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Role of Background Electrolyte in Electrokinetic Locomotion by Reaction-Induced Charge Auto-Electrophoresis JEFFREY L. MORAN, JONATHAN D. POSNER, University of Washington — Bimetallic particles propel themselves through aqueous solutions by harvesting chemical energy from hydrogen peroxide fuel and converting it to fluid motion through reaction-induced charge auto-electrophoresis. We present a scaling analysis and computational simulations that describe the physics underlying the locomotion of these particles. The model shows that the motion results from electrical body forces in the surrounding fluid, which are generated by a coupling of an asymmetric dipolar charge density distribution and the electric field it generates. The simulations and scaling analysis make the predictions, in agreement with experiments, that the speed of the autonomous motion depends linearly on fuel concentration and particle surface charge and inversely on solution conductivity.

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