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Geometric pumping in autophoretic channels SEBASTIEN MICHELIN, LadHyX - Ecole Polytechnique, THOMAS MONTENEGRO JOHNSON, GABRIELE DE CANIO, DAMTP - University of Cambridge, NICOLAS LOBATTO-DAUZIER, LadHyX - Ecole Polytechnique, ERIC LAUGA, DAMTP - University of Cambridge — Pumping at the microscale has important applications from biological fluid handling to lab-on-a-chip systems. It can be achieved either from a global (e.g. imposed pressure gradient) or local forcing (e.g. ciliary pumping). Phoretic slip flows generated from concentration or temperature gradients are examples of such local flow forcing. Autophoresis is currently receiving much attention for the design of self-propelled particles achieving force- and torque-free locomotion by combining two essential surface properties: (i) an activity that modifies the solute content of the particle's environment (e.g. catalytic reaction or solute release), and (ii) a mobility that generates a slip flow from the resulting local concentration gradients. Recent work showed that geometric asymmetry is sufficient for a chemically-homogeneous particle to self-propel. Here we extend this idea to micro-pumping in active channels whose walls possess both chemical activity and phoretic mobility. Using a combination of theoretical analysis and numerical simulations, we show that geometrically-asymmetric but chemically-homogeneous channels can generate pumping and analyze the resulting flow patterns.

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