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Non-isothermal crystallization behavior of polyethylene glycol/expanded vermiculite form-stable composite phase change material

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ABSTRACT

In this work, non-isothermal crystallization behavior of polyethylene glycol (PEG)/expanded vermiculite (EVM) form-stable composite phase change material (PEG-EVM) was investigated. The activation energy of non-isothermal crystallization of PEG-EVM (-219.7 kJ/mol) was lower than that of PEG (-375.3 kJ/mol), indicating that the energy barrier of heterogeneous nucleation decreased, demonstrating that the EVM significantly accelerated the nucleation of PEG. However, the crystallization kinetic parameters (half-crystallization time, crystallization rate and required cooling rate for a designated relative crystallinity) revealed that the non-isothermal crystalline growth of PEG in PEG-EVM was constrained because the surface interactions of EVM hindered the migration and diffusion of PEG molecular chains to the surface of nucleus.

KEYWORDS

Polyethylene glycol; Expanded vermiculite; Energy storage and conversion; Phase transformation; Thermal properties; Non-isothermal crystallization kinetics

INTRODUCTION

Thermal energy storage based on phase change materials (PCMs) plays an important role in energy conversion and management. Recently, the clay

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