

Effects of Molecular Weight and Ionic Strength on the Adsorbing Dynamics of Polyelectrolyte Chains onto Colloidal Particles

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高分子電解質はコロイド粒子表面に吸着し架橋作用を出現させるため、コロイドの凝集剤として広く用いられているが、溶液中の高分子鎖がどのようにしてコロイド粒子表面へ吸着し、架橋作用を出現させるか、その機構の動力学は十分明らかではない。その機構にアプローチするために、ここでは裸のコロイド粒子に粒子と反対符号の荷電を持つ高分子電解質を吸着させていったときの電気泳動移動度の変化を経過時間の関数としてモニターした。その結果、イオン強度が低く、高分子の分子量が大きいとき、吸着時の緩和速度が著しく低下することが見出された。

The kinetics of the adsorption of a polyelectrolyte onto oppositely charged colloidal particles were measured by means of electrophoresis as a function of the molecular weight of the polyelectrolyte and the ionic strength of the solution. In the experiment, the dispersion of bare PSL particles was mixed with a solution of Dimethylaminoethyl methacrylates quaternized with methyl chloride of three different molecular weights. The rate of electrophoretic mobility of a PSL particle, which remained as a singlet, was measured against the mixing time elapsed after the onset of flocculation. The shape of the kinetic curves is typical: a linear increase for a short period followed by a plateau, implying the saturation of the colloidal surface by the adsorbed polyelectrolyte. In the case of low ionic strength, the plateau value was dependent on the molecular weight of the polyelectrolyte. That is, a lower plateau value was detected when the molecular weight of the polyelectrolyte was smaller and its concentration was lower. However, the amount of adsorption was kinetically controlled only for the case of higher molecular weight. In the case of high ionic strength, the plateau value of electrophoresis was constant, regardless of the polyelectrolyte concentration and molecular weight. These data will ultimately be useful in further analysis of the flocculation behavior of colloidal particles with polyelectrolytes.

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