Abstract Submitted
for the DFD14 Meeting of
The American Physical Society

Induced- and alternating-current electro-osmotic control of the diffusion layer growth in a microchannel-membrane interface device SINWOOK PARK, GILAD YOSSIFON, Technion - Israel Institute of Technology — The passage of an electric current through an ionic permselective medium under an applied electric field is characterized by the formation of ionic concentration gradients, which result in regions of depleted and enriched ionic concentration at opposite ends of the medium. Induced-current electro-osmosis (ICEO) and alternating-current-electro-osmosis (ACEO) are shown to control the growth of the diffusion layer (DL) which, in turn, controls the diffusion limited ion transport through the microchannel-membrane system. We fabricated and tested devices made of a Nafion membrane connecting two opposite PDMS microchannels. An interdigitated electrode array was embedded within the microchannel with various distances from the microchannel-membrane interface. The induced ICEO (floating electrodes) / ACEO (active electrodes) vortices formed at the electrode array stir the fluid and thereby suppress the growth of the DL. The intensity of the ACEO vortices is controlled by either varying the voltage amplitude or the frequency, each having its own unique effect. Enhancement of the limiting current by on-demand control of the diffusion length is of importance in on-chip electro-dialysis, desalination and preconcentration of analytes.

Gilad Yossifon
Technion - Israel Institute of Technology

Date submitted: 29 Jul 2014 Electronic form version 1.4