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**Numerical and analytical models of concentration polarization in a microchannel** CHRISTOFFER P. NIELSEN, HENRIK BRUUS, Department of Physics, Technical University of Denmark — We present a comprehensive analysis of salt transport in microchannels during concentration polarization. We have carried out full numerical simulations of the coupled Poisson–Nernst–Planck–Stokes problem governing the transport and rationalized the behaviour of the system. A surprising discovery is that bulk advection relies heavily on the surface currents, even when these surface currents do not contribute much to the overlimiting current themselves. The numerical simulations are supplemented by analytical results valid in the long channel limit as well as in the limit of negligible surface charge. Notably, by including the effects of diffusion and advection in the diffuse double layers we extend a recently published analytical model of overlimiting current due to surface conduction.

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