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Separation of chiral objects by shear flow in microfluidic channels - Theory HENRY FU, Brown University, MARCOS, MIT, THOMAS POWERS, Brown University, ROMAN STOCKER, MIT — Motivated by the desire to separate chiral molecules, we investigate the motion of helices in shear flow generated by a microfluidic channel. We present a model based on resistive force theory to show that hydrodynamic forces on a helix in shear flow produce a drift perperdicular to the shear plane. The drift depends on the sign of the shear rate and the chirality of the helix. Net drift results from preferential alignment with streamlines. For large ($>$ 1 micron), elongated particles, alignment is a consequence of the deterministic tumbling trajectories (Jeffery orbits) in shear flow. For smaller particles, we estimate the effect of Brownian rotational diffusion on chirality-sensitive drift. We deduce a lower size limit for separation of chiral objects by shear flow in microfluidic channels.

Henry Fu
Brown University

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