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Self-propulsion of chemically active colloids BHARGAV RALLABANDI, University of California, Riverside, FAN YANG, HOWARD STONE, Princeton University — Phoretic particles are able to propel in the presence of externally applied or self-generated chemical gradients. Focusing on the non-Brownian limit, we discuss the autonomous motion of colloids that generate chemical gradients through surface reactions and consequently self-propel via diffusiophoresis. We develop a general framework by combining truncated multipole expansions for the hydrodynamic and chemical fields with the Lorentz reciprocal theorem. Applying the framework to particles with uniform surface chemical fluxes, we find that the particles translate primarily through chemical interactions, whereas hydrodynamic interactions are typically subdominant. We discuss the utility of truncated expansions in accurately describing particle trajectories, while also contrasting autophoretic motions in ionic and non-ionic solvents. We apply the model to a mixture of two particle populations and find behaviors that include pair-chasing, attraction and cluster formation.

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