

Development of Expanded Perlite-Caprylicacid Composite for Temperature Maintenance in Buildings

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Abstract : The energy consumption of humankind is growing day by day due to an increase in the population, industrialization and their needs for living. Fossil fuels are the major source of energy to satisfy energy needs, which are non-renewable energy resources. So, there is a need to develop green resources for energy production and storage. Phase change materials (PCMs) derived from plants (green resources) are well known for their capacity to store the thermal energy as latent heat during their phase change from solid to liquid. This property of PCM could be used for storage of thermal energy. In this study, a composite with fatty acid (caprylic acid; M.P 15°C, Enthalpy 179kJ/kg) as a phase change material and expanded perlite as support porous matrix was prepared through direct impregnation method for thermal energy storage applications. The prepared composite was characterized using Differential scanning calorimetry (DSC), Field Emission Scanning Electron Microscope (FESEM), Thermal Gravimetric Analysis (TGA), and Fourier Transform Infrared (FTIR) spectrometer. The melting point of the prepared composite was 15.65°C, and the melting enthalpy was 82kJ/kg. The surface nature of the perlite was observed through FESEM. It was observed that there are micro size pores in the perlite surface, which were responsible for the absorption of PCM into perlite. In TGA thermogram, the PCM loss from composite was started at ~90°C. FTIR curves proved there was no chemical interaction between the perlite and caprylic acid. So, the PCM composite prepared in this work could be effective to use in temperature maintenance of buildings.

Keywords : caprylic acid, composite, phase change materials, PCM, perlite, thermal energy

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