Optical absorptivity and thermal conductivity analysis of silver nanoparticle dispersed salt hydrate PCM

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ABSTRACT

Thermal energy storage using phase change materials (PCM) s are of notable technique towards improving the utilization of solar energy mix within the global energy consumption. Major problem with solar power is its intermittent nature. Phase change materials acts as a thermal battery to store thermal energy received from the sun, and use the same during absence of sun. In spite of numerous advantages PCM suffers due to low thermal conductivity and specifically organic PCMs are flammable in nature. In this particular research investigation, we choose inorganic salt hydrate PCM and disperse silver nanoparticle to enhance their thermal characteristics. Sodium phosphate dibasic dodecahydrate (SPDD) is the opted inorganic salt hydrate PCM. Silver nanoparticle dispersed SPDD PCM are prepared at different composition of SPDD-0.3Ag%, SPDD-0.5Ag% and SPDD-0.7 Ag% using a two-step water bath sonication process. The prepared samples are explored experimentally using FTIR spectroscopy and UV-VIS Spectroscopy to evaluate their chemical and optical absorptivity behavior. Thermal conductivity of the composite inorganic salt hydrate PCM are determined using numerical model available in the literature. Results ensure better optical absorptivity and thermal conductivity for the composite salt hydrate sample with higher concentration of silver nanoparticle. Prepared composite PCM are expected to enhance the thermal energy storage with significance to contribute towards sustainable development goal of clean and affordable energy.

KEYWORDS

Phase change materials; Silver nanoparticle; Sodium phosphate dibasic dodecahydrate; Thermal energy storage

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