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Effect of Viscoelasticity on Drop Deformation NISHITH AGGARWAL, University of Delaware, KAUSIK SARKAR, University of Delaware — Deformation of a drop is numerically investigated when one or both of the drop and continuous phases is viscoelastic. A three-dimensional front-tracking finite difference method is used to simulate the deforming drop. The viscoelasticity is modeled using the Giesekus and Oldroyd–B constitutive relations. In a shear flow, a viscoelastic drops in a Newtonian matrix deforms less than a Newtonian drop. Specifically, bounded viscoelastic drop shapes are found for capillary numbers where a Newtonian drop would break up. Matrix viscoelasticity, however is observed to cause non-monotonic change in drop deformation with increasing viscoelasticity. The effects of inertia, interfacial tension, viscosity ratio and imposed flow periodicity (in oscillatory shear) will be presented. The detailed results about transient dynamics, viscous and viscoelastic stresses and the velocity fields inside and outside the drop will be discussed and explained.

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