Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Cell and Colloidal Substrates for Dielectrophoretic Microfluidic Immunoassays JILL MAZUR, ZACHARY GAGNON, HSUEH-CHIA CHANG, University of Notre Dame, Department of Chemical and Biomolecular Engineering — Dielectrophoresis (DEP) is a term commonly used to describe the field induced polarization and translational motion of a polarizable particle in a non-uniform AC field. The frequency at which the induced particle dipole goes to zero, known as the crossover frequency (cof), is highly dependent on the surface conductance of the particle. We have shown previously that DNA hybridization on the surface of a 100 nm functionalized silica particle leads to detectable surface conduction changes which make it possible to detect DNA hybridization reactions by simply measuring changes in particle suspension cof. In this work we present a similar detection scheme using novel colloidal and cell substrates as dielectrophoretic immunosensors. Aminated cell or nanocolloid surfaces are subjected to a polymer coating glutaraldehyde treatment followed by antibody coupling reaction for immunoassay based detection. By varying the polymer coating thickness on the colloid or cell surface we demonstrate the ability to tune, stabilize the cell and colloid cof, and minimized non-specific adsorption of proteins. As such, a library of cof labeled colloids and cells are created and used for multiple antigen analysis. By measuring the colloid and cell specific DEP cof prior to and after antibody-antigen interaction we demonstrate the ability to perform rapid label free protein detection within a microfluidic device.

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Date submitted: 11 Dec 2008 Electronic form version 1.4