Zhenduo Zhang et al., Madridge J Nanotechnol Nanosci. 2018
http://dx.doi.org/10.18689/2638-2075.a3.003

3rd International
Nanotechnology Conference & Expo
May 7-9, 2018 Rome, Italy

Heat Transfer Performance of paraffin/Nano-SiO_2 Nanocomposite for Thermo-Protective Applications

Zhenduo Zhang*, Jian Huang, Yanwei Hu and **Yurong He**
School of Energy Science and Engineering, Harbin Institute of Technology, China

In recent years, passive thermal protection has been desperately needed in those situations where extremely high temperature can result in serious security problems. Unlike traditional ways such as air cooling, thermal management systems using latent heat phase change materials have special advantages such as high thermal storage efficiency in relatively less temperature ranges, which will be helpful to optimize the operating temperature and improve the working conditions for complicated thermal systems such as thermal intelligent buildings and electronic devices. Introducing oxide nanoparticles into phase change materials is one of the effective ways to regulate thermal properties and guarantee the stabilization at the same time. Therefore, different oxide nanoparticles have been added to phase change materials to control their thermal conductivity. In brief, the main point for phase change nanocomposite is to ensure its controllable thermal properties and stability.

In this work, SiO_2 nanoparticles with 30 nm average size were added to paraffin wax to prepare the paraffin/Nano-SiO_2 nanocomposites. Significant thermal properties such as latent heat and specific heat capacity were measured using the differential scanning calorimeter (DSC) method. Meanwhile, a two-phase Lattice Boltzmann (LB) method was applied to simulate the melting process of the nanocomposites with different mass fractions of SiO_2 nanoparticles. It was found that compared to pure paraffin wax, adding SiO_2 nanoparticles could make a reduction on the latent heat and specific heat capacity of phase change materials. Besides, the proceeding speed of solid-liquid phase change process can be affected and controlled by means of addition of SiO_2 nanoparticles.

Acknowledgement: This work is financially supported by the National Natural Science Foundation of China (Grant No. 51676060), the Natural Science Founds of Heilongjiang Province for Distinguished Young Scholars (Grant No. JC2016009).

Biography:

Mr. Zhenduo Zhang obtained his B.S. Degree at Harbin Institute of Technology in China in 2017, and is a postgraduate student of Harbin Institute of Technology at present. His current research is concentrated on thermal energy storage and functional phase change materials.