

Shape-stabilized n-octadecane/activated carbon nanocomposite phase change material for thermal energy storage

ABSTRACT

A shape-stabilised n-octadecane/activated carbon nanocomposite was successfully prepared using a one-step impregnation method. Activated carbon (AC) was used as an inorganic framework material, and n-octadecane was used as a phase change material (PCM) for thermal energy storage. The mass loading percentage of n-octadecane in the PCM nanocomposites which was determined using DSC is 42.5 wt.%, due to the excellent adsorption ability of AC. Field Emission Scanning Electron Microscope (FESEM) images and nitrogen adsorption–desorption results for the nanocomposites PCM indicate that n-octadecane was uniformly adsorbed into the pores of AC. The porous networks of the AC prevented leakage of the melted n-octadecane during the phase change processes. The performance of the n-octadecane/AC nanocomposites as a thermal energy storage material for building applications was examined by incorporation of the nanocomposite with gypsum to function as a panel board. The results indicate that the incorporation of the n-octadecane/AC nanocomposites in gypsum board lowered the indoor temperature fluctuation of the buildings, which could reduce energy consumption.

Keyword: Shape-stabilised phase change material; Activated carbon; n-Octadecane; Thermal energy storage; Gypsum