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Speed of sound in ionic liquids with a common ion as a function of pressure and temperature.

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Abstract

The speed of sound was determined within the temperature and pressure intervals (283.15-343.15) K and (0.1-95) MPa for a set of ionic liquids with a common ion. The selected ionic liquids were composed by the bis(trifluoromethylsulfonyl)imide anion with 1-butylmethylpiperidinium, 1-butylmethylpyrrolidinium, triethylsulfonium and 1-butylpyridinium cations, and by the 1-butyl-3-methylimidazolium cation with dicyanamide, hexafluoroantimonate, trifluoromethanesulfonate and methylsulfate anions. The analysis of the experimental data together with those available in literature reveals that changes in the chemical structure of anion have a much stronger influence over this magnitude than those in the cation. In addition, a clear inverse correlation between speed of sound and the ionic liquid molar mass was detected. Since data against temperature and pressure are available, the speed of sound derivatives against these variables were also determined; low values as compared with other liquids were obtained, with no clear correlation against chemical nature of the ionic compound.

Keywords: Ionic liquids, speed of sound, pressure.

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