

Abstract Submitted
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The dominant role of surface conduction in electro-osmotic flows through periodically varying narrow channels LOTAN LUDAR, EHUD YARIV, Technion — As surface conduction has no effect on electro-osmosis in uniform channel flows, where the tangential Debye-layer currents are longitudinally uniform, it may appear as it would only result in a small modifying correction in lubrication analyses of slowly varying channels. This misconception is refuted here by analyzing flows through periodic channels of slowly varying but otherwise arbitrary geometry. Assuming that the channel width is still large compared with the Debye thickness we employ the simplest thin-double-layer model which incorporates surface conduction. We find that surface conduction affects the leading-order flow and the consequent net volumetric flux, introducing a nonlinear dependence upon the zeta potential. Remarkably, as the channel becomes more and more narrow, the scaled flux approaches a limit which is independent of the Dukhin number yet different from that calculated for zero Dukhin number.

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