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Effect of Carbon Black & Titanium Dioxide Dispersants on solidification of multiwall carbon nanotube added saltbased phase change material

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Abstract

The effect of carbon black and titanium dioxide (TiO₂) dispersants on solidification of potassium nitrate phase change material (PCM) with multiwall carbon nanotube (MWCNT) addition was investigated using the Fourier method of thermal analysis. On addition of 0.1 % of MWCNT, the solidification time of PCM decreased by 26 %, enhancing the heat release rates. A decrease in thermal diffusivity of the PCM was observed on addition of MWCNT particles. These benefits were observed to diminish over successive thermal cycles because of the agglomeration of MWCNT particles. To prevent the agglomeration of additives, dispersants such as carbon black and TiO₂ were used. In the presence of carbon black, the nanosalt PCM retained all the cooling curve parameters over 10 thermal cycles, preventing the agglomeration of nanoadditives. On the other hand, the dispersant TiO₂ significantly enhanced the thermal diffusivity property of PCM by virtue of its superior thermal conductivity. These are critical outcomes in development of nanosalt PCMs for thermal energy storage applications.

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