

Modeling of Enthalpy and Heat Capacity of Phase-Change Materials

Authors : Igor Medved, Anton Trnik, Libor Vozar

Abstract : Phase-change materials (PCMs) are of great interest in the applications where a temperature level needs to be maintained and/or where there is demand for thermal energy storage. Examples are storage of solar energy, cold, and space heating/cooling of buildings. During a phase change, the enthalpy vs. temperature plot of PCMs shows a jump and there is a distinct peak in the heat capacity plot. We present a theoretical description from which these jumps and peaks can be obtained. We apply our theoretical results to fit experimental data with very good accuracy for selected materials and changes between two phases. The development is based on the observation that PCMs are polycrystalline; i.e., composed of many single-crystalline grains. The enthalpy and heat capacity are thus interpreted as averages of the contributions from the individual grains. We also show how to determine the baseline and excess part of the heat capacity and thus the latent heat corresponding to the phase change.

Keywords : averaging, enthalpy jump, heat capacity peak, phase change

Conference Title : ICCEM 2017 : International Conference on Civil Engineering and Materials

Conference Location : Vancouver, Canada

Conference Dates : August 07-08, 2017