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Convective self-propulsion of chemically active particles OLEG SHKLYAEV, HENRY SHUM, ANNA BALAZS, University of Pittsburgh — A mechanism of particle self-propulsion activated by transduction of chemical energy into convective motion of fluid that drags microscale particles is proposed. The convection is generated by an active spherical particle located on the bottom of a microchannel and coated with a catalyst that decomposes reagent dissolved in the solution into less dense products and gives rise to a buoyancy force. The symmetry of the flow generated around the active particle can be broken if a passive spherical particle, which does not produce the flow, is present in the vicinity of the first one. The generated flow drags the passive particle toward the active one along the bottom wall until they form a dimer. The resulting asymmetric fluid flow, which is generated by only one of the particles, imposes a different drag on the different sides on the dimer. The net force causes the dimer to translate along the bottom wall. By varying numbers of active and passive particles, as well as their positions within a group, one can control the structure of the generated convective flow and, therefore, design clusters with different mobile properties. The proposed mechanism can be harnessed to transport cargo in microchannels.

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