Newtonian drop deformation in a viscoelastic matrix under shear\textsuperscript{1}

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When a Newtonian drop is sheared in a viscoelastic matrix, the direct numerical simulation produces a viscoelastic “wake” at the interface at the front and back of the drop. In the case of a drop reaching a stationary state, the stresses in the wake and the viscous shear balance out the interfacial tension force. When a viscoelastic drop is sheared in a Newtonian matrix, numerical simulations exhibit an overshoot in the transient evolution of drop deformation. Experimental observations also show that an overshoot can occur when a Newtonian drop is sheared in a viscoelastic matrix. However, these overshoots do not appear for 3D drop computations. In this work, we investigate why drop simulations in 3D do not display overshoots.

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