Ion-Association Analysis between Inorganic Anions and Symmetrical Tetraalkylammonium Ions in Aqueous-Acetonitrile Media by Capillary Zone Electrophoresis

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Abstract

Weak ion-association equilibrium was analyzed in a water-acetonitrile solution at 25 °C by capillary zone electrophoresis using an ordinary silica capillary. The ion associates examined were formed between some inorganic anions and symmetrical tetraalkylammonium ions, where a series of acetonitrile compositions up to 62.2% (m/m) were investigated. Ion-association constants, Kass, were determined by analyzing the changes in the electrophoretic mobility; the Kass values for most of the anions increased up to about 47% (m/m) acetonitrile, beyond which they remained constant, or decreased slightly. The ion-association equilibrium between tetramethylammonium and bromide ions in aqueous-acetonitrile and in aqueous-ethanol media were compared through the Gibbs free energy of transfer, which revealed that the extent of the equilibrium in aqueous-acetonitrile media is dependent mainly on the increasing instability of Br-. On the other hand, those in aqueous-ethanol media depend on the instabilities of both tetramethylammonium and bromide ions.