Review

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PII: S1385-8947(18)31723-6
DOI: https://doi.org/10.1016/j.cej.2018.09.013
Reference: CEJ 19852

To appear in: *Chemical Engineering Journal*

Received Date: 16 June 2018
Revised Date: 20 August 2018
Accepted Date: 2 September 2018

Please cite this article as: X. Huang, X. Chen, A. Li, D. Atinafu, H. Gao, W. Dong, G. Wang, Shape-stabilized phase change materials based on porous supports for thermal energy storage applications, *Chemical Engineering Journal* (2018), doi: https://doi.org/10.1016/j.cej.2018.09.013

Shape-stabilized phase change materials based on porous supports for thermal energy storage applications

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Abstract: Phase change materials (PCMs) are widely utilized in latent thermal energy storage and thermal management systems due to their high-energy storage density, high latent heats and excellent capabilities of maintaining almost constant temperature. However, the formidable challenge still seriously limited the performance of PCMs in thermal energy storage systems, such as their leakage and low thermal conductivities. Therefore, appropriate approaches to construct shape-stabilized PCMs (ss-PCMs) and effectively enhance the thermal conductivities are importantly necessary to realize the practical applications of PCMs. Porous supports packaged PCMs provide an effective route for constructing ss-PCMs with enhanced thermal conductivity, mechanical strength, chemical stability and flame resistance. In this review, we aim to assess the advantages/disadvantages of porous materials via summarizing the key research progress on the porous materials (e.g., metal foams, expanded graphite, graphene aerogels, carbon nanotubes, porous minerals, mesoporous silica, etc.) as ss-PCMs supports. The effects of pore size and geometry, surface modification, interaction forces, compositions, etc. on the phase change