

Effect of the Temperature and Pressure on the Viscosity of Ionic Liquids: Measurements and Modelling

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Viscosity of ionic liquids (ILs) varies from low-viscosity fluids, similar to common organic solvents, to glasslike extremely viscous fluids. This property depends strongly on the molecular structure and is highly dependent on the interactions between the ions: electrostatic, van der Waals interactions and hydrogen bonding. We have analysed the effect of the structure on the viscosity and its temperature dependence [1,2]. Despite of the large amount of studies of viscosity of ILs at atmospheric pressure, viscosity database of these fluids at high pressure is still scarce [3-4]. In this work we present viscosity measurements for eight ILs performed by means of a falling-body viscometer at several temperatures and at pressures up to 150 MPa. The cations of these ILs are of pyrrolidinium and imidazolium types whereas the anions are triflate, ethylsulfate and other imide and phosphate derivatives. Experimental data were used to check the application of the thermodynamic scaling approach as well as the hard-sphere scheme to these ILs. Furthermore, the film forming capability for elastohydrodynamic lubrication of these liquids was evaluated and compared with those of other lubricants.

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References

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