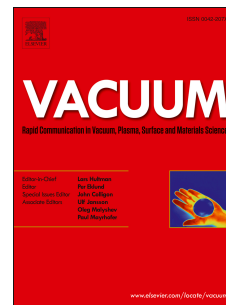


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Thermal and microstructural properties of paraffin/diatomite composite

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Abstract

The present work is devoted to the study of the impregnation of both the raw and calcined Algerian diatomite with a mixture of paraffin wax (PW) and liquid paraffin (LP) in order to obtain composite PCMs with a melting temperature below 30°C and an appropriate latent heat. Structural, microstructural and thermal properties were studied by X-ray diffraction (XRD), scanning electron microscopy (SEM), Fourier transform infrared spectroscopy (FT-IR), differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA). The raw diatomite contains many phases such as quartz (hexagonal SiO₂), tridimite (trigonal SiO₂), corundum (α -Al₂O₃, trigonal), CaSO₄ (orthorhombic) and calcite (CaCO₃, trigonal). After calcination, the main phases are quartz, tridimite, calcite and CaSO₄. The SEM micrographs show that the PCMs are well impregnated into the diatomite pores. The FT-IR results reveal the absence of chemical interaction between paraffin and diatomite. The paraffin/calcined diatomite composite PCMs exhibits a melting temperature of 28.44°C and a latent heat of about 56.40 J/g. Due to their thermal reliability and thermal energy storage performance after thermal cycling, the prepared composites PCMs are good candidates for thermal energy storage in buildings.

Keywords: Diatomite; Phase change materials; Composite PCMs; Thermal properties; Microstructure.

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