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Thermophysical properties of ionic liquids (ILs) are of great importance for their application as new liquid materials. For instance, ILs that show a good thermal stability, melting points in the range of 25–100°C and high enthalpies of melting may be considered for use as thermal energy materials. Furthermore, ILs with a large liquid range and high energy density reflected in a large value of heat capacity are often considered as alternatives to existing thermal fluids[1]. In our work, phase transitions were thus measured for 1-butyl-3-methylimidazolium methanesulfonate by differential scanning calorimetry (DSC) and by the Heat-Leak-Modulus (HLM) method. This method developed by Quirion et al. allows for a simple thermal analysis of materials[2]. The information provided by the HLM method is essentially equivalent to that obtained from differential scanning calorimetry (DSC) measurement. While being more robust than DSC, it provides a good reproducibility of the measured temperatures of melting and is thus suitable for a quick screening of the phase transitions in the studied materials. The DSC measurements by means of a heat-flux TA Q1000 calorimeter were then used to corroborate the values obtained by means of HLM. Both methods gave comparable results in terms of enthalpy and temperature of melting, but the DSC thermogrammes point to a more complex behaviour than that found by the HLM method. Thermophysical properties of chosen IL strongly depend of thermal history and water content. For a deeper understanding of the measured values, non-statistical methods based on mathematical gnostics were then applied for data analysis and correlation. Finally, the heat capacity has been also predicted by an in silico method based on the COSMO-RS model[3].

References

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