Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

In-situ Microfluidic Measurement of the Dielectric Constant of Colloidal Particles SETAREH MANAFIRASI, Department of Chemical Engineering, The City College of New York, THOMAS LEARY, Department of Chemical Engineering and Applied Chemistry, University of Tornoto, CHARLES MALDARELLI, Department of Chemical Engineering, The City College of New York
— The ability to manipulate micron-sized colloidal particles or biological cells in a liquid medium in microfluidic geometries is necessary in lab on a chip devices for micro scale biological analysis and diagnostics for sorting and directing the trafficking of the particles. In dielectrophoresis, a nonuniform electric (E) field is applied to move the particles along the gradient of the field energy, and the velocity is a function of the particle's dielectric constant. Measurement of the dielectric constant is necessary in order to scale field strengths for applications, and it is important to undertake this measurement in-situ as the particle's dielectric content can be modified by the suspending medium (e.g. adsorption onto the particle surface). In this talk we measure directly the dielectric constant of colloids in a microfluidic channel by applying an electric field with "V"-shaped and planar electrodes on opposite sides of the channel. The cusp of the "V" shape concentrates the field to provide a sufficient field intensity gradient which is designed to be uniform across the height of the channel and to vary only with its width. Optical measurements of the diffusiophoretic velocity of polymer colloids are compared to simulations based on numerical solution of the E-field and particle hydrodynamics to obtain the particle dielectric constant and investigate the effect of biomolecule adsorption on the particle surface.

Setareh Manafirasi
City College of CUNY

Date submitted: 01 Aug 2015 Electronic form version 1.4