Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Experiments of salt concentration effects on translocation dynamics of polyelectrolytes passing through alpha-hemolysin pore BYOUNG-JIN JEON, MURUGAPPAN MUTHUKUMAR, University of Massachusetts — We have investigated physical mechanisms of electric field driven single file translocation of polyelectrolytes through an alpha-hemolysin pore by measuring the translocation time under different voltages, salt concentrations, and pH. Our experiments reveal an intricate coupling among various driving forces in dictating the polyelectrolyte translocation. For example, we find that the salt concentrations in the donor and the recipient compartments influence the polymer translocation dynamics differently, depending on pH. From a series of systematic experiments, we demonstrate that the salt concentration in the donor compartment influences the polymer charge and the free energy barrier for entrance and that the salt concentration in the receiver compartment influences the electrostatic interaction between the polymer and pore. We provide a physical model for the free energy landscape of the translocation process and offer an explanation of the origin of the salt concentration effects on the polymer translocation dynamics for different pH conditions. This study offers an opportunity to understand how different driving forces get coupled in dictating the polyelectrolyte dynamics under nonequilibrium conditions.

Murugappan Muthukumar
University of Massachusetts

Date submitted: 12 Nov 2014 Electronic form version 1.4