Maximum operation temperature of ethyl-methyl-imidazolium halides

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Within this project, decisive information on main characteristics of the solid and liquid states, and maximum operating temperatures of ethyl-methyl-imidazolium halides were to gather [1].

As ionic liquids tend to form non-equilibrated melt with extensive ranges of subcooling, special attention has been paid to the investigation of processes during solidification and crystallization including the determination of a complete data set of thermochemical properties, namely melting and solidification temperatures, enthalpies of fusion and crystallization, and glass transition. Differential scanning calorimetry (DSC) was used to characterize the [EtMeIm]*X* (*X* = Cl, Br, I) from −100 °C to RT. In the temperature range RT ÷ 600 °C the short-term thermal stability of selected substances has been investigated by dynamic thermogravimetric analysis (TG/DTA) coupled with a mass spectrometer (MS).

The thermal stability of ionic liquids, and thus, their applicability can hardly be described by decomposition temperatures that are derived from standard evaluation methods of thermogravimetric analysis. Therefore, the *maximum operation temperatures* were estimated based on a kinetic model using non-isothermal TG-measurements at different heating rates. Thereby, with insignificantly low vapor pressure of the ionic liquids, the thermal decomposition is assumed to be the dominant process, which is described by a first order kinetic model. Finally, based on mass spectrometric scans the decomposition mechanism of [EtMeIm]*X* (*X* = Cl, Br, I) during thermal degradation was suggested.

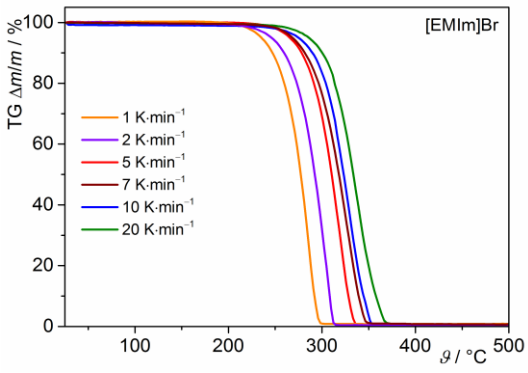

Figure 1: Ramped temperature thermogravimetric (TG) curves of [EMIm]Br at a heating rate of 1, 2, 5, 7, 10 and 20 K/min.

[1] A. Efimova, L. Pfützner, P. Schmidt, *Thermochim. Acta* **604** (2015) 129-136.

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