Abstract Submitted
for the DFD05 Meeting of
The American Physical Society

Effect of Divalent Electrolytes on Electroosmotic Flow[1]
HAIFENG LI, MINAMI YODA, Georgia Institute of Technology, PRADEEP GNANAPRAKASAM, A. TERRY CONLISK, Ohio State University — Electroosmotic flow (EOF) is of importance in micro- and nanofluidic applications. Recent numerical results [Zheng *et al.* (2003) *Electrophoresis* **24**, 3006] suggest that the addition of even trace amounts of divalent counterions can greatly affect the velocity and electric potential distribution for EOF of a nominally monovalent electrolyte solution, nearly halving the flow rate in 20 nm channels. Scaled experiments were therefore carried out for steady and fully-developed EOF of buffered aqueous mono- and divalent electrolyte mixtures through fused silica microchannels. Nano-particle image velocimetry (nPIV), based upon evanescent-wave illumination of colloidal tracers, was used to obtain velocity data within about 300 nm of the wall. In all cases, the thickness of the electric double layer, defined as the distance from the wall where the velocity and electric potential recover to 99% of their freestream values, is of $O(10$ nm), or much less than the channel dimension of $O(10$ μm). The nPIV results are compared with predictions from an asymptotic perturbation analysis.

[1]Supported by AFOSR and DARPA

Minami Yoda
Georgia Institute of Technology

Date submitted: 02 Aug 2005 Electronic form version 1.4