

MAR15-2014-001093

Abstract for an Invited Paper  
for the MAR15 Meeting of  
the American Physical Society

**Dynamics of Polyelectrolyte Chains within Layer-by-Layer Assemblies<sup>1</sup>**

SVETLANA SUKHISHVILI, Department of Chemistry, Chemical Biology and Biomedical Engineering, Stevens Institute of Technology, Hoboken 07030

Layer-by-layer (LbL) assembly of charged polymers/nanoparticles finds diverse industrial applications ranging from NIR reflective heat-reduction to multi-stage drug delivery. Internal layering of film components lies at the heart of their performance. I will discuss experiments aimed to unravel relationships between center-of-mass diffusion of polyelectrolyte (PE) chains within LbL films, PE molecular characteristics, environmental conditions (salt concentration), and film structure. Upon film annealing in salt solutions, chain diffusion is highly anisotropic (as probed by fluorescence recovery after photo-bleaching and neutron reflectometry), and is strongly coupled with film structure. For layered LbL films, PE diffusion in the direction parallel to the substrate reveals quasi-Rouse scaling with molecular weight ( $D \sim M^{-1}$ ), even for long chains, suggesting that chains disentangle upon adsorption. Finally, I will discuss quantitative aspects of salt-induced PE chain diffusion in directions parallel and perpendicular to the substrate, and their consequences for persistent layering within LbL films.

<sup>1</sup>This work was supported by the National Science Foundation under Award DMR-0906474.