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Stable Jets of Viscoelastic Fluids and Self-assembled Cylindrical Capsules by Hydrodynamic Flow Focusing KAZEM EDMOND, University of Massachusettts, MANUEL MARQUEZ, Kraft Foods, Inc. and Los Alamos National Lab, ANTHONY DINSMORE, JONATHAN ROTHSTEIN, University of Massachusettts — In recent years, a number of studies have investigated the use of flows developed within microfluidic devices to generate emulsions with precisely controlled drop sizes and polydispersity. In this talk, we will present a series of hydrodynamic flow focusing experiments designed to produce long-lived cylindrical jets of viscoelastic polymer solutions. These stable cylinders are then subsequently used as templates for the assembly of nanoparticles at the oil-water interface in order to form rigid, semi-permeable cylinders with potential applications in encapsulation and in novel structural materials. In the flow-focusing device, an aqueous solution of polyacrylamide flows coaxially with an immiscible oil, experiences a strong extensional flow over a short distance, and then flows into a uniform cylindrical tube. At sufficiently high flow rates, the aqueous phase forms a cylindrical jet with a diameter of 10-90 microns which can remain stable for several centimeters downstream. A simple analysis is presented to account for the role of extensional rheology and first normal stress difference on the stability of the viscoelastic jets. The model is found to agree well with the data.

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