Abstract Submitted
for the DFD06 Meeting of
The American Physical Society

Quantification of Electrokinetic Instability Induced Micromixing using Ion Indicating Dyes PHILIP WHEAT, JONATHAN POSNER, Arizona State University — Electric fields coupled with ionic conductivity gradients generates charge density in the bulk fluid which can result in electrokinetic instabilities (EKI). Electrokinetic (EK) flow with conductivity gradients become unstable when the electroviscous stretching and folding of conductivity interfaces grows faster than the dissipative effect of molecular diffusion. In this work we quantify EK micromixing in a cross-shaped microchannel using epifluorescence microscopy and ion indicating dyes. The quantum efficiency of ion indicating dyes increase when bound to specific ionic species. In this way, the degree of mixing of the ion-indicating dye and the target ion is proportional to the fluorescence intensity. Here we present a method for quantitative determination of the degree of fluid mixing. We show that mixing of these EK unstable flows increases with electric field (for a fixed ionic conductivity ratio) and that nearly complete mixing can be obtained in less than 10 microchannel widths.

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Date submitted: 05 Aug 2006 Electronic form version 1.4