Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

**Electro-convective instability at an ion-selective membrane** MATHIAS B. ANDERSEN, CLARA L. DRUZGALSKI, JOSEPH W. NICHOLS, ALI MANI, Center for Turbulence Research, Stanford University — In electrochemical engineering processes a major unresolved problem is the theoretical understanding of transport above the nominal diffusion limitation. When an electric current is passed from an aqueous electrolyte into an ion-selective membrane, ionic depletion next to the surface leads to transport limitation for a stagnant electrolyte. However, it has been shown that electrolytes under such conditions are hydrodynamically unstable when biased above a critical voltage. Mixing by the resulting flow can lead to enhanced transport. In this presentation we touch upon different elements of two studies of electro-convective instability at an ion-selective membrane: (1) the linear spatiotemporal stability when subject to a plane-Poiseuille cross flow, and (2) the chaotic transport characteristics at high voltages (cross flow absent). In (1) we identify absolutely and convectively unstable regimes and show that the imposed shear acts as a stabilization mechanism.

Mathias B. Andersen
Center for Turbulence Research, Stanford University

Date submitted: 02 Aug 2013 Electronic form version 1.4