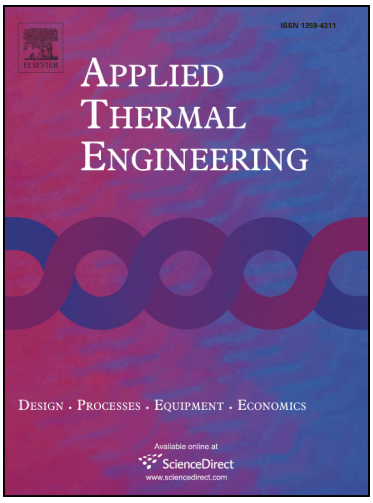

Research Paper

Effect of Phase Transition Temperature and Thermal Conductivity on the Performance of Latent Heat Storage System

Yu Bie, Ming Li, Reza Malekian, Fei Chen, Zhikang Feng, Zhixiong Li

PII: S1359-4311(17)37909-7
DOI: https://doi.org/10.1016/j.applthermaleng.2018.02.036
Reference: ATE 11818

To appear in: *Applied Thermal Engineering*

Received Date: 13 December 2017
Revised Date: 7 February 2018
Accepted Date: 11 February 2018

Please cite this article as: Y. Bie, M. Li, R. Malekian, F. Chen, Z. Feng, Z. Li, Effect of Phase Transition Temperature and Thermal Conductivity on the Performance of Latent Heat Storage System, *Applied Thermal Engineering* (2018), doi: https://doi.org/10.1016/j.applthermaleng.2018.02.036

Effect of Phase Transition Temperature and Thermal Conductivity on the Performance of Latent Heat Storage System

Yu Bie [1, 2], Ming Li [1, *], Reza Malekian [3], Fei Chen [2], Zhikang Feng [1], Zhixiong Li [4, 5]

1 *Solar Energy Research Institute, Yunnan Normal University, Kunming 650500, China;*

2 *Faculty of Chemical Engineering，Kunming University of Science and Technology, Kunming 650500, China;*

3 *Department of Electrical, Electronic and Computer Engineering, University of Pretoria, Pretoria 0002, South Africa;*

4 *School of Mechatronics Engineering, China University of Mining and Technology, Xuzhou 221116, China*

5 *School of Mechanical, Materials, Mechatronic and Biomedical Engineering, University of Wollongong, Wollongong, NSW 2522, Australia*

Abstract: The heat transfer properties of phase change materials (PCMs) are of importance for the efficiency assessment on the heat storage and release in solar thermal systems. Previous research results demonstrate that the increase of thermal conductivity of PCMs can enhance the thermal performance in solar thermal systems; however, the corresponding mechanism is not clear. To this end, this work investigates the influence of PCMs properties on storage performance of solar thermal systems. First, experimental testing was conducted to verify the effectiveness of a thermal simulation model in the heat storage and release process. Then, the proposed simulation model was used to investigate the performance of several commonly used PCMs in the process of melting and solidification. The influence of thermal conductivity and phase transition temperature on the thermal storage properties was analyzed. The analysis results demonstrated that the influence of phase transition temperature on the thermal system performance was greater than that of the thermal conductivity in short time, while the thermal conductivity contributed greater influence on the system performance in long time. The phase transition temperature hardly affected the total system efficiency if given enough heat transfer time. The findings in this work may provide a theoretical reference for the selection of heat storage materials.

* Corresponding author. Tel.: +86 871 65517266.
E-mail address: lmllldy@126.com (M. Li).