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Enhanced Transport Due to Driven and Active Colloids at Fluid Interfaces NICHOLAS CHISHOLM, MEHDI MOLAEI, JIAYI DENG, KATHLEEN STEBE, University of Pennsylvania — We examine the hydrodynamics of driven or active colloids trapped at fluid interfaces and their impact on mass transport rates. We assume that the colloids are adhered to the interface by a pinned contact line and thus in a fixed orientation with respect to the interface. However, they are free to translate along the interface and rotate about an axis normal to the interface. Far-field flows generated by these colloids are of primary importance to long-ranged hydrodynamic interactions that drive transport of other passive material on or near the interface. We introduce a library of such flows, which vary depending on the mechanism of colloid motion, colloid orientation, and the properties of the interface. We then quantify transport of passive material by computing the drift, or fluid tracer displacements, arising from each of these modes for a colloid moving along a specified trajectory. We also estimate the resulting tracer diffusivity due to a dilute layer of active or driven colloids moving along random trajectories. We find conditions for viscous fluid interfaces in which lateral dispersion of passive material on or near the interface may be greatly enhanced by driven or active colloids.

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