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Self-Phoretic Helical Particles RUBEN POEHNL, WILLIAM USPAL, University of Hawai'i — Chemically active colloids self-propel by catalyzing the decomposition of molecular "fuel" available in the surrounding solution. If the various molecular species involved in the reaction have distinct interactions with the colloid surface, and if the colloid has some intrinsic asymmetry in its surface chemistry or geometry, there will be phoretic flows in an interfacial layer surrounding the particle, leading to directed motion. Most studies of chemically active colloids have focused on spherical, axisymmetric Janus particles, which (in the bulk, and in absence of fluctuations) simply move in a straight line. For particles with complex (non-spherical and non-axisymmetric) geometry, the dynamics can be much richer. Here, we consider chemically active helices. Via numerical calculations and slender body theory, we study how the translational and rotational velocities of the particle depend on geometry and the distribution of catalytic activity over the particle surface. Significantly, we find that both tangential and circumferential concentration gradients contribute to the particle velocity, and that the relative importance of these effects, which can be tuned by varying the particle geometry, determines the surrounding flow field.

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