

Synchronous Multi-Layered Alternative Absorption of Macro-Cations and -Anions on Colloidal Spheres

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Abstract

Alternative multiple absorbed layers up to ten of macro-cations [poly(4-vinyl-N-n-butyl(and/or ethyl)pyridinium bromide)] and macro-anions [sodium poly(styrene sulfonate) and/or poly(vinyl acrylate)] are formed on monodisperse polystyrene and/or colloidal silica spheres above the critical concentration of macroions, m^* . The m^* -value is the minimum amount of macro-ions to reverse the sign of ζ -potential of the spheres in the first absorption step. Alternative sign reversal in the zeta-potential and the expansive-contractive thickness changes are observed by the repeated and alternative addition of macro-cations first and macro-anions next. During the multiple absorption, pH and conductivity values decrease and increase continuously as number of absorbed layers increases. When the macro-anions are added first, the sign reversal in the ζ -potential and the reversible expansion and contraction do not occur. Breaking of the alternative multiple-type absorption occurs when equivalency in the amount of dissociative groups of macro-cations and -anions is broken. Synchronous conformational changes of macro-cations and -anions in the multiple-absorbed layers, where balancing of the conformational rigidities with the multiple electrostatic attraction and repulsion between macro-cations and -anions are strongly supported