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Concentration Polarization and Electroconvection in a Nanochannel Array System YOAV GREEN, SINWOOK PARK, GILAD YOSSIFON, Technion - Israel Institute of Technology — The passage of an electric current through a permselective medium (membranes/nanochannels) 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, i.e. concentration polarization (CP). Here we study experimentally the effects of 3D geometric field focusing on CP in realistic three dimensional and three layers system (i.e. microchannel-permselective medium-microchannel device). Previous analytical solutions were derived under the simplifying assumptions of local-electroneutrality, ideal permselectivity and negligible convection. In particular, we studied the effect of the interchannel spacing of an array of such permselective regions/channels, on the resulting current-voltage curves and concentration profiles, wherein an increased interchannel spacing corresponds to an increased geometric heterogeneity of the permselective medium. Good qualitative agreement is obtained between these theoretical predictions and experimental data obtained for a nanoslot array system with varying interchannel spacing. These results highlight the importance of geometric field focusing, interchannel communication and electro-convection effects on the ion transport in heterogeneous permselective systems.

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