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Folding and swirling of viscous threads in microfluidics THOMAS CUBAUD, THOMAS G. MASON, UCLA, Chemistry and Biochemistry Dept. — We study miscible multiphase flows with large viscosity contrast in microchannels. We investigate the folding instability of a viscous thread surrounded by a less viscous liquid that flow into a diverging microchannel. In this situation, extensional viscous stresses cause the thread to bend and fold rather than dilating in order to minimize dissipation. We show that diffusive mixing at the boundary of the thread can significantly modify the folding flow morphologies. We relate the folding frequency to the characteristic shear rate. We also examine the hydrodynamic coupling between multiple threads and the threads' rupturing into arrays of viscous swirls, reminiscent of the Kelvin-Helmholtz instability.

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