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Viscous irrotational analysis of the deformation and break-up time of a bubble or drop in uniaxial straining flow[1] JUAN C. PADRINO, DANIEL D. JOSEPH, University of Minnesota — The deformation of a bubble or drop in uniaxial straining flow is modeled by assuming the motion of the viscous fluids to be irrotational. In this approach, viscosity enters the analysis through the balance of normal stresses at the interface. The tracking of the interface motion is achieved by integration of the set of differential equations furnished by the conservation of linear momentum and kinematical conditions, coupled with a boundary-integral formulation along the interface. This methodology is thus employed to investigate the influence of a finite Reynolds number on the time evolution, up to break-up, of the drop or bubble for various Weber numbers. Comparison with results from simulations of the Navier-Stokes motion, which includes rotational effects, are presented and discussed.

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