Measuring thermo-physical properties for an open-source PCM reference library

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Thermal energy storage (TES) systems are of utmost importance to the energy turnaround, i.e. the proliferation of renewable energy sources. One promising application of storage is in the form of latent heat with a phase change material (PCM). To select the right PCM for a given application, the thermo-physical properties must be known for a proper and concise evaluation process. Measuring thermo-physical properties of PCM in a consistent and reliable manner is essential for system layout of thermal energy storages and correspondingly material selection. Therefore, a consistent measurement methodology using Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA) has been developed and applied to determine the thermo-physical properties of different PCM classes [1].

A collaboration between Mettler Toledo and the Lucerne University of Applied Sciences and Arts resulted in a collection of thermo-physical properties of more than 70 PCM. These materials comprise of alcohols, sugar alcohols, esters, paraffins, fatty acids, eutectics and salt hydrates that were all measured with the same protocol defined in the publication of Müller et al. [1]. This allows a comparison and the correlation of thermo-physical properties with inherent material parameters of the different classes are enabled. For all mentioned materials thermo-physical data has been measured, containing enthalpy, melting temperature, density, and other parameters. In the newest version of the library, even commercial products of two major companies are included. All the data is published and available to the scientific community through the latest release of the PCM library by Mettler Toledo.

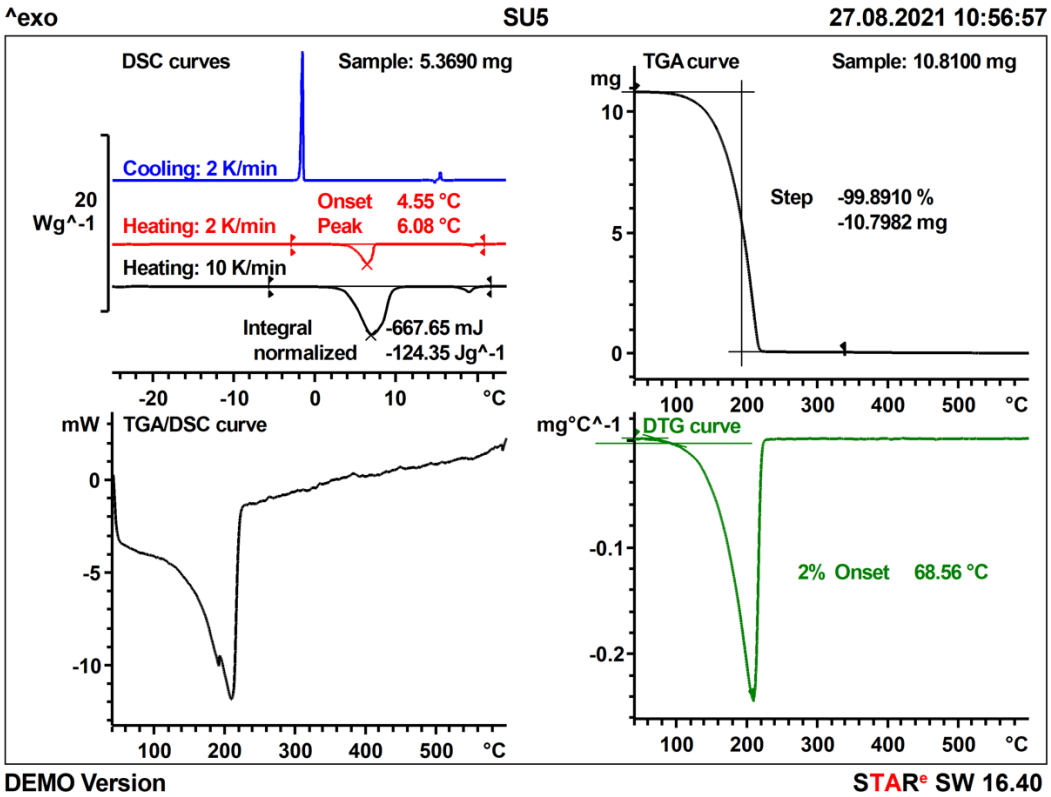

Figure 1: Example of an entry in the library.

References:

[1] Müller, L., Rubio-Pérez, G., Bach, A., Muñoz-Rujas, N., Aguilar, F., & Worlitschek, J. (2020). Consistent DSC and TGA methodology as basis for the measurement and comparison of thermo-physical properties of phase change materials. *Materials*, *13*(20), 4486.