Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Active microfluidic mixing based on transverse electro-osmotic flows[1] NICHOLAS S. LYNN JR., Department of Chemical and Biological Engineering, Colorado State University, CHARLES S. HENRY, Department of Chemistry, Colorado State University, DAVID S. DANDY, Department of Chemical and Biological Engineering, Colorado State University — As with their macroscale counterparts, laminar fluid mixing becomes a very important, albeit inherently difficult step at the microscale. Micromixers based on electro-osmotic flow (EOF) rely on either a modification of microchannel geometries or a modification of the ζ-potential of the microchannel surfaces to enhance fluid mixing. Here we present a new method of achieving chaotic advection in microchannels by applying an electric field perpendicular to the mean flow direction driven by a pressure gradient in a planar rectangular microchannel. EOF on microchannel surfaces in a direction orthogonal to the main channel axis is generated via an electric field produced by integrated electrodes at the corners of a microchannel. By using serial combinations of different mixing cycles, we show that complete mixing can occur in straight microchannels of length scales on the order of a millimeter. Computational fluid dynamics (CFD) is used to characterize and optimize the mixing efficiency of the system and to compare with experimental measurements.

[1]NIH EB00726

Nicholas S. Lynn Jr.
Department of Chemical and Biological Engineering, Colorado State University

Date submitted: 20 Nov 2006 Electronic form version 1.4