Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Evaluating surface electrodes and hydrophobic patches for generating vortices in nanoconfined electroosmotic flows HARVEY ZAMBRANO, Universidad de Concepcion, MARIE FUEST, Ohio State University, NICOLAS VASQUEZ, Universidad de Concepcion, A.T. CONLISK, SHAURYA PRAKASH, Ohio State University — As a silica surface is exposed to an electrolyte, a net charge arise on the solid-liquid interface. In a confined electrolyte, a consequence of the net charged interface is the development of an imbalance of ions near the confining walls. The net charged region near the walls is called the Electrical Double Layer (EDL). A critical technology for the next generation of nanodevices, such as lab on a chip and electroosmotic pumps is controlling the EDL structure. Furthermore, important technical processes such as desalination using membranes could be improved by mitigating the concentration polarization, a phenomenon directly related to the EDL. Here, we study the generation of interfacial vortices in nanoconfined electroosmotic flows. We conduct molecular dynamics simulations of a multivalent electrolyte solution in a slit silica nanochannel. We apply axial electric fields and evaluate the response of the system as a counter charged patch is placed on the channel wall. Moreover, we study an alternative method for generating vorticity by employing hydrophobic surface patches. Charge, density and flow velocity profiles are computed. The profiles reveal that both types of patches are able to generate counter flow in electroosmotic devices. We compared the results against experiments.

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Date submitted: 29 Jul 2014 Electronic form version 1.4