Analysis of electrowetting phenomena inside a nanoslit

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Electrowetting phenomena of electrolyte solution are theoretically studied by understanding the electric potential distribution of the solution. The length scale of the considered system is in the order of 10nm where conducting experiments are hardly possible, which is why theoretical approach is necessary. The Poisson-Boltzmann equation is used as the governing equation to obtain the electric potential distribution. Analytic solutions in two special cases are obtained: under low voltage approximation and under counter ions only assumption. Numerical solutions are simulated not containing any approximation or assumption. The shape of the fluid surface is determined from a force balance considering osmotic pressure, pressure difference, surface tension, and the normal stress evaluated from electric potential distribution.