

Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Nonlinear electrokinetic phenomena in insulator-based dielectrophoretic microdevices.¹ ZHIJIAN LIU, DI LI, XIANGCHUN XUAN, Clemson University — Insulator-based dielectrophoresis (iDEP) is an emerging technology that has been widely used to manipulate particles and cells in microfluidic devices. However, the presence of in-channel insulators can cause two simultaneous nonlinear electrokinetic phenomena that may strongly disturb the linear electrokinetic flow and affect the particle and cell manipulation in iDEP microdevices: one is electrothermal flow due to the amplified Joule heating in the fluid around the insulators, and the other is induced charge electroosmotic (ICEO) flow due to the electrical polarization of the insulators. We study these nonlinear phenomena in the electrokinetic flow of buffer solutions with varying molecular concentrations through a constriction microchannel. We find that the ICEO and electrothermal flows are dominant in low and high ionic concentration fluids, respectively. Increasing the magnitude of electric field can also change the flow from ICEO to electrothermal in low concentration fluids.

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Date submitted: 18 Jul 2017

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