Abstract

Ionic liquids are an attractive possibility for battery electrolytes. Five ionic liquids were synthesized using a 1-alkyl-3-methylimidazolium (XMI+) cation, where the alkyl group was ethyl, propyl, butyl, pentyl, or hexyl, and a bis(pentafluoroethyl-sulfonyl)imide (Beti-) anion. The absorption and desorption of water, conductivities, densities, viscosities, decomposition temperatures, and electrochemical properties were studied. These ionic liquids were found to absorb less water than previously studied ionic liquids with tetrafluoroborate (BF4-) and hexafluorophosphate (PF6-) anions. Their conductivities decreased with longer alkyl chains on the imidazolium cation and were lower than ionic liquids with BF4- as the anion. The densities of the ionic liquids decreased with increasing temperature and alkyl chain length. Viscosities decreased with increasing temperature but increased with increasing chain length. All of the ionic liquids were found to be thermally stable to nearly 400 oC. The potential windows increased with increasing chain length, from 4.2 V (EMIBeti) to 4.7 V (HMIBeti).