Properties of n-octadecane-encapsulated activated carbon nanocomposite for energy storage medium: the effect of surface area and pore structure

ABSTRACT

Shape-stabilized phase change materials (PCMs) composed of n-octadecane encapsulated into activated carbon (AC) micro-and meso-pores were prepared by direct impregnation method. Three types of ACs with different pore structures were used as frameworks, namely AC prepared from peat soil using phosphoric acid activation method (PSAC-C) and physical activation method (PSAC-P), and a commercial activated carbon (CAC). The results show that the phase change properties of the n-octadecane/AC PCM nanocomposite are governed by the pore structure-adsorption interaction of the n-octadecane on the AC. Generally, the specific surface area is the important parameter, which is directly proportional to the latent heat of fusion and encapsulation efficiency. Similarly, the encapsulation efficiency is directly proportional to the latent heat of fusion. This study shows that peat soil is a potential, cheap source for activated carbon which can be used as inorganic frameworks for the preparation of shape-stabilized phase change materials which can be designed by tuning the pore structures of the activated carbon.

Keyword: Activated carbon; Peat soil; Thermal energy storage; Phase change material; N-octadecane