

Evaluation of eutectic mixtures for use as PCM

Thermodynamic modeling and experimental methods

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The investigation and optimization of the thermochemical properties of phase change materials (PCM) is very complex. Since there are currently no suitable concepts for the rational planning of PCM systems, procedures for the efficient screening of these systems have to be established.

With the help of thermochemical calculation methods (CalPhaD method) [1] on the one hand, extended insights into the phase equilibria of eutectic systems are obtained, on the other hand, time-consuming calorimetric measurements can be specified and a 'trail-and-error' procedure avoided.

Within the eutectic system of the salt hydrates $\text{Mn}(\text{NO}_3)_2 \cdot 4\text{H}_2\text{O}$ and $\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ a large number of DSC measurements have already been carried out for the determination of characteristic temperatures and latent heats [2]. The modeling of the phase diagram is intended to support these measurements as well as other measurements used to clarify the system.

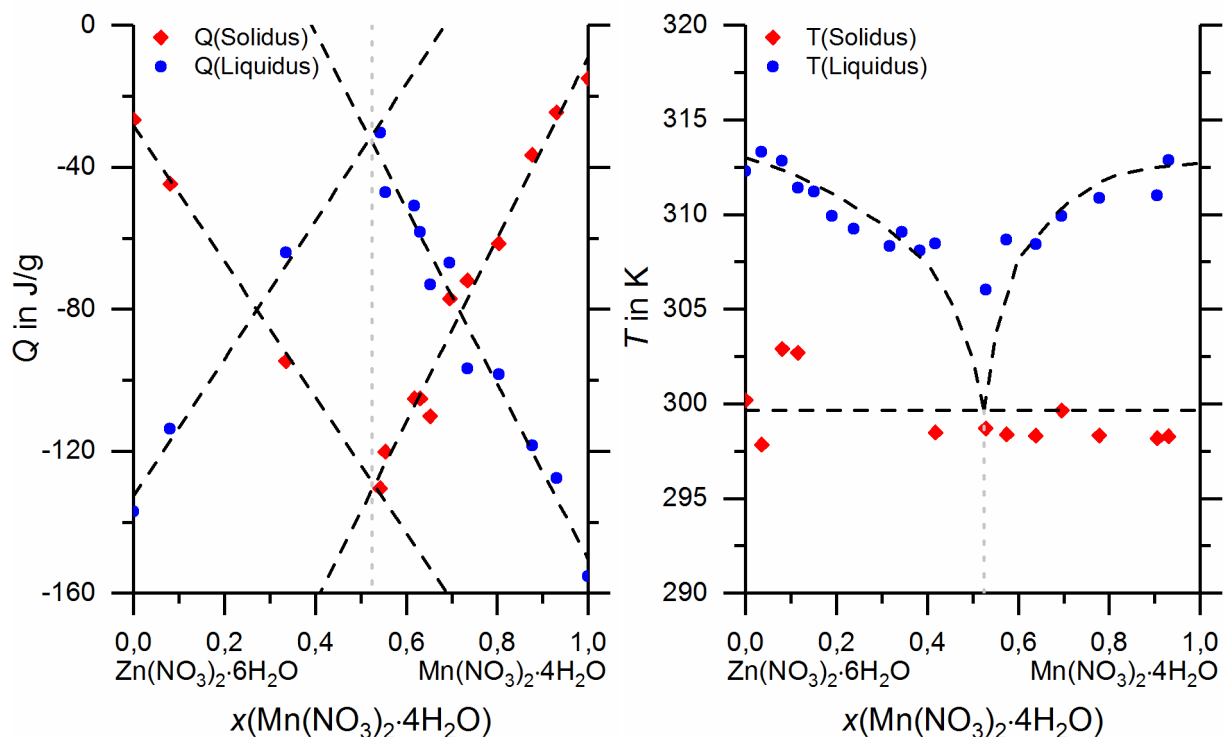


Figure 1: a) Designation of the eutectic point based on the enthalpy contributions of the mixtures (TAMMAN-Plot) and b) predicted phase diagram of the salt hydrates

[1] C. W. Bale, E. Bélisle, P. Chartrand, S. A. Deckerov, G. Eriksson, K. Hack, I. H. Jung, Y. B. Kang, J. Melançon, A. D. Pelton, C. Robelin and S. Petersen, *FactSage Thermochemical Software and Databases - Recent Developments*, Calphad, vol. **33** (2009) 295-31.

[2] S. Pinnau, A. Efimova, P. Schmidt, M. Mischke, *Identifikation technischer Salze als Latentspeichermaterialien im Temperaturbereich von 4 bis 15 °C und deren Verkapselung*. BMWi-Forschungsbericht, Bundesministerium für Wirtschaft und Technologie (2013) 1-92, DOI: 10.2314/GBV:786966173.