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Dynamics of associative polymer solutions: Capillary break-up, jetting and rheology VIVEK SHARMA, Hatsopoulos Microfluids Laboratory, Dept of Mechanical Eng., MIT, Cambridge, MA 02139, JAMES G. SERDY, Laboratory of Manufacturing and Productivity, MIT, PHIL THREFALL-HOLMES, AkzoNobel, UK, GARETH H. MCKINLEY, Hatsopoulos Microfluids Laboratory, Mechanical Eng., MIT, Cambridge, MA 02139 — Associative polymer solutions are used in extensively in the formulations for water-borne paints, food, inks, cosmetics, etc to control the rheology and processing behavior of multi-component dispersions. These complex dispersions are processed and used over a broad range of shear and extensional rates. Furthermore, the commercially relevant formulations use dilute solutions of associative polymers, which have low viscosity and short relaxation times, and hence their non-Newtonian response is not apparent in a conventional rheometer. In this talk, we explore several methods for systematically exploring the linear and nonlinear solution rheology of associative polymer dispersions, including: fractional model description of physical gelation, high frequency oscillatory tests at frequencies up to 10 kHz, microfluidic shear rheometry at deformation rates up to 1000000 /s and the influence of transient extensional rheology in the jet breakup. We show that high deformation rates can be obtained in jetting flows, and the growth and evolution of instability during jetting and break-up of these viscoelastic fluids shows the influence of both elasticity and extensibility.

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