GLENN FREDRICK-SON, GARY LEAL, University of California, Santa Barbara — Shear banding is a well-documented phenomenon occurring in the flow of various complex fluids, e.g. wormlike micellar solutions. In recent years, experiments have revealed that shear banding can occur in entangled polymer solutions. To model this behavior it has been assumed, for over 40 years, that an underlying non-monotonic constitutive curve is required to theoretically generate steady shear banding. It is widely believed, however, that the underlying constitutive curve for polymer solutions is strictly increasing. In this we talk we show that the linear instability of a monotonic curve driven by the Helfand-Fredrickson mechanism of polymer moving up stress gradients results in a shear-banded profile with a non-uniform concentration distribution. In addition, a subcritical, nonlinear instability exists resulting in multiple steady states, which agrees with a recent experimental observation.

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