

DEVELOPMENT OF PARAFFIN WAX INCORPORATED WITH ALUMINUM WASTE AS PHASE CHANGE MATERIAL FOR THERMAL ENERGY STORAGE

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Abstract:

In this paper, an investigation of a new innovation of heat storage properties of thermal conductivity enhancement via a newly formulated composite consists of paraffin wax incorporated with waste aluminum can from solid municipal waste as the potential PCM composite was studied. The samples composite were synthesized at different percentage of waste aluminum powder mass loading ranging from 0wt% until 100wt% into the paraffin wax and characterized. From differential scanning calorimetry (DSC) analysis, the rate of heat flow has been found to be increased as more mass loading of waste aluminum was added. However, the latent heat during melting and freezing of DSC data has reduced. This is due to the high amount filler which has reduced the amount of PCM, whereby latent heat is only absorbed/released by the PCM; not the filler/additive. Besides that, the thermal stability has improved strongly when waste filler is added rather than lone paraffin PCM. The density of waste composite PCM materials has also be found to be higher and thus, has increased the heat flow between the materials and improves the energy storage process. From the addition of filler, the smooth surface of lone paraffin has improved as the surface area has becoming to be rougher and shinier, thus resulted with higher contact surface area. Therefore, the new formulated waste PCM composite of paraffin wax incorporated with aluminum waste ranging from 60wt% and above could become a promising material for TES medium.

Keywords: Thermal energy storage (TES); Phase change material (PCM); Organic PCM; Paraffin wax; PCM composite; Waste material

ACKNOWLEDGMENT

The authors gratefully acknowledge MERCU Resolution Sdn Bhd. for kindly supporting this research work by giving the permission to collect solid sample waste at the Kg. Sg. Ikan landfill. The authors also would like to thank Universiti Malaysia Pahang for provision of research grant with vot. no. RDU170347.