Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

**From diffusive motion to sub-diffusive motion with local aggregation: the effect of surface contamination in dipolophoresis** JAE SUNG PARK, DAVID SAINTILLAN, Department of Mechanical Science and Engineering, University of Illinois at Urbana-Champaign — We investigate the effects of surface contamination in suspensions of ideally polarizable spheres in an applied electric field using large-scale particle simulations. In the case of clean particles, suspensions are known to undergo dipolophoresis (DIP), or combination of dielectrophoresis (DEP) and induced- charge electrophoresis (ICEP), in which ICEP dominates the dynamics over DEP. Surface contamination is modeled as a thin dielectric layer coated uniformly around the particle surface, which can be captured by a means of a correction factor multiplying the induced zeta potential or slip velocity driving ICEP. Because the correction factor is always less than unity, ICEP is gradually suppressed as surface contamination becomes significant, resulting in a transition in the suspensions from diffusive motions to sub-diffusion and local aggregation. Large- scale simulation results are presented on the suspension microstructure, as well as on particle velocities, which are strongly reduced for contaminated particles. We demonstrate a clear transition from diffusion to sub-diffusion by calculating particle mean-square displacements, and we explain it as a consequence of the non-integrable local waiting time distributions that arise in the sub-diffusive regime due to the trapping of the particles inside chains and clusters.

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Date submitted: 12 Aug 2011 Electronic form version 1.4