An Investigation of Weak Ion Association Equilibria between Inorganic Anions and Tetraalkylammonium Ions in Ethanol–Aqueous Media Using Capillary Zone Electrophoresis

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Abstract

Weak ion association equilibria between inorganic anions, ranging in charge from −1 to −4, and symmetrical tetraalkylammonium ions, R_4N^+ (R = Me, Et, Pr, Bu, *n*-Am), were investigated in formate buffer solutions containing a variable composition of ethanol (0–62.9% (m/m)). The individual effective mobilities of the inorganic anions in a series of tetraalkylammonium chloride solutions were measured using an ordinary silica capillary maintained at 25.0 ± 0.1 °C under a negative potential (−10 kV) and direct UV detection (λ = 220 nm). Under the stated experimental conditions, the association constants, K_{ass}, showed a modest increase as the amount of ethanol in the buffer was increased. The concepts of medium effect and Gibbs free energy of transfer were applied to weak ion equilibria in order to investigate changes in association constant as the ethanol content in the buffer solutions was increased. The above treatment on selected associations revealed that the increased instability of the inorganic anion in mixed ethanolic solutions is responsible for the observed increase in K_{ass}.