

## عنوان مقاله:

An experimental assessment of nanostructured materials embedded in a PCM-based heat sink for transient thermal management of electronic

## محل انتشار:

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## خلاصه مقاله:

In the present paper, an experimental assessment was performed on the transient thermal performance of a heat sink filled by a phase change material (PCM) and PCM embedded with carbon nanofibers (CNFs) and titania ( $\text{TiO}_2$ ) nanoparticles as nanostructured materials. In order to enhance the thermal conductivity of PCM, CNFs and  $\text{TiO}_2$  nanoparticles at different loadings (0.5 wt. % and 2 wt.% of CNFs and 2 wt.% and 4 wt.%  $\text{TiO}_2$ ) were dispersed by two-step method in to the molten PCM. The thermal conductivity and viscosity measurements showed an enhancement in composite thermal conductivity as well as an increment in viscosity. The heat sink was filled with PCM, PCM/CNF and PCM/ $\text{TiO}_2$  and experiments were accomplished by inputting power ranging from 3 W to 8 W. Results showed that filling the heat sink with PCM delayed the time to reach a typical temperature of  $35^\circ\text{C}$  by up to 11% for the power level of 8 W, while adding 2 wt.% of CNFs reduced this time by 15% and 4 wt.% of  $\text{TiO}_2$  nanoparticles improved by 2%. Generally, dispersion of  $\text{TiO}_2$  led to lower heat sink transient temperatures. However, adding 2 wt.% of CNFs and 4 wt.%  $\text{TiO}_2$  nanoparticles in to PCM at power level of 8 W raised the steady operation temperature by  $11^\circ\text{C}$  and  $0.3^\circ\text{C}$ , respectively.

## کلمات کلیدی:

heat sink, PCM, nanostructured material, thermal conductivity, transient operation

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