Abstract Submitted
for the DFD10 Meeting of
The American Physical Society

Optimization of Nanoparticle Separation through Solid State Nanopore PRASHANTA DUTTA, TALUKDER JUBERY, Washington State University, ANMIV PRABHU, MINJUN KIM, Drexel University — Recently there has been a growing interest on solid state nanopores to separate biological molecules such as proteins, DNA, and RNA. However, efficient separation of biomolecules through nanopores is a challenging task as a number of factors such as size and charge density of particle, size and charge density of membrane pore, and the concentration of bulk electrolyte influence the translocation behavior of nanoparticles through pores. To address this issue, a mathematical model is developed based on mass, momentum, and charge conservation equations to study the behavior of particles through pores. The surface charge density of the membrane pore was identified as the most critical parameter that determines the selectivity of the membrane and the throughput of the separation process. Based on this model, a single 150 nm pore was fabricated in a 50 nm thick free standing silicon nitride substrate by focused ion beam milling. This pore was subsequently chemically modified with (3-Aminopropyl) triethoxysilane to change its surface charge density. This chemically modified nanofluidic architecture was then used to separate 22 nm and 58 nm polystyrene nanoparticles.

Prashanta Dutta
Washington State University

Date submitted: 06 Aug 2010 Electronic form version 1.4