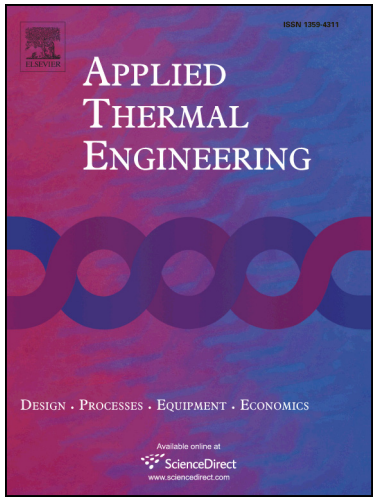

Research Paper

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Experiments on Thermal Performance of Erythritol/Expanded Graphite in a Direct Contact Thermal Energy Storage Container

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Abstract: To enhance heat transfer of erythritol in a direct contact thermal energy storage (TES) container, expanded graphite (EG) was used as additives. Composite PCMs with 1wt%, 2wt%, 3wt% and 4wt% EG were prepared using melt-blending method; the thermal characteristic and thermal response of the materials was tested; and the thermal performance in a direct contact container was measured by thermal charging and discharging experiment. The thermal characteristic test showed that with the increase of EG content, the thermal conductivity of the composite PCMs increased while the latent heat slightly decreased. For the composite PCM with 4wt% EG, the thermal conductivity was increased by about 2.5 times and the latent heat was only decreased by 2.59% compared with that of the pure erythritol. However, considering the melting time in thermal response tests, the composite PCM with 3wt% EG, of which the thermal conductivity was increased by about 1.8 times was chosen for thermal performance experiments. The experiments results indicated that for the composite PCM the melting time was 16.7% lower, but the solidification time was almost identical when compared with that of the pure erythritol. When quick channels (QCs) were formed at the beginning of the thermal