Choline Chloride Thermophysical and Phase Change Studies: Relevance for the Representation of Eutectic Systems

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Choline chloride is omnipresent in (deep) eutectic systems studies. The primordial work from Petrouleas and Lemmon[1] shed light on a well-defined solid-solid transition, but the same level of reliability is yet to be found concerning other properties, such as the melting temperature and enthalpy, among others. In 2017, we first proposed a methodology to estimate the melting properties of choline chloride,[2] allowing us to model (deep) eutectic systems containing choline chloride and opening a line of research, as demonstrated by the works of Pyykkö[3], Kollau et al.[4], or Bruinhorst et al.[5]

Following these first significant efforts to characterize choline chloride thermal properties, we were able to contribute much by measuring the enthalpy and temperature of the solid-solid transition, the heat capacities of both solid phases, estimating solid-liquid heat capacity change at 298.15 K, and the thermal decomposition of choline chloride.[6] Additionally, the solid-liquid phase diagram of the choline chloride + water binary system was measured in the whole composition range, characterizing the eutectic coordinates and some peculiarities in the solid-solid transition in the binary system. A detailed analysis of all data is shown in this communication, comparing and testing different values and their impact on the representation of binary phase diagrams. The very recent new data from fast-DSC[5] are explored, highlighting challenges for a complete description of that compound and systems.

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