Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Near-contact electrokinetic interactions between ideally polarizable particles MOHAMMAD ABU HAMED, EHUD YARIV, Technion — When a zero-net-charge spherical particle is exposed to a uniformly applied electric field it polarizes, giving rise to an induced zeta potential distribution and a concomitant electro-osmotic flow field. Due to symmetry, the particle does not experience any electrophoretic motion. This symmetry is disturbed when an adjacent boundary (e.g. another particle or a channel wall) is introduced. This gives rise to boundary-driven particle motion, which is nonlinear in the applied field, approximately quadratic in it when it is weak. Using matched asymptotic expansions, we analyze electrokinetic interactions between a pair of ideally polarizable particles at small gap separations. When the field is applied perpendicular to their line of center, it tends to repel the particles away from each other. This repulsion is dominated by the pressure field within the gap, animated by the intense electric field there. The resulting pair interaction weakly diverges as an irrational power of the gap thickness. When the field is applied in parallel to the line of center, the electric field within the gap is exponentially small, and the pair interaction is bounded.

Avshalom Manela
MIT

Date submitted: 03 Aug 2009 Electronic form version 1.4