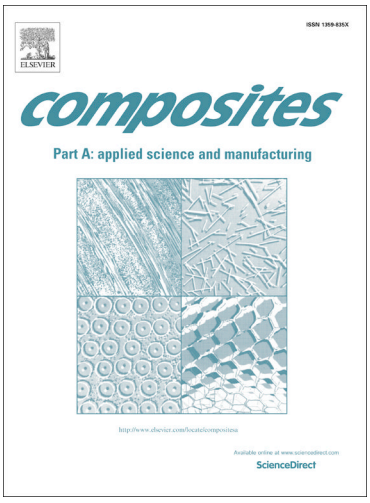
Accepted Manuscript



An energy-efficient composite by using expanded graphite stabilized paraffin as phase change material

Xi Guo, Shaodi Zhang, Jinzhen Cao

PII: S1359-835X(17)30472-4
DOI: https://doi.org/10.1016/j.compositesa.2017.12.032
Reference: JCOMA 4881

To appear in: *Composites: Part A*

Received Date: 7 November 2017
Revised Date: 10 December 2017
Accepted Date: 31 December 2017

Please cite this article as: Guo, X., Zhang, S., Cao, J., An energy-efficient composite by using expanded graphite stabilized paraffin as phase change material, *Composites: Part A* (2017), doi: https://doi.org/10.1016/j.compositesa.2017.12.032

An energy-efficient composite by using expanded graphite stabilized paraffin as phase change material

Xi Guo, Shaodi Zhang, Jinzhen Cao*

MOE Key Laboratory of Wooden Material Science and Application, Beijing Forestry University, Qinghua East Road 35, Haidian 100083, Beijing, China

Abstract:

Thermal energy storage (TES) composites were prepared by employing expanded graphite (EG) stabilized paraffin as phase change material (PCM) and wood flour/ high density polyethylene (WF/HDPE) as matrix. The morphology and structure of EG and form-stable phase change material (FSPCM) were investigated by scanning electron microscopy (SEM), X-ray diffractometer (XRD) and mercury intrusion porosimetry. The fabricated TES composites with different FSPCM types and contents were characterized by differential scanning calorimetry (DSC), thermogravimetric (TG), infrared thermography and laserflash thermal analysis. Physical and mechanical strength were also evaluated. The results showed that: (1) the EG had abundant pores and most of the pores were below 26 μm, the EG stabilized paraffin material showed perfect stability without any chemical reactions; (2) thermal performance indicated that the TES composites had efficient temperature-regulated ability, but thermal durability need to be further enhanced; (3) addition of paraffin and EG destroyed the interface bonding of the TES composites and mechanical properties appeared slight decrease; (4) the satisfying thermal performance and acceptable mechanical property indicating the TES composites can be used as building material for temperature conditioning.

Keywords: phase change materials (PCMs), expanded graphite (EG), thermal energy storage (TES), temperature regulation, wood-plastic composites (WPC)

1. Introduction

With the rapid development of modern society, buildings has been one of the biggest energy

*Correspondence to: Jinzhen Cao (caoj@bjfu.edu.cn). Tel/Fax: 86 010 62337381.