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Highly non-linear induced-charge electroosmosis for flat electrodes GAURAV SONI, CARL MEINHART, Dept. Mech. Eng., University of California, Santa Barbara, CA 93106, MATHIAS B. ANDERSEN, HENRIK BRUUS, Dept. Micro- and Nanotechnology, Technical University of Denmark, 2800 Kgs. Lyngby, Denmark — We have simulated induced-charge electroosmotic flow over a flat surface in the highly nonlinear regime, where the notion of the double layer as a linear capacitor is invalid. We have developed two completely independent solution methods: one resolving the double layer under continuum assumption and the other treating the double layer as an effective boundary condition balancing the normal and tangential flux of ions. We show that tangential transport within the double layer leads to gradients in bulk scalar fields. By comparing the effective-boundary model with continuum model, we are able to quantify the accuracy of the effective boundary model. There are certain simplifications of the effective boundary model. One simplification ignores the bulk concentration gradients but incorporates surface conduction. Another simplification is based on linearization and ignores both bulk concentration gradients and surface conduction. We quantify the accuracy of these simplifications.

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