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Nonlinear elastic instabilities in parallel shear flows LICHAO PAN, University of Pennsylvania, ALEXANDER MOROZOV, University of Edinburgh, PAULO ARRATIA, University of Pennsylvania — It is a common assumption that, in the absence of inertia and curvature, the flow of a viscoelastic fluid is linearly stable to flow perturbations. Recent evidence, however, suggests that such flow may be unstable to a finite amplitude perturbation. In this talk, we present evidence of a subcritical nonlinear instability for the flow of a dilute polymeric solution in a straight microchannel (no curvature) at low *Re*. The experimental configuration consists of a long, straight microchannel that is 100 μm deep, 100 μm wide and 3.0 cm long. The channel is divided into two main regions: a short ($\sim$0.3 cm) region where an array of cylinders is positioned in order to introduce perturbations in the flow, and a long ($\sim$2.7 cm) parallel flow region; a channel devoid of cylinders is also used for control. The flow is investigated using both dye advection and particle tracking velocimetry. Results show large velocity fluctuations far downstream (2 cm) away from the initial perturbation for strong enough and long lived disturbances. Small disturbances decay quickly under the same flow conditions (i.e. flow rate). A hysteresis loop, characteristic of subcritical instabilities, is observed.

Lichao Pan
University of Pennsylvania

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