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Instability of a Sheared Fluid-Gel Interface SATISH KUMAR, University of Minnesota, SHENG LIN-GIBSON, ERIK K. HOBBIE, NIST — The planar interface between a viscous fluid and an elastic gel is known to be unstable to simple steady shear flow [V. Kumaran and R. Muralikrishnan, Phys. Rev. Lett. **84**, 3310 (2000)]. By embedding a small number of micron-sized Latex particles at the planar interface between a Newtonian fluid and a soft viscoelastic gel, we use stroboscopic particle tracking to study the onset of this instability in the limit of large gel-to-fluid thickness ratios. The mean-square displacement of the interface and the power spectrum of displacement fluctuations are measured as a function of applied shear rate and gel modulus. Long-wavelength fluctuations with a periodic component are observed in the plane of flow and vorticity, with limited motion normal to the plane of the interface. By relating the power spectrum of fluctuations to the viscoelasticity of the gel, we discuss potential applications in the area of non-Brownian microrheology, where one exploits this instability to optically infer the rheological properties of an otherwise inaccessible soft phase.

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