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**Coiling and Folding of Viscoelastic Jets** TRUSHANT MAJMUDAR, MATTHIEU VARAGNAT, GARETH MCKINLEY, Mechanical Engineering, MIT — The study of fluid jets impacting on a flat surface has industrial applications in many areas, including processing of foods and consumer goods, bottle filling, and polymer melt processing. Previous studies have focused primarily on purely viscous, Newtonian fluids, which exhibit a number of different dynamical regimes including dripping, steady jetting, folding, and steady coiling. Here we add another dimension to the problem by focusing on mobile (low viscosity) viscoelastic fluids, with the study of two wormlike-micellar fluids, a cetylpyridinum-salicylic acid salt (CPyCl/NaSal) solution, and an industrially relevant shampoo base. We investigate the effects of viscosity and elasticity on the dynamics of axi-symmetric jets. The viscoelasticity of the fluids is systematically controlled by varying the concentration of salt counterions. Experimental methods include shear and extensional rheology measurements to characterize the fluids, and high-speed digital video imaging. In addition to the regimes observed in purely viscous systems, we also find a novel regime in which the elastic jet buckles and folds on itself, and alternates between coiling and folding behavior. We suggest phase diagrams and scaling laws for the coiling and folding frequencies through a systematic exploration of the experimental parameter space (height of fall, imposed flow rate, elasticity of the solution).

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