

Utilization of a Composite of Oil Ash, Scoria, and Expanded Perlite with Polyethylene Glycol for Energy Storage Systems

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Abstract : Shape-stabilized phase change materials (ss-PCMs) for energy storage systems were developed using perlite, scoria, and oil ash as a carrier, with polyethylene glycol (PEG) with a molecular weight of 6000 as phase change material (PCM). Physical mixing using simple impregnation of ethanol evaporation technique method was carried out to fabricate the form stabilized PCM. The fabricated PCMs prevent leakage, reduce the supercooling effect and minimize recalescence problems of the PCM. The differential scanning calorimetry (DSC) results show that perlite composite (ExPP) has the highest latent heat of melting and freezing values of (141.6 J/g and 143.7 J/g) respectively, compared with oil ash (OAP) and scoria (SCP) composites. Moreover, ExPP has the highest impregnation ratio, energy storage efficiency, and energy storage capacity compared with OAP and SCP. However, OAP and SCP have higher thermal conductivity values compared to ExPP composites which accelerate the thermal storage response in the composite. These results were confirmed with DSC, and the characteristic of the PCMs was investigated by using XRD and FE-SEM techniques.

Keywords : expanded perlite, oil ash, scoria, energy storage material

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