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Purely elastic instabilities in parallel shear flows LICHAO PAN, PAULO ARRATIA, University of Pennsylvania — In this talk, the stability of viscoelastic fluids in parallel shear flow at low Reynolds number (Re<0.01) is experimentally investigated using dye advection visualization and particle tracking velocimetry. The fluid of interest is a dilute polymeric fluid with nearly constant shear-viscosity. The experimental setup is a micro channel that is 3 cm long and 100 um wide. The channel consists of two regions. The first region contains a linear array of cylinders designed to introduce perturbations to the viscoelastic flow. The second region is a long (2.7 cm) and straight channel devoid of cylinders in which the spatial-and temporal behavior of the initial perturbation is monitored. This second region is the parallel shear geometry. Preliminary results based on velocity measurements shows that the initial disturbance is sustained far downstream in the parallel shear geometry above certain Wissenberg number (Wi), and increase non-linearly with Wi even at vanishing small Re. For the viscoelastic fluid, curved streamlines are observed in the parallel shear geometry region of the channel. No velocity fluctuations or curved streamlines are found for the Newtonian fluid under the same conditions.

Lichao Pan
University of Pennsylvania

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