Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Patterning electrohydrodynamic flows with conductive obstacles in microfluidic channels C.K. HARNETT, Sandia National Labs, T.F. HILL, MIT, A.J. SKULAN, L.M. BARRETT, G.J. FIECHTNER, E.B. CUMMINGS, B.A. SIMMONS, Sandia National Labs — Flow patterns with both recirculating and unidirectional characteristics are useful for controlled mixing and pumping within microfluidic devices. We have developed a fabrication process that converts injection-molded polymer chips into devices that demonstrate induced-charge electroosmosis (ICEO) effects (1,2) in AC fields. Polymeric insulating posts are coated with metal to produce a nonuniform zeta potential under an applied electric field. Induced flows are analyzed by particle image velocimetry. Stable, recirculating flow patterns are discussed, along with their potential to produce well-characterized and reversible streamlines for on-chip mixing in chemical separation and synthesis devices. Asymmetric conductive features can bias the flow direction, generating unidirectional pumping in an AC field. This pumping approach will be discussed in comparison with DC electrokinetic pumps we have studied. 1) M. Z. Bazant and T. M. Squires, Phys. Rev. Lett. 92, 066101/1-4 (2004). 2) T. M. Squires and M. Z. Bazant, J. Fluid Mech. 509, 217 (2004).

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Date submitted: 23 Dec 2004 Electronic form version 1.4