

PCM Screening: current state of experimental work on high temperature PCMs

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We continue to work on the development of thermodynamic database, which should include the main components Na^+ , K^+ , $\text{Ca}_2^+ // \text{NO}_3^-$, Cl^- . This database should help us to identify new high temperature phase change materials.

In this work binary and reciprocal phase diagrams were studied using differential thermal analysis (DTA) and high temperature X-ray diffraction (HTXRD). Thermodynamic properties of pure and intermediate compounds as well as selected eutectic mixtures were measured by differential scanning calorimetry (DSC). Kinetic effects were observed during the study of the K^+ , $\text{Ca}^{2+} // \text{Cl}^-$, NO_3^- and Na^+ , K^+ , $\text{Ca}^{2+} // \text{NO}_3^-$ systems. For example Fig. 1 shows undercooling effects in the KNO_3 - $\text{Ca}(\text{NO}_3)_2$ system. Also thermal stability/vapor pressures of pure compounds have been measured with the thermal gravimetry (TG) and the Knudsen effusion mass spectrometry (KEMS). The obtained vapor pressures were compared with calculated values from available databases. Large discrepancies have been found, which can have significant influence on the prediction of thermal stability of PCMs.

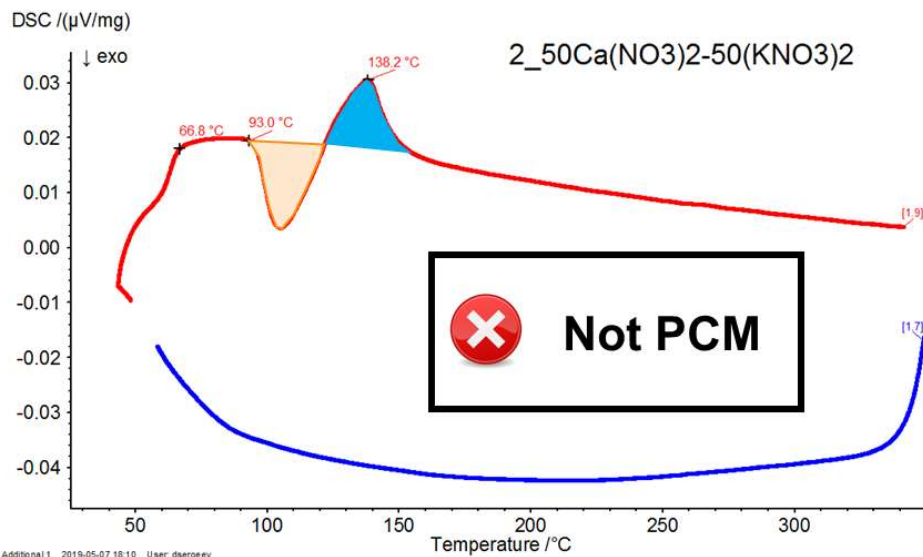


Fig. 1 DTA heating and cooling curves of the $50\text{Ca}(\text{NO}_3)_2$ - $50(\text{KNO}_3)_2$ mixture

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