

A Simple Method of Low-Melting-Temperature Phase Change Materials (PCM) Thermal Characterization

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Abstract

Successful implementation of a high-efficient latent heat storage system necessitates an appropriate experimental approach to investigate and quantify the Phase Change Material (PCM) thermal properties variations caused by its aging, as well as its disaggregation induced by cyclic melting and freezing. In this paper, we present a simple concept for PCM off-line characterization. The proposed method is a relatively simple and easy to be implemented. It consists of cyclic heating and cooling the PCM sample placed into a tube and monitoring the temperature evolution inside the probed material using a set of temperature probes. In order to improve the accuracy of the measurement of the PCM thermal parameters, the experimental conditions are chosen such that the Biot number is greater than 0.1. Accordingly, in the numerical model, it is important to account for the different possible temperature gradients in the PCM sample. In our work, the temperature history of the PCM sample, as well as its sensitivity to the PCM's thermal parameters has been numerically investigated using the COMSOL Multiphysics® software. The computational results were compared with the experimental ones.