Physical Mathematics Seminar

Electroosmosis Through a Bottleneck: Formation of Eddies and Theory for Arbitrary Debye Lengths

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2:30 PM
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Abstract

The electroosmotic flow (EOF) through a constricted cylinder is calculated for arbitrary Debye lengths $\varkappa^{-1}$ using a perturbation approach. The varying diameter of the cylinder produces radially and axially varying effective electric fields, as well as an induced pressure gradient. We predict the existence of eddies for certain constricted geometries and propose the possibility of electrokinetic trapping in these regions. Eddies can be found both in the center of the channel and along the perimeter, and the presence of the eddies is a consequence of the induced pressure gradient that accompanies electrically driven flow into a narrow constriction. An experimental system is also presented in which we observe regions of recirculation in EOF eddies in the small Debye length limit.

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