Abstract

In this work the synthesis of five new Brönsted acidic [ionic liquids](https://www.sciencedirect.com/topics/chemistry/ionic-liquid) (BAILs) bearing same anion (camphorsulfonate) but different cations; 3-(3-sulfopropyl)-imidazolium, 1-methyl-3-(3-sulfopropyl)-imidazolium, 1-methyl-3-(4-sulfobutyl)-imidazolium, 1-ethyl-3-(3-sulfopropyl)-imidazolium, 1-butyl-3-(3-sulfopropyl)-imidazolium) were synthesized and characterized. The characterization of BAILs was carried out using NMR, FTIR and [elemental analysis](https://www.sciencedirect.com/topics/chemistry/elemental-analysis) (CHNS). The [thermophysical properties](https://www.sciencedirect.com/topics/chemistry/thermodynamic-property) of these ILs such as density, [refractive index](https://www.sciencedirect.com/topics/chemistry/refractive-index), viscosity and thermal stability were analyzed in wide temperature window. Furthermore, the effect of alkyl chain length of cations on thermophysical properties was well studied. The experimental values of density were further used to calculate other significant properties such as [molar volume](https://www.sciencedirect.com/topics/chemistry/molar-volume), standard molar entropy, [lattice energy](https://www.sciencedirect.com/topics/physics-and-astronomy/lattice-energy) and [thermal expansion coefficients](https://www.sciencedirect.com/topics/chemistry/thermal-expansion-coefficient). The Brönsted acidities of investigated ILs were determined using Hammett method. Furthermore, COSMO-RS study was performed to determine δ-surface, and δ-profile of the studied ILs.

