Triple Ion Formation in Solutions of [emim][BF₄] and [bmim][BF₄] in Dichloromethane at Various Temperatures. A New Method of Analysis of Conductivity Data

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Detailed conductometric studies of solutions of the imidazolium-based ionic liquids 1-ethyl-3-methylimidazolium tetrafluoroborate [emim][BF₄] and 1-butyl-3-methylimidazolium tetrafluoroborate [bmim][BF₄] in the low-permittivity solvent dichloromethane have been carried out from ($6 \cdot 10^{-4}$ to $1 \cdot 10^{-2}$) mol dm⁻³ in the temperature interval of (278.15 - 303.15) K. A new method of analysis of conductivity data based on the low concentration Chemical Model (lcCM) has been developed and successfully applied to the solutions containing free ions, ion pairs, and triple ions in order to obtain the triple ion formation constants K_T and the limiting molar conductances of triple ions $\Lambda_{o,T}$. The values of limiting molar conductances at various temperatures were used to calculate the Eyring's activation enthalpy of charge transport. The thermodynamic parameters of triple ion formation such as standard Gibbs energy, enthalpy, and entropy were also calculated from the temperature dependence of the triple ion formation constants.

Keywords: conductance, ion association, triple ions, dichloromethane.

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