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Trajectories of a pair of drops in steady shear at finite inertia: effects of viscosity ratio and positioning RAJESH SINGH, KAUSIK SARKAR, University of Delaware — Two drops driven towards each other by shear, experience a new trajectory at finite inertia. Unlike in Stokes flow, where drops always slide past each other, here they turn back in a reversed trajectory due to a zone of reversed streamlines around the drops at finite inertia. The trajectory type depends on initial offset, Reynolds number, capillary number, as well as viscosity ratio. We investigate the transition from one type of trajectory to the other, and delineate the different zones in the parameter space. Drops pass each other at low and high capillary numbers, but reverse their motion at intermediate capillary numbers because of the increased drop inclination in the flow direction at increased capillary number. Above a critical viscosity ratio, drop trajectory transitions from reversed to passing. The critical viscosity ratio increases with Reynolds number at small capillary numbers, but shows a nonmonotonic behavior at higher capillary numbers. Increasing initial offset in the vorticity direction also leads to a transition from passing to reversed trajectory.

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