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Autophoretic self-propulsion of homogeneous particles SEBASTIEN MICHELIN, LadHyX - Ecole Polytechnique, ERIC LAUGA, GABRIELE DE CANIO, DAMTP - University of Cambridge — Phoretic mechanisms such as diffusiophoresis exploit short-ranged interactions between solute molecules in the fluid and a rigid wall to generate local slip velocities in the presence of solute gradients along the solid boundary. This boundary flow can result in macroscopic fluid motion or phoretic migration of inert particles. These mechanisms have recently received a renewed interest to design self-propelled "autophoretic" systems able to generate the required solute gradients through chemical reaction at their surface. Most existing designs rely on the asymmetric chemical treatment of the particle's surface to guarantee symmetry-breaking and the generation of a net flow. We show here, however, that chemical asymmetry is not necessary for flow generation and that homogeneous particles with asymmetric geometry may lead to self-propulsion in Stokes flow. Similarly, this principle can be used to manufacture micro-pumps using channel walls with uniform chemical properties.

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