

Abstract Submitted
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Autophoresis of two dissolving particles with surface chemical reactions FAN YANG, BHARGAV RALLABANDI, HOWARD STONE, Princeton University — Classic diffusiophoresis describes the motion of charged particles in an electrolyte solution with an imposed concentration gradient. We investigate the autophoresis of two particles where the concentration gradient is induced by the dissolution and chemical reaction on the particle surfaces. Analytical results of the interactions are given in bi-spherical coordinates. We find that when the chemical reactions are fast relative to the diffusion of ions, the ion concentration near the particle surfaces is strongly modified and a significant local concentration gradient is generated, which results in large deviations from the conventional expression of the autophoresis where the diffusiophoretic slip velocity on the particle surface is assumed to be proportional to the concentration gradient. In particular, we show that the effective diffusiophoretic mobility is enhanced when the surface chemical reaction results in an absorption of ions from solution, while a much smaller mobility results from the reaction depositing ions into solution.

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