

具有 导热性、光热转换性能和形状稳定的 增强导热木质复合相变材料

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摘要: 太阳能是一种清洁的可持续能源, 然而太阳能的供给存在间歇性、不稳定的缺点, 以相变材料 (PCM) 为核心的潜热储能技术是高效利用太阳能的理想技术。然而, PEG 在使用过程中存在易泄漏和导热性能不足的问题。因此, 我们采用多孔木材作为骨架, 将 PEG 封装其中, 并添加 Cu 颗粒进行改性, 通过真空浸渍法制备了一种新型的复合相变材料 Cu-DW/PEG。实验结果表明, Cu 颗粒增强的导热型木基复合相变材料具有高导热性、优异的热稳定性和光热转换能力。特别值得注意的是, Cu-DW/PEG 的导热系数显著增强, 达到 0.41W/mK , 是 DW/PEG 的 1.64 倍, 是纯 PEG 的 2.05 倍。其焓效率为 89.81%, 相对焓效率为 95.78%, 均高于类似复合相变材料。此外, 所制备的 Cu-DW/PEG 具有高达 76.5% 的光热转换效率。总的来说, 我们所研发的 Cu-DW/PEG 在热能管理和太阳能吸收等领域具有广泛的应用潜力。

关键词: 相变材料; 多孔材料; 导热性; 热稳定性; 光热转换;

Cu reinforced thermal conductive wood-based composite phase change material with high thermal conductivity, photothermal conversion performance, and shape stability

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Abstract: Solar energy is a clean and sustainable energy source, but its supply has intermittent and unstable drawbacks. The latent heat storage technology centered on phase change materials (PCM) is an ideal technology for efficient utilization of solar energy. However, it is prone to leakage and has a low thermal conductivity coefficient during use. Therefore, porous wood is used as the skeleton to encapsulate PEG, and Cu particles are the modified component. A new type of composite phase change material Cu-DW/PEG is prepared by vacuum impregnation method. The experimental results show that Cu particle reinforced thermal conductive wood-based composite phase change material has high thermal conductivity, excellent thermal stability, and optical properties. Thermal conversion capability. Among these improvements, the thermal conductivity of Cu-DW/PEG is significantly enhanced, reaching 0.41W/mK , which is 1.64 times that of DW/PEG and 2.05 times that of pure PEG. The enthalpy efficiency is 89.81%, and the relative enthalpy efficiency is 95.78%, both of which are higher than those similar composite phase change materials. Especially, the photothermal conversion efficiency of the prepared Cu-DW/PEG is as high as 76.5%. In summary, the Cu-DW/PEG prepared in this work has broad application potential in thermal energy management, solar energy absorption, and other fields.

Keywords: Phase change materials; Porous materials; Thermal conductivity; Thermal stability; Photothermal conversion