Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Investigation of Current Hotspots on an Ion-Selective Membrane Subject to Chaotic Electroconvection CLARA DRUZGALSKI, ALI MANI, Stanford University — We have performed a 3D direct numerical simulation (DNS) of chaotic ion transport associated with electroconvective instability near an ion-selective membrane. Data from the 3D DNS demonstrate that the chaotic fluid motion substantially influences the transport of ions and causes instantaneous hotspots of high current density on the surface. We present a comprehensive statistical analysis of surface current density, including probability density functions (PDFs) and joint-PDFs with other interfacial measures involving flow, conductivity and electric fields. These results provide new insights into the mechanism and characterization of current hotspots. Our results are relevant to industrial applications involving ion-selective interfaces such as electrodialysis for water purification, and emerging microfluidic devices that use ion-selective components for separation processes.

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Date submitted: 20 Nov 2015 Electronic form version 1.4