中央大學物理學系

Department of Physics, National Central University

Welcome to Complex System and Biophysics Seminar

Electric Double Layer Composed of an Antagonistic Salt in an Aqueous Mixture: Local Charge Separation and Surface Phase Transition

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Time: 12:00-13:00

Abstract: We examine an electric double layer containing an antagonistic salt in an aqueous mixture, where the cations are small and hydrophilic but the anions are large and hydrophobic. In this situation, a strong coupling arises between the charge density and the solvent composition. As a result, the anions are trapped in an oil-rich adsorption layer on a hydrophobic wall. We then vary the surface charge density \sigma on the wall. For \sigma >0 the anions remain accumulated, but for \sigma <0 the cations are attracted to the wall with increasing $|\sigma|$. Furthermore, the electric potential drop \Psi(\sigma) is nonmonotonic when the solvent interaction parameter \chi(T) exceeds a critical value \chi_c determined by the composition and the ion density in the bulk. This leads to a first-order phase transition between two kinds of electric double layers with different \sigma and common \Psi. In equilibrium such two-layer regions can coexist. The steric effect due to finite ion sizes is crucial in these phenomena.