

Study of PCM Systems Containing Metal-Metal Oxide Particles

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Organic phase change materials (PCMs) have the advantages of large phase change enthalpy, high stability and relatively low super-cooling temperature, but their heat conductivities are very low [1-3].

In the present work, 1-tetradecanol and palmitic acid were selected as PCMs, a series of PCM-metal (metal oxide) composite materials were in-situ synthesized in aqueous solution according to references [4,5] with some modification, and characterized by means of TG-DSC and XRD. In the case of palmitic acid composite materials with copper, the palmitic acid underwent a chemical transformation during the preparation process. The DSC analysis showed that the product exhibited endothermal peak at much high temperature than pure palmitic acid and the phase change enthalpy were much lower. However, their thermal stability was better than that of pure palmitic acid. In the case of 1-tetradecanol composite materials and copper, the copper was mainly in the forms of pure metal, but there was also copper oxide due to existence of oxygen during the preparation process. The composite of 1-tetradecanol and copper still had relatively large phase change enthalpy. Moreover, their phase change enthalpy could be correlated linearly with the loading of 1-tetradecanol. The composite materials demonstrated a good thermal stability under 200 degrees centigrade. It appears that there was no strong interaction between the metal particles and the 1-tetradecanol. It seems that the heat conduct coefficients of the materials were much larger than that of pure 1-tetradecanol and could be correlated linearly with the loading of metal particles.

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