**360f Electrokinetic Transport with Stokes Flow in Lab-on-a-Chip under Asymmetric Surface Conditions**

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Understanding the electrokinetic microflow plays an essential role in the design and fabrication of the microfluidic-chip, and provides insight into a trade-off between device design and performances. Since the Stokes flow in confined spaces is evidently influenced by the electric double layer (EDL), therefore, the fluid behavior in microchannels deviates from that described by the laminar flow equation in general. A viscosity of the fluid flowing in charged microchannels apparently has a higher value, indicating the electroviscous effect. Many studies have contributed to the slip behavior in narrow channels, in which the Navier's fluid slip occurs in hydrophobic surfaces [Tretheway and Meinhart, Phys. Fluids, 2002; Barrat and Bocquet, Phys. Rev. Lett., 1999]. In micro total analysis system devices, the surface of channel wall usually has inhomogeneous properties, due to a bonding with different materials. Considering the momentum equation coupled with the Poisson-Boltzmann electric field in a rectangular channel, we have developed the explicit model incorporated together the finite difference scheme [Chun et al., J. Micromech. Microeng., 2005]. Since the electric and the hydrodynamic properties depend on the material of the wall, computations were performed with asymmetric variations of both surface zeta potential and slip length for channel width of 20 micrometer. Our results exhibit the effect of EDL thickness upon the flow pattern, where the flow velocity decreases with decreasing the electrolyte concentration. Subsequently, the friction factor is also quantified. For the experimental verification, the velocity profile of dilute suspension was obtained in the channel of polydimethylsiloxane(PDMS)-glass as well as PDMS-PDMS chip, by employing the fluorescent microscope with particle streak velocimetry. We observed the fluid slip at the hydrophobic surface of PDMS wall, which allows evaluating the value of slip length for different suspension conditions. In a large inverse dimensionless EDL region, with increasing the electrolyte concentration, the average velocity at no-slip condition is almost constant whereas it is still increasing at slip condition. (This work was supported by the Basic Research Funds R01-2004-000-10944-0 and M6-0302-00-0005 from the Korea Science and Engineering Foundations.)