Abstract Submitted
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A theory of wall-induced lateral migration of a drop in shear: effects of drop inclination and viscoelasticity[1] KAUSIK SARKAR, George Washington University — Recently, migration of suspended particles, drops, polymers and biological cells have assumed importance in microfluidic separation and filtration assays. A rigid sphere in shear does not move cross-stream due to the reversibility in a Stokes flow. Deformation, as well as inertia and viscoelasticity, breaks the reversibility and leads to lateral migration away from a nearby wall. There have been algebraically complex perturbative analyses of the moving boundary problem [e.g. Chan and Leal 1979, JFM 92,131] to determine the migration velocity. However, the underlying physics remains unclear. Here, we show that the migration is induced by the image stresslet field, as was also indicated earlier by Smart and Leighton [1991, Phys. Fluid A, 3, 21]. We relate the stresslet field to the Interface tensor, and investigate the effects of drop inclination. In contrast to a plausible notion asserted also in the literature, that reduced inclination (increased alignment with flow) decreases migration, it is shown here that reduced inclination increases the stresslet and thereby the migration velocity. A semi-analytical expression of migration velocity based on numerically computed stresslet will be compared against simulation and the results will be discussed.

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