Fast scanning calorimetry - Convenient technic for vaporization study of aprotic and protic ionic liquid

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The experimental determination of the absolute vapor pressure for such extremely low volatile compounds as ionic liquids (ILs) is still a challenging task. The conventional methods used to study such materials have a limited temperature range since they are limited towards low temperatures and low vapor pressures by sensitivity and towards high temperatures by stability of the compounds. So the determination becomes very time-consuming and also less reliable due to the possible decomposition of ILs at elevated temperatures.

The recently developed Ultra-fast scanning calorimetry method was applied to determine the absolute vapor pressures of ionic liquids. This technic allows heat capacity measurements of nomogram samples at heating rates up to 10^6 K s^{-1} giving the possibility to determine the vaporization rate even at high temperature range and to decrease drastically the experimental time. The DFSC-technique has shown reliable absolute vapor pressure data for ionic liquids over a temperature range from 400 to 780 K.

The study was performed under different inert atmospheres (N_2, He, SF_6), which one needs to distinguish between evaporation and decomposition of the ILs. The mass loss rates per unit of area were compared for the different gasses since the decomposition is independent of the ambient gas unlike the evaporation process, and it has been proofed the absence of decomposition during the evaporation.

The thermodynamic parameters of vaporization of these ILs were also calculated from the corresponding vapor pressures data, the agreement of the vapor pressure and the evaporation enthalpies with the literature data is remarkably good and proofs the reliability of the device to determine vapor pressures and evaporation enthalpies.