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Deionization shocks in flat and thin microchannels SHIMA ALIZADEH, MATHIAS B. ANDERSEN, ALI MANI, Department of Mechanical Engineering, Stanford University — We have investigated dynamics of deionization shocks in flat and thin microchannel using two different approaches: (1) extension of Mani and Bazant's simple model [PRE 2011] to two-dimensions, and (2) development of a height-averaged model from tabulated solutions of the Poisson-Boltzmann equation. The latter model is more accurate since it captures both thin and overlapped double-layer regimes as well as diffusion-osmotic flows. Both models describe ion transport and deionization shock dynamics in two dimensional space corresponding to the transverse flat dimensions. We compare prediction of these models for shock profile, speed and dynamical response, as well as onset conditions for hydrodynamic instability of deionization shocks. The outcome of this study has applications in deionization processes in lab-on-a-chip systems as well as porous microstructures.

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