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Effects of matrix viscoelasticity on drop deformation in steady shear KAUSIK SARKAR, NISHITH AGGARWAL, University of Delaware — We investigate a viscous/Oldroyd-B drop in an Oldroyd-B matrix. We compare simulated drop deformation and inclination with experimental observations by other groups. A non-monotonic change in the steady state drop deformation is observed with increasing Deborah number (De) and explained in terms of the competition between increased localized polymer stretching at the drop tips and the decreasing effects due to change in drop orientation angle. The transient drop orientation angle is found to evolve on the polymer relaxation time scale for high . The breakup of a viscous drop in a viscoelastic matrix is inhibited for small De, and promoted at higher De. The effect of polymeric to total viscosity ratio β was seen to affect through the parameter β De indicating a dominant role of the first normal stress difference. A viscoelastic drop in a viscoelastic matrix with matched relaxation time experiences less deformation compared to the case when one of the phases is viscous. But the inclination angle assumes an intermediate value between two extreme cases. Increased drop phase viscoelasticity compared to matrix phase leads to decreased deformation.

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