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Self-propulsion of active colloids *via* ion production MARCO DE CORATO, XAVIER ARQU, TANIA PATIO, Institute for Bioengineering of Catalonia (IBEC), MA ARROYO, LaCN, Universitat Politcnica de Catalunya, SAMUEL SNCHEZ, Institute for Bioengineering of Catalonia (IBEC), IGNACIO PAGONABARRAGA, Universitat de Barcelona — Active particles that harness chemical energy from the environment and turn it into directed motion attracted great interest in the recent years. Several applications have been envisaged for these particles from pollutant removal to anti-cancer therapies. To optimize active colloids for advanced applications, one has to achieve fundamental understanding of their dynamics in fluidic environments. Here, we develop a model for the self-propulsion of a chemically active colloid that asymmetrically releases ionic species. By solving the relevant equations using simulations and a perturbation expansion, we evaluate the velocity of the active particle as a function of the main parameters. Our results highlight several novel aspects that are qualitatively different from other mechanisms. The active particle can reverse direction of motion by changing the salt concentration in the solution and can propel even if it is not charged. We find an optimal condition for self-propulsion and a novel regime in which the velocity is independent of the ionic strength of the environment. The model quantitatively captures the salt-dependent velocity measured in experiments using active colloids that propel by decomposing urea via enzymatic reaction.

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