

Abstract Submitted
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Spatially-dependent elastic instabilities in flow around an array of cylinders LICHAO PAN, BARRY SCHARFMAN, PAULO ARRATIA, University of Pennsylvania — When flexible polymer molecules (in dilute solution) flow around a cylinder, they are strongly stretched due to the combination of both curved streamlines and extensional flow. Here, the flow of a viscoelastic fluid around an array of cylinders is investigated in a microchannel. As the strain-rate is varied at low Reynolds number ($<10^{-2}$), tracer and particle-tracking experiments show that molecular stretching produces two flow instabilities, one in which the velocity field becomes asymmetric, and a second in which it fluctuates non-periodically in time. These instabilities are spatially-dependent in the sense that the two instabilities may be present at a single values of strain-rate (or Wissenberg number) but at different locations in the microchannel.

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