Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Electrokinetic Concentration of Charged Macromolecules In Nanoporous Media BRIAN J. KIRBY, Cornell University, Ithaca, NY, DANIEL J. THROCKMORTON, ANUP K. SINGH, Sandia National Laboratories, Livermore, CA — We present a technique for concentrating proteins and other charged macromolecules in microfabricated systems through the manipulation of molecular electromigration at the interface between bulk flow in microchannels and flow through micro/nanoporous material with a bimodal pore distribution. The presence of a bimodal pore structure allows for the creation of metastable electrokinetic regions in areas of double layer overlap without the attendant electrokinetic pressure generation required for continuity in transitions between open microchannels and unimodal nanoporous structures. Directed experiments on the dependence of the observed phenomena on pH, macromolecule charge state, chemi- and electrosorption are supportive of a relatively simple model that defines the criteria that must be satisfied to observe macromolecule concentration. This technique has been applied to concentrate proteins by 2-3 orders of magnitude before pressure elution for analysis, and has been implemented with both polymeric and silicate materials in capillaries and in microfabricated glass microfluidic devices.

Brian Kirby
Cornell University

Date submitted: 01 Dec 2004 Electronic form version 1.4