Thermophysical Properties of 1-Methyl-3-Octylimidazolium Tetrafluoroborate at High Pressures and Over Wide Range of Temperatures

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Room temperature ionic liquids (ILs) are salts that are liquids at ambient temperatures and pressures. They are excellent solvents for a broad range of polar organic compounds and they show partial miscibility with aromatic hydrocarbons. IL's are composed of bulky ions, have very small vapor pressure, low melting point, high solvating capacity, high ionic conductivity and high thermal stability, which make them attractive for practical applications. Thermophysical properties of IL's make them very suitable as heat transfer fluids and short heat term storage in power plants. Therefore, the thermodynamic and structural properties of ILs are urgently needed for the design of many technological processes. In this presentation, we inform about the (p,ρ,T) data of 1-methyl-3-octylimidazolium tetrafluoroborate [OMIM][BF4] at T = (283.15 to 413.15) K and pressures up to p = 140 MPa with an estimated experimental relative combined standard uncertainty of $\Delta\rho/\rho$ = ±(0.01 to 0.08) % in density. The measurements were carried out with an Anton- Paar DMA HPM vibration- tube densimeter. The temperature within the measuring cell where the U – tube is located is controlled using a thermostat (F32 - ME Julabo, Germany) with an error of ±10 mK and is measured using the (ITS-90) Pt100 thermometer (Type 2141) with an experimental error of ±15 mK. Pressure is measured by pressure transmitters P-10 and HP-1 (WIKA Alexander Wiegand GmbH & Co., Germany) with a relative uncertainty of (0.1 and 0.5) % respectively, of the measured value. An empiric equation of state fitted to the experimental (p,ρ,T) data of [OMIM][BF4] as a function of pressure and temperature is presented. This equation is used for the calculation of thermophysical properties of this IL, such as isothermal compressibility, isobaric thermal expansibility, thermal pressure coefficient, internal pressure, isobaric and isochoric heat capacities, speed of sound and isentropic expansibility. The literature (p,ρ,T) values of [OMIM][BF4] were compared with our values and good agreement was obtained.