PB type models for electric double layers

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In this lecture, two kinds of PB (Poisson-Boltzmann) type models will be introduced for the study of electric double layers. One is CCPB (charge conserved Poisson-Boltzmann) equation and the other is PBns equation (new Poisson-Boltzmann equation with steric effects). Analytical and numerical results of CCPB equations are comparable with experimental results. For two species ions (one anion and one cation), symmetry and non-symmetry breaking conditions are expressed by coefficients of the PBns equation. When non-symmetry breaking condition holds true and the small parameter goes to zero, we prove that PBns equations are asymptotically close to the modified Poisson-Boltzmann equations developed by Andelmann et al. On the other hand, when symmetry breaking condition holds true, numerical simulations show that the charge densities of the solution of PBns equations having fluctuations near the boundary points, which may be related to Stern layers and can not be found in conventional PB equations. This is a joint work with YunKyong Hyon, Chiun-Chang Lee and Chun Liu.