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Effects of viscoelasticity on retraction of a sheared drop SWARNAJAY MUKHERJEE, KAUSIK SARKAR, University of Delaware — The retraction of a sheared drop when either the drop or the matrix phase is Oldroyd B is investigated. The retraction is initially faster and later slower with increasing drop viscoelasticity. The initial faster relaxation of viscoelastic drops is due to inward pulling viscoelastic stresses at the drop tip and the later slowing down is due to the slowly relaxing viscoelastic stresses at the equator. The behavior is captured well by three model ODEs for two principal viscoelastic stresses (along the tip and equatorial directions) and the deformation. Matrix viscoelasticity slows the relaxation of a Newtonian drop right from the beginning because of the slow relaxation of stresses near the drop tip with increasing Deborah number. For drops sheared in supercritical conditions, when initially stretched beyond a certain length, relaxation leads to neck formation with two bulbous ends resulting in drop break-up, while for less stretching, it relaxes back to its spherical state.

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