Optimization of TGA Control Parameters

for Long-Term Thermal Stability Prediction of Ionic Liquids

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For multifarious applications of ionic liquids (ILs) the knowledge of characteristic caloric properties, as well as the thermal and electrochemical stability at low and high temperatures is essential. Indeed, the application temperatures of ILs can be insufficiently described by decomposition temperatures resulting from standard thermogravimetric analysis (TGA) [1].

In order to describe the time-dependent long-term stability of the ILs, TGA has been applied in combination with an optimized kinetic model using an isoconversional method of determination of activation energy. The concept was named maximum operating temperature (MOT) [1-3].

Dynamic measurements of 1-methyl-3-propylimidazolium iodide at heating rates of 1, 2, 5, 7, 10 and 20 K/min were performed. As a highly sensitive determination of decomposition temperatures at conversion of α = 1% is required for the prediction of long-term thermal stability, the influence of various control parameters of the TGA apparatus has been analyzed in detail.

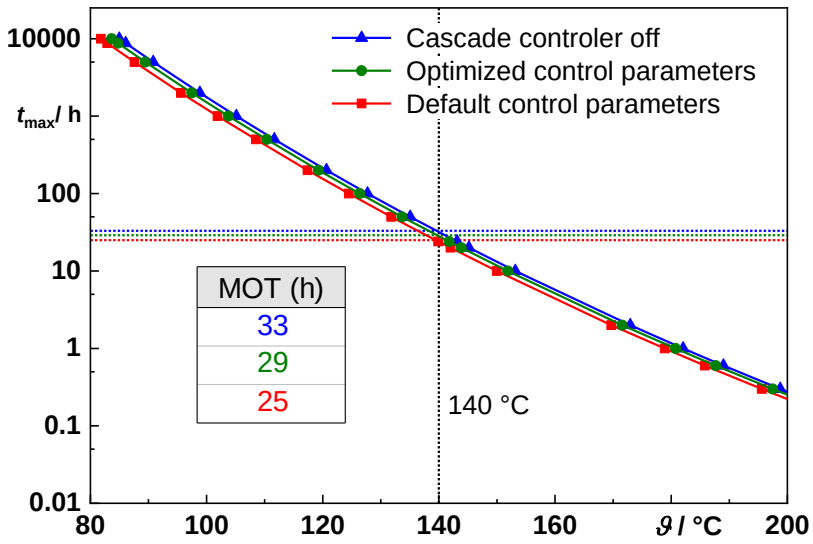

Figure 1: Comparison of MOT-curves with different setup parameters.

Here the comparison of the resulting differences of the TG- and corresponding MOT-curves in dependence of the control parameters is given. The measured mass losses and the predicted MOT as a function of the applied setting parameters of the TGA device are compared. (Fig. 1).

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[2] A. Seeberger, A.-K. Andresen, A. Jess, *Phys. Chem. Chem. Phys*. **2009**, *11*, 9375–9381.

[3] A. Efimova, J. Varga, G. Matuschek, M.R. Saraji-Bozorgzad, T. Denner, R.Zimmermann, P. Schmidt, *J. Phys. Chem. B*, **2018**, *122 (37)*, 8738–8749.