Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Electrokinetics due to gas phase Plasma Polarization. SIDDHARTH MAHESHWARI, HSUEH-CHIA CHANG, Center for Microfluidics and Medical Diagnostics, University of Notre Dame — Exposed AC drop electrodes are shown to generate a local negative plasma cloud due to asymmetric gas-phase ionization reactions. This negative plasma can be transferred onto a disjoint flat interface during the cathodic half cycle of the generating electrode. The resulting interfacial electrokinetics are quite different depending upon the location of the charge, with normal and tangential interfacial Maxwell stresses dominating for each case respectively. Microjets eject from the plasma-generating drop with normal Maxwell stress. The microjet velocity and radius are determined by a balance among the Maxwell, extensional and capillary stresses, which we decipher via matched asymptotics. Internal vortices are produced without significant interfacial distortion with tangential Maxwell stress. Both electrokinetic phenomena are strong functions of the AC frequency and are most pronounced at a frequency corresponding to the inverse charge relaxation time of the gas plasma.

Siddharth Maheshwari
Center for Microfluidics and Medical Diagnostics, University of Notre Dame

Date submitted: 05 Aug 2005 Electronic form version 1.4