Synthesis and characterization of polyethylene glycol- polymethyl methacrylate infused multiwalled carbon nanotube nanocomposite as an efficient thermal energy storage

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ABSTRACT

Organic phase change materials (O-PCMs) are recommended thermal energy storage materials due to low super-cooling, non-corrosive in nature and no phase segregation. Nevertheless, the issue of low thermal conductivity and thermal stability in O-PCMs hinders their extensive use in thermal energy storage (TES). To address this problem, multiwalled carbon nanotube (MWCNT) is employed as nano conductive filler to improve thermal properties. In addition, polymethyl methacrylate (PMMA) as supporting material is used to reduce the steric hindrance effect of the PEG-1000 and enhance the chemical stability. In this research work, an ultrasonication technique is adopted to develop PEG-PMMA/MWCNT composite with different weight fractions of MWCNT to evaluate the optimum thermal conductivity. Moreover, morphological behaviour, chemical stability, optical absorptivity, thermal property & thermal reliability of developed PEG-PMMA/MWCNT composite are experimentally characterized and scientifically discussed. The highest thermal conductivity is found to be 92.30% at 0.7 wt% of MWCNT. Further, 500 thermal cycles were performed which confirmed the thermal reliability of developed nanocomposites.

KEYWORDS
Organic phase change materials; PMMA; Thermal energy storage; Thermophysical properties

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