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Effect of asymmetric deformation on capsule lateral migration[1]
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In a Stokes flow, lateral migration is the movement of a particle perpendicular to the flow direction due to the presence of a wall and/or shear gradient. Lateral migration has an effect on microscale flows in a number of fields. For example, in the cardiovascular system, the presence of a cell-free layer in blood vessels near the vessel wall is caused by the lateral migration away from the wall. In this study, we use the boundary integral method to investigate the wall-induced lateral migration of a capsule, which consists of a hyperelastic membrane enclosing an inner fluid. The boundary integral equation can be separated into two terms that represent contributions due to the capsule shape and wall. We find that the extent of the asymmetrical deformation of the capsule works to decrease the rate of migration perpendicular to the wall by up to 30% compared to the far-field analytical solution. Additionally, the effect of the asymmetrical deformation persists for distances up to ten times the capsule radius. Since the effect of asymmetrical deformation is only weakly dependent on the membrane properties, this type of analysis could be useful towards the understanding of lateral migration of other particles, such as drops and vesicles.

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