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**Electrokinetic self-Propulsion of a Catalytic Nanomotor; a Perturbation Analysis**[1] AMIR NOURHANI, Chem. Eng. Dept., Penn State University, PAUL LAMMERT, Phys. Dept., Penn State University, ALI BORHAN, Chem. Eng. Dept., Penn State University, VINCENT CRESPI, Phys. Dept., Penn State University — The development of bimetallic catalytic nanomotors has been one of many attempts to mimic the behavior of bionanomotors and micro-organisms. Recent experimental analysis has shown that electrokinetic self-propulsion is the dominant mechanism for autonomous motion of these nanomotors in hydrogen peroxide. In this work, we propose a mathematical model for the steady state locomotion of an axisymmetric spherical nanomotor in a symmetric binary electrolyte. The asymmetric production and consumption of hydrogen ions on the surface of the particle is modeled by a general position-dependent flux. The flux of negative ions on the surface is zero. Using perturbation analysis and the method of matched asymptotic expansion, we solve the model for the velocity of the particle to the leading order in Debye length and to the first order in the intensity of hydrogen ions flux. The velocity depends linearly on the interfacial potential of the surface of the particle and the intensity of hydrogen ions flux. It also inversely depends on the viscosity of fluid, the ion concentration in electrolyte and the diffusion coefficient of the hydrogen ions. The predicted behavior is consistent with experimental results and numerical calculations.

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