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院　　系：机械工程系
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准考证号：[redacted]
考试时间：2018年12月

总分	听力 (35%)	阅读 (35%)	写作和翻译 (30%)
523	180	202	141

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全国大学英语六级考试
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姓　　名：傅媛

学　　校：太原工业学院

院　　系：机械工程系

身份证号：[redacted]

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准考证号：[redacted]

考试时间：2020年9月

总分	听力 (35%)	阅读 (35%)	写作和翻译 (30%)
447	110	194	143

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5、 学术能力证明材料

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Shaped ionic wood for enhanced phase change performance

Yuan Fu, Huanbo Wang, Yue Liu, Jinpeng Li, XianZu Sun & Tian Liu

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Shaped ionic wood for enhanced phase change performance

Yuan Fu, Huanbo Wang, Yue Liu, Jinpeng Li, XianZu Sun and Tian Liu

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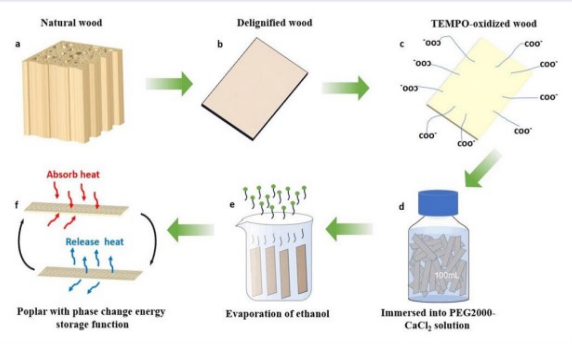
ABSTRACT

Wood with a porous structure is the best carrier for phase change energy storage materials, which can effectively prevent material leakage during thermal cycling and ensure its shaping effect. In this work, natural poplar wood was treated with delignification and then oxidized by TEMPO as a thermal energy storage matrix. Then, it was immersed in a solution of ethanol as the solvent, polyethylene glycol (PEG) and calcium chloride as the solutes, obtaining phase change energy storage ionic wood (DTW-PCMs). The results showed that the phase change energy storage material PEG-$CaCl_2$ was successfully impregnated into the pore structure of wood; calcium chloride was effectively combined with –COOH in TEMPO oxidized wood for intermediate bonds and formed white complex crystals with PEG2000. The maximum absorption rate and differential scanning calorimetry (DSC) test results showed that TEMPO-oxidized poplar had a maximum absorption rate of 95.26% for PEG2000-$CaCl_2$. Additionally, TEMPO-oxidized poplar exhibited good phase transition performance and suitable phase change temperature. The latent heat of phase transition was 86.96 J/g. Thus, the novel DTW-PCMs displayed a high potential application in the field of thermal energy storage and temperature regulation.



An ionic wood was prepared by impregnating it with PEG2000 and $CaCl_2$ as PCMs and TEMPO-oxidized delignified poplar as support material at room temperature and atmospheric pressure. Calcium ions acted as intermediate mediums, effectively forming chemical bonds with –COOH in modified wood, thus forming white complex crystals with PEG2000. This interaction between calcium ions and modified wood facilitated the adsorption of PEG2000-$CaCl_2$ into wood pores.

KEYWORDS

Ionic wood; PEG; TEMPO-oxidized; phase change; energy storage

Introduction

The impact of global warming has led to a continuous increase in summer temperature. Therefore, storing and recycling thermal energy is crucial and urgent.[1,2] The rapid increase in energy demand, coupled with the excessive exploitation and waste of nonrenewable energy, has posed significant challenges to the global energy supply.[3–5] A significant amount of energy is lost or wasted in the form of thermal energy during its production, conversion, and utilization, which are one of the main factors causing energy shortages.[6–10] Phase change energy storage materials (PCMs) are widely applied owing to its high storage density and small temperature variation.[11–13]

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摘要: Wood with a porous structure is the best carrier for phase change energy storage materials, which can effectively prevent material leakage during thermal cycling and ensure its shaping effect. In this work, natural poplar wood was treated with delignification and then oxidized by TEMPO as a thermal energy storage matrix. Then, it was immersed in a solution of ethanol as the solvent, polyethylene glycol (PEG) and calcium chloride as the solutes, obtaining phase change energy storage ionic wood (DTW-PCMs). The results showed that the phase change energy storage material PEG-CaCl2 was successfully impregnated into the pore structure of wood; calcium chloride was effectively combined with -COOH in TEMPO oxidized wood for intermediate bonds and formed white complex crystals with PEG2000. The maximum absorption rate and differential scanning calorimetry (DSC) test results showed that TEMPO-oxidized poplar had a maximum absorption rate of 95.26% for PEG2000-CaCl2. Additionally, TEMPO-oxidized poplar exhibited good phase transition performance and suitable phase change temperature. The latent heat of phase transition was 86.96 J/g. Thus, the novel DTW-PCMs displayed a high potential application in the field of thermal energy storage and temperature regulation.
An ionic wood was prepared by impregnating it with PEG2000 and CaCl2 as PCMs and TEMPO-oxidized delignified poplar as support material at room temperature and atmospheric pressure. Calcium ions acted as intermediate mediums, effectively forming chemical bonds with -COOH in modified wood, thus forming white complex crystals with PEG2000. This interaction between calcium ions and modified wood facilitated the adsorption of PEG2000-CaCl2 into wood pores.

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