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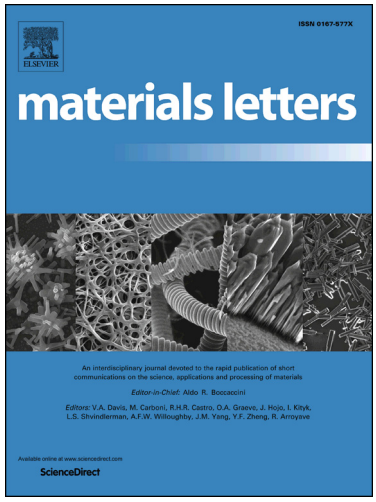

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Preparation and Characterization of Cross-linked Polyurethane Shell Microencapsulated Phase Change Materials by Interfacial Polymerization

Shaofeng Lu [a, *], Tianwei Shen [a], Jianwei Xing [a], Qingwen Song [a], Jingfeng Shao [b], Jing Zhang [a], Cheng Xin [a]

a, College of Textile & Material, Xi'an Polytechnic University, Xi'an, China

b, School of Management, Xi'an Polytechnic University, Xi'an, China

Abstract：A new cross-linked shell microencapsulated phase change materials (MEPCMs) were prepared by interfacial polymerization, and butyl stearate and polyurethane was empolyed as core material and shell material respectively, while polyurethane shell was reacted by isophorone diisocyanate (IPDI), diethylene triamine (DETA) and pentaerythritol. The surface morphology, chemical structure, phase change properties and thermal stability of MEPCMs were investigated by SEM, FTIR, DSC and TGA. The results show that the prepared microcapsules are sphere with smooth and compact surface, and have good thermal storage properties. When pentaerythritol was employed, the thermal stability and compactness of the cross-linked polyurethane shell MEPCMs has been greatly improved compared to that of linear polyurea shell MEPCMs. When the continuous drying time point is at 120℃ for 5 hours, the weight loss of cross-linked MEPCMs was only 4.65%.

Key words: polymers; composite materials; microcapsules; phase change materials; polyurethane; cross-linked shell

1. Introduction

Microencapsulated phase change materials (MEPCMs) have attracted considerable interest during recent decades [1,2], and have been widely studied as solar energy storage utilization [3], thermo-regulated fibers [4], energy saving building materials [5], heat transfer slurry [6], etc. Due to polyurea having the formaldehyde-free properties and it is widely used as shell materials of MEPCMs. Usually, the traditional polyurea shell is normally prepared by the reaction between aromatic diisocyanate and aliphatic primary diamines [7-9]. However this reaction existed some serious problems, which included the linear structure and the fast reaction rate, and these problems led to poor thermal stability and compactness of MEPCMs, and limited its application.

[*] Corresponding author. Tel.: +86 29 82330176; fax: +86 29 82330357. E-mail address: lsf622@163.com (S.F. Lu)

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