Synthesis and Characterization of 1-(2-Hydroxyethyl)-3-Methyl Imidazolium and N-(2-Hydroxyethyl)-N-Methyl Morpholinium Ionic Liquids

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In this study, various ionic liquids (ILs) were prepared, via metathesis reactions, from two kinds of cations: 1-(2-hydroxyethyl)-3-methyl imidazolium ($[HEMIm]^+$) and N-(2-hydroxyethyl)-N-methyl morphorinium ($[HEMMor]^+$), and three kinds of anions: tetrafluorobarate ($[BF_4]^-$), bis(trifluoromethanesulfonyl)imide ($[TFSI]^-$), and hexafluorophosphate ($[PF_6]^-$). All of the $[HEMIm]^+$ derivatives were in a liquid state at room temperature. In particular, both $[HEMIm][BF_4]$ and [HEMIm][TFSI] showed no possible melting point from -150 to 200 ^oC by DSC analysis, and their high thermal stability until 380 ~ 400 ^oC was verified by TGA analysis. Also, their stable electrochemical properties (electrochemical windows of more than 6.0 V) and high ionic conductivities (0.002 to 0.004 $S \cdot cm^{-1}$) further confirm that the suggested ILs are electrolytes potentially usable in electrochemical devices. Simultaneously, the $[HEMMor]^+$ derivatives have practical value in electrolyte applications because of their easy synthesis procedures, cheap morpholinium cation sources, and the possibility of high Li^+ mobility because of the oxygen group in the morpholinium cation. However, $[HEMMor]^+$ derivatives with high viscosities usually had lower ionic conductivities than $[HEMIm]^+$ derivatives.