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1.1 Ionic Liquids

During the past decades, ionic liquids (ILs) have attracted considerable attention of the academic and industrial chemical community, because their unique physico-chemical properties and sometimes environmentally friendly character offer a great variety of prospective applications. These molten salts with melting temperatures often defined below 100°C have been recognized as novel "designer" materials.

The early history of ILs began in 1888 by report of Gabriel [1] on the discovery of ethanoammonium nitrate, which has a melting point of 52–55°C. Ethylammonium nitrate, formed by neutralization of ethylamine with concentrated nitric acid and with melting point of 12.5°C, was the first truly room-temperature IL discovered by Walden [2] in 1914. After the World War II, the scientists re-emerged back to the issue of ILs, with the main objective on electrodeposition of aluminum using chloroaluminate(III) ILs. Many researchers attempted to describe properly the thermodynamic behavior of chloroaluminate(III) ILs bearing the imidazolium or pyridinium cations [3], but their industrial application had serious limitations due to their high sensitivity to moisture followed by undesirable decomposition. In 1992, Wilkes and Zawrotko [4] reported on preparation of moisture insensitive, water soluble, but hygroscopic ILs containing 1-ethyl-3-methylimidazolium cation and acetate, nitrate and tetrafluoroborate anions. Later, in 1996, Bonhôte *et al.* [5] extended the number of existing ILs with more hydrophobic, mostly heavily fluorinated anions.

Ions of Ionic Liquids

Most common ionic liquids are formed through the combination of an organic heterocyclic cation, and an inorganic or organic anion. Typical cations and anions of ionic liquids, and their common abbreviations, are shown in Figure 1.1 and 1.2, respectively. In cations A, B and D–F the R_1 is mostly $-CH_2/H-$ and R_2 is $-C_nH_{2n+1}$ or in other way modified longer alkyl chain (ethylene glycol units, fluorinated). Cations G–I are mostly fully alkylated with alkyl chain of single type or the R_1 , R_2 are of different lengths. In cations J–L the R_1 is mostly a methylene group CH_2 or hydrogen $-H$. Now turn to the anions. In anion C, the $-C_nF_{2n+1}$ can be of length $n = 1 - 4$ [6]. In anion D the fluorine atoms can be substituted by any perfluoroalkyl chain with final general formula $B(C_nF_{2n+1})_x F_{1-x}^-$ ($n = 1, 2$ and $x = 0 - 4$) [7]. Stemming from the big potential of an almost unlimited number of such variations, still new ILs are being prepared to extend the existing portfolio. For exam-