Osmotic Pressure of an Electrolyte in a Cylindrical Nanochannel: Steric Effect of Ions

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Steric effects of ions have been shown to have tremendous influence on electrokinetic phenomena of liquid flows in nanochannels. Most of the nanochannels are cylindrical or rectangular shaped. Hence, there is a need to undertake thorough investigation of Electric Double Layer (EDL) with respect to steric effect in cylindrical nanochannels. Steric effect of electrolyte is considered because in nanoscale dimensions EDL thickness becomes comparable to the width of the nanochannel. Modified Poisson-Boltzmann equation is used as the governing equation for the study of EDL overlapping phenomena in the nanochannel. Ionic concentration, osmotic pressure and electrocapillarity effect are estimated using the electric potential distribution using numerical simulation. An effort is also made to predict the shape of the deformed interface due to the applied electric field.