

Abstract Submitted  
for the MAR09 Meeting of  
The American Physical Society

**Conformation and Dielectrophoresis of Single Weak Polyelectrolyte under AC Electric Field** SHENGQIN WANG, YINGXI ZHU, Department of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, Indiana 46556, USA — The application of AC-electric fields, when integrated with current microarray and “lab-on-chip” platforms, has emerged as a useful tool to manipulate and assemble supramolecular aggregates, such as AC-field induced protein crystallization and DNA hybridization, yet the detailed mechanism remains unclear. To understand the AC-polarization mechanism of biomacromolecules, we examine the conformational and dielectrophoretic behavior of polyelectrolytes under AC-electric field using fluorescence correlation spectroscopy (FCS) at single molecular level. We focus on poly (vinyl pyridine) (PVP) as a model polyelectrolyte whose conformation can be tuned by adjusting the pH and ionic strength. We observe that in the non-uniform AC electric field, PVP in a coil conformation experiences the positive DEP force at applied frequency below 500 kHz; it is also intriguing to observe the elongation of PVP coils at a characteristic AC-frequency of  $\sim 200$  kHz. In sharp contrast, PVP in a globule conformation shows insensitive to imposed AC-fields. We also examine the conformational change in a uniform AC-field where the DEP force is absent; the result suggests a redistribution of counterions with an induced dipole of polyelectrolyte. The behavior is further investigated with varied medium conductivity and microelectrode geometry.

Shengqin Wang  
Department of Chemical and Biomolecular Engineering,  
University of Notre Dame

Date submitted: 02 Dec 2008

Electronic form version 1.4