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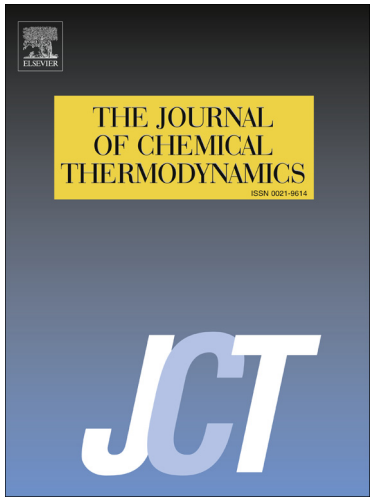

Measurement of high pressure densities and atmospheric pressure viscosities of alkyl phosphate anion ionic liquids and correlation with the ε*-modified Sanchez-Lacombe equation of state

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Measurement of high pressure densities and atmospheric pressure viscosities of alkyl phosphate anion ionic liquids and correlation with the ε^*-modified Sanchez-Lacombe equation of state

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Abstract

High pressure densities up to 200 MPa from 313 to 393 K and atmospheric pressure viscosities from 293 to 373 K for two alkyl phosphate anion ionic liquids, 1-ethyl-3-methylimidazolium dimethylphosphate ([emim][DMP]) and 1-butyl-3-methylimidazolium dimethylphosphate ([bmim][DMP]), are reported. Several forms of the Tait equation were applied and all forms could correlate the data to within 0.03 % average relative deviation (ARD). The derivative properties calculated had specific trends for the ionic liquids. The ε^*-modified Sanchez-Lacombe equation of state could correlate the data to within an ARD of 0.07 %, and the deviations were lower than those of the original Sanchez-Lacombe equation of state (0.19 %). The improvement by ε^*-modified Sanchez-Lacombe equation of state can be attributed its assumed close-packed density structure at low temperature.

Keywords: ionic liquid, density, viscosity, equation of state

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