

Alcohols as a Phase Change Material with Excellent Thermal Storage Properties in Buildings

Authors : Dehong Li, Yuchen Chen, Alireza Kaboorani, Denis Rodrigue, Xiaodong (Alice) Wang

Abstract : Utilizing solar energy for thermal energy storage has emerged as an appealing option for lowering the amount of energy that is consumed by buildings. Due to their high heat storage density, and non-corrosive and non-polluting properties, alcohols can be a good alternative to petroleum-derived paraffin phase change materials (PCMs). In this paper, ternary eutectic PCMs with suitable phase change temperatures were designed and prepared using lauryl alcohol (LA), cetyl alcohol (CA), stearyl alcohol (SA), and xylitol (X). The differential scanning calorimetry (DSC) results revealed that the phase change temperatures of LA-CA-SA, LA-CA-X, and LA-SA-X were 20.52°C, 20.37°C, and 22.18°C, respectively. The latent heat of phase change of the ternary eutectic PCMs was all stronger than that of the paraffinic PCMs at roughly the same temperature. The highest latent heat was 195 J/g. It had good thermal energy storage capacity. The preparation mechanism was investigated using Fourier-transform Infrared Spectroscopy (FTIR), and it was found that the ternary eutectic PCMs were only physically mixed among the components. Ternary eutectic PCMs had a simple preparation process, suitable phase change temperature, and high energy storage density. They are suitable for low-temperature architectural packaging applications.

Keywords : thermal energy storage, buildings, phase change materials, alcohols

Conference Title : ICBEDC 2024 : International Conference on Building Envelope Design and Construction

Conference Location : Lisbon, Portugal

Conference Dates : February 05-06, 2024