On the viscosity of two 1-butyl-1-methylpyrrolidinium ionic liquids: effect of the temperature and pressure - DTU Orbit (29/12/2018)

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A new calibration procedure was used and four new temperature probes have been placed on a falling-body viscometer to improve its accuracy. The new configuration and calibration procedure allow measuring viscosities with an uncertainty of 3.5% at pressures up to 150 MPa. This device was employed to measure viscosities as a function of temperature and pressure for two ionic liquids (ILs): 1-butyl-1-methylpyrrolidinium tris(pentafluoroethyl)trifluorophosphate and 1-butyl-1-methylpyrrolidinium trifluoromethanesulfonate. Besides, we have measured the flow curves at pressures up to 75 MPa and shear rates up to 1000 s⁻¹ in a Couette rheometer. Dynamic viscosities were correlated as a function of temperature and pressure with four different equations with average absolute deviation lower than 1%. The pressure-viscosity and temperature-viscosity derived properties were analyzed and compared with those of other ionic liquids. Furthermore, experimental data were used to check the application of the thermodynamic scaling approach as well as the hard-sphere scheme. Both models represent the viscosity values with average relative deviations lower than 2%.

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