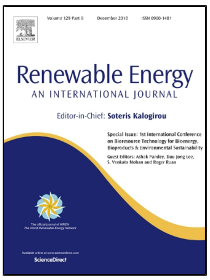
Accepted Manuscript



Experimental investigation on thermal properties and thermal performance enhancement of octadecanol/expanded perlite form stable phase change materials for efficient thermal energy storage

Peizhao Lv, Mingyue Ding, Chenzhen Liu, Zhonghao Rao

PII:	S0960-1481(18)30899-1
DOI:	10.1016/j.renene.2018.07.102
Reference:	RENE 10376
To appear in:	*Renewable Energy*
Received Date:	07 February 2018
Accepted Date:	20 July 2018

Please cite this article as: Peizhao Lv, Mingyue Ding, Chenzhen Liu, Zhonghao Rao, Experimental investigation on thermal properties and thermal performance enhancement of octadecanol /expanded perlite form stable phase change materials for efficient thermal energy storage, *Renewable Energy* (2018), doi: 10.1016/j.renene.2018.07.102

Experimental investigation on thermal properties and thermal performance enhancement of octadecanol/expanded perlite form stable phase change materials for efficient thermal energy storage

Peizhao Lv, Mingyue Ding, Chenzhen Liu, Zhonghao Rao*

(School of Electrical and Power Engineering, China University of Mining and Technology, Xuzhou 221116, China)

Corresponding author. Tel.: +86 051683592000. E-mail address: raozhonghao@cumt.edu.cn.

Abstract:

Octadecanol (OC) was employed as phase change material (PCM) to compound with expanded perlite (EP) because of its relatively high latent heat capacity (245.97 kJ/kg). OC/EP composites were prepared via vacuum impregnation method in this paper. The microstructure, chemical components and interactions that between two materials were characterized via Scanning Electron Microscope (SEM), X-Ray Diffraction (XRD) and Fourier Transform Infrared Spectroscopy (FTIR). The leakage-proof properties of OC within the composites were investigated and the leakage phenomena were weakened by adding expanded graphite (EG) with mass fractions of 5%, 10% and 15%. The mass fraction of OC maintains 60% without any leakage after adding EG (mass fraction of 15%). Latent heat capacity and phase change temperature were tested via Differential Scanning Calorimeter (DSC). Latent heat capacity of 60% OC/EP/15EG is 140.20 kJ/kg, and phase change temperature is 59.00 ^{o}C. The thermal conductivity of the composites was tested, and the variation tendency was linearly fitted. The thermal storage and release tests were performed to evaluate thermal performance of the composites. And the efficiency of the heat storage and release of OC/EP composites were improved significantly after filling EG (mass fraction of 15%) into the interspace that is among the particles of EP.

Keywords: Phase change material; Thermal energy storage; Expanded perlite; Expanded graphite; Heat transfer enhancement