Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Electroosmotic Flow and Particle Transport in Micro/nano Nozzles and Diffusers LEI CHEN[1], PRADEEP GNANAPRAKASAM[2], A.T. CONLISK[3], The Ohio State University — Electroosmotic flow in a converging or diverging micro-nozzle is calculated using the lubrication approximation. The pressure driven component and the electroosmotic component of the velocity is superimposed and the pressure distribution is obtained by satisfying mass continuity. Electroosmotic flow in micro-nozzles is important in many applications, for example in electrical measurements on living cells, for the injection and the manipulation of DNA fragments and in drug delivery systems. In this work the velocity, potential and concentration distribution are predicted as a function of nozzle (diffuser) geometry, ionic strength and other parameters. In the Debye-Huckel limit valid for small potentials analytical solutions may be obtained for the velocity and potential. Asymptotic analysis is used to calculate a uniformly valid solution for thin electric double layers and is valid for potentials far outside the Debye-Huckel limit. The transport of long chain polymers through these nozzles and diffusers is also considered. If time permits we will compare the results with experimental data. Supported by NSF through the NSEC Center for the Affordable Nanoengineering of Polymeric Biomedical Devices.

[1]Ph.D student
[2]Graduate Student
[3]Professor

A. T. Conlisk
The Ohio State University

Date submitted: 27 Jul 2006 Electronic form version 1.4