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Lateral migration of a viscoelastic drop in a shear flow near a wall[1] SWARNAJAY MUKHERJEE, University of Delaware, KAUSIK SARKAR, George Washington University — Deformation, orientation and lateral migration of a viscoelastic drop suspended in a wall-bounded shear flow of Newtonian fluid is numerically investigated using a front-tracking finite-difference method. The viscoelasticity is modeled using the modified FENE-CR constitutive equation. The initial position is found to not affect the quasi-steady migration dynamics of a viscoelastic drop just like that of a Newtonian drop. As viscoelasticity is increased, lateral migration is enhanced initially, then a saturation is reached and finally for very high viscoelasticity lateral migration decreases. This non-monotonicity is due to the presence of two opposite factors: the interfacial stresslet term and the non-Newtonian normal stresses inside the drop phase. Viscoelasticity increases the orientation angle which hinders migration by decreasing the interfacial stresslet term. Deformation is non-monotonic affecting the stresslet term and adding to the non-monotonicity of migration. Finally, the viscoelastic normal stresses inside promote migration in contrast to the case of a Newtonian drop migrating in a viscoelastic matrix, where the viscoelastic stresses outside hinders migration. The viscoelastic effect is enhanced at lower Ca and higher viscosity ratios.

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