CASTS Talk

Electrokinetic transport phenomena in a microchannel containing salt-free solution

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15:30 - 17:00
308, Mathematics Research Center Building (ori. New Math. Bldg.)

In general, electrically neutral liquids have a distribution of electrical charges near a surface because of a charged solid surface. A salt-free solution is referred to a special system in which the liquid phase contains only counterions dissociated from the functional groups of the charged surfaces. Such systems are common in salt-free organic systems containing natural polyelectrolytes such as proteins, nucleic acids, and DNA, and synthetic polyelectrolytes such as polyacrylic acid (PAA). Even an electrolyte solution with low salt concentration (<10-5M) can also be approximated as a salt-free solution. Since electrokinetic phenomena such as electrophoresis and electroosmosis in a salt-free solution are quite different from those in an electrolyte solution due to the effect of the counterion condensation. Therefore, an understanding of the electrokinetic transport phenomena in a slat-free solution is needed for design and operation of microfluidic devices in Biochips or other biomedical systems. In this talk, a systematic parametric study on electrokinetic transport phenomena in slit and cylindrical tube containing salt-free solution such as osmotic pressure and electroosmotic mobility will be investigated in detail based on the exact analytical solutions for the potential distribution and electro-osmotic flow velocity obtained by solving the Poisson-Boltzmann and momentum equations, respectively.