Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

AC electrophoretic effect in inhomogeneous electrical field: potentials for single molecule trapping[1] WEIHUA GUAN, Department of Electrical Engineering, Yale University, JAE HYUN PARK, PREDRAG KRSTIC, Physics Division, Oak Ridge National Laboratory, MARK REED, Department of Electrical Engineering, Yale University — In micro-fabricated fluidic devices, we have experimentally observed trapping of objects in the supposed unallowed positive dielectrophoresis (pDEP) region. This 'anomalous' trapping behavior motivates us to investigate the missing contributions in the trapping dynamics. We present here a study on overlooked aspects of alternating current (AC) electrokinetics-AC electrophoretic (ACEP) phenomena. The dynamics of a particle with both polarizability and net charges in an *inhomogeneous* AC electric trapping field are investigated. It is found that either electrophoretic (EP) or dielectrophoretic (DEP) effects can dominate the trapping dynamics, depending on experimental conditions. A dimensionless parameter is developed to predict the relative strength of EP and DEP effect. Contrary to conventional thought, an ACEP trap is feasible for charged particles in 'salt-free' or low salt concentration solutions. In contrast to DEP traps, an ACEP trap favors the down scaling of particle size. We anticipate that this feature will allow the confinement of single nanometer-sized objects or macromolecules.

[1]Supported by NIH under grant No. 1R21HG004764-01

Weihua Guan
Department of Electrical Engineering, Yale University

Date submitted: 17 Nov 2010 Electronic form version 1.4