

Nano additive enhanced salt hydrate phase change materials for thermal energy storage

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ABSTRACT

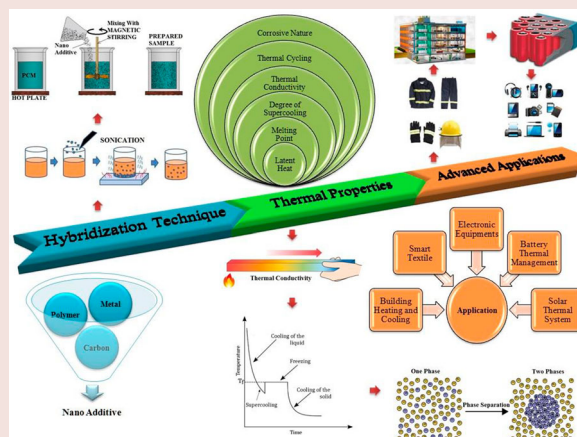
Energy storage plays a vital role in sustainable development. Focus on energy storage using phase change materials (PCMs) are of current research hotspot due to high latent heat value. Nevertheless, poor thermal conductivity, supercooling, phase separation, corrosive nature of salt hydrate is of great concern. Distress related to properties of PCM is resolved using nano additives. Major research focus on the dispersion of nano additive with PCM depends on (a) technique of preparing a novel composite PCM; (b) improvement of their thermophysical characteristic; and (c) advanced application for human comfort without polluting the environment. This article presents a critical review of hybridization techniques of metal, carbon and polymer additives on salt hydrate PCMs. To facilitate researchers, the significant variation on thermophysical properties of salt hydrate with nano additives are vitally compared, analysed and critically reviewed. This review article also includes the advanced application of nano additives-based salt hydrate PCMs.

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KEYWORDS

Salt hydrate PCMs; hybridization; nano additives; carbon nanoparticle; thermal property; thermal energy storage; PCM applications; inorganic phase change material



Highlights

- Salt hydrates are cheaper than organic PCM and exhibit good thermal properties for TES.
- Synthesis and hybridization techniques of composite salt hydrate are elaborated.
- Energy storage potential increases with the dispersion of nano additives.
- Nano additive effects on thermal and chemical stability are emphasized.
- Applications of nano additive PCM with 0–350°C PTT are presented.

Introduction

Clean, affordable, reliable and enduring supply of energy is the basic need for all developing countries [1]. Rapid growth in a global economy and industrial development highly depends on energy consumption. High consumption of fossil fuel has elevated the alert of depletion. As well, electric power generation using fossil fuel causes environmental pollution by emitting greenhouse gases. These harmful emissions raise the ambient temperature of the environment and cause concern over the climatic condition. In the year 2015, United Nations member states introduced 17

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