Thermodynamic Investigation on Intermediate of Room Temperature Ionic Liquid: The Heat Capacity and Thermodynamic Function of EMIC, BMIC and PMIC

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Room temperature ionic liquids (RTILs) have emerged as a new kind of media alternative to the conventionally used organic solvents, which are generally volatile, flammable, and hazardous chemicals [1-3]. Even though the solvent properties of different halogenoaluminate (Ⅲ) ionic liquids (ILs) were studied as early as in 1986 [4], very little is known about the various properties of the contemporary ionic liquids and their intermediates despite their extensive usage in synthetic applications. We refer, for instance, to that data of heat capacity, standard enthalpy of formation and other thermodynamic functions, which are paramount for the design of technological processes and these data are very scarce [5]. As a continuation of previous investigations of RTILs [6], in the present study the molar heat capacities of intermediates of RTILs such as EMIC (1-ethyl-3-methylimidazolium chloride), BMIC (1-methyl-3-butylimidazolium chloride) and PMIC (1-methyl-3-pentylimidazolium chloride) were measured by an adiabatic calorimeter in temperature range from 80 to 390 K. The dependences of the molar heat capacity on temperature were given as a function of the reduced temperature (X) by polynomial equations in different temperature ranges. Based on the measured heat capacity data and thermodynamic relationship, the values of corresponding thermodynamic function of the EMIC, BMIC and PMIC relative to 298.15 K were calculated. The dissimilarity of thermodynamic functions of these intermediates was discussed. The glass translations and the phase translations of EMIC, BMIC and PMIC were observed. The enthalpy and entropy of the transitions were calculated, and the difference of these intermediates was investigated.

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