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Electrokinetic Instability, Geometric Confinement, and Overlimiting Conductance JARROD SCHIFFBAUER, Techinion, Israel Institute of Technology, MATHIAS BAEKBO ANDERSON, ALI MANI, Stanford University, GILAD YOSSIFON, Techinion, Israel Institute of Technology — For systems containing ion-selective membranes or nanochannels, concentration polarization (CP) under DC voltage beyond the classical Levich limit leads to the loss of local electroneutrality over micron or larger scales at the salt-depleted interface. This manifests itself in the appearance of an extended space charge (ESC) region, which is rendered unstable above a critical voltage drop. The instability drives the the formation of a fast-flowing vortex system with complex, often chaotic, dynamics. In unconfined systems, i.e. large electrolytic cells, this contributes strongly to the overlimiting conductance (OLC) of the system. However, both the role of the instability in OLC as well as its origin and onset become more complicated in highly confined systems such as microchannel devices. The problem of instability under geometric confinement has been studied both analytically and numerically using two different approaches. We compare the two approaches, and discuss relevant experimental evidence.

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