Abstract Submitted
for the DFD08 Meeting of
The American Physical Society

Dielectrophoretic interdigitated electrode arrays in the presence of double layer SOPHIE LOIRE, IGOR MEZIC, UCSB — Uncharged particles in electrolytic solutions can be manipulated using a nonuniform AC electric field which generates a dielectrophoretic (DEP) force, acting on those particles. Nonuniform AC electric fields generated by coplanar microelectrodes also produce steady fluid flow in electrolytic solutions also called AC electroosmosis, ACEO. This fluid flow is explained by the presence of an electrode shielding or double layer where ions from the bulk fluid are distributed above electrodes when an electric field is applied. If the electric field is constant, the distribution of ions can be described by Debye and Huckel. If the electric field is alternating, as is the case in dielectrophoretic, the behavior of the double layer becomes more complex. The presence of this double layer is significant for microfluidic applications and combined use of ACEO and DEP have been used to manipulate micro and nano-particles. DEP force fields have been studied ignoring the presence of the double layer. We study the influence of the electrode shielding on the dielectrophoresis forces. We adopt the simple mathematical model used in previous simulations of ACEO pumps. Neglecting Faradaic reactions, the double layer on each electrode acts like a capacitor with a constant capacitance in the linear regime of small voltages. According to this approach, the DEP force field has interesting properties which could now give an understanding of some previously unexplained experimental observations.

Sophie Loire
UCSB

Date submitted: 03 Aug 2008 Electronic form version 1.4