15th International Conference on

Environmental Chemistry and Engineering

August 15-16, 2019 | Rome, Italy

Porous support for phase change materials with superior thermal performance

[1]Ge Wang and **[2]Ang Li**
[1]University of Science and Technology, China
[2]Suzhou University of Science and Technology, China

Phase change materials (PCMs) have been widely developed in thermophysical storage technologies. However, issues with leakage in the liquid phase and low thermal conductivity of pure PCMs block their real-world applications. Typically, porous support can stabilize the PCMs through surface tension action and capillary forces. However, support with high porosity usually leads to amorphous structures and low thermal conductivity, which is inadequate for meeting most power conversion targets. Therefore, designing advanced support with excellent thermal performance still remains highly desired. Recently, our group developed a one-design many-functions strategy to create metal organic frameworks (MOFs) derived porous carbons and 3D porous carbon support for PCMs. For example, a highly porous carbon from MOFs have been fabricated by using a control carbonization method. The large mesopores of the support guarantees a high loading percentage of PEG molecules, and the micropores induced the surface tension and capillary force to ensure the high thermal stability of the shape stabilized PCMs. The phase change enthalpy of shape stabilized PCMs is close to pure PEG and the thermal conductivity of PEG can be further improved through porous carbon. 3D conductive network carbons have been synthesized by employing a direct-calcined CQDs-derived porous carbon from the aldol reaction. 3D porous carbon offered large loading space for PCMs, meanwhile, the graphitized sp2-hybrid carbon nanosheets provides thermally conductive network and improves thermal conductivity. These shape stabilized PCMs exhibit excellent thermal performance which show great potential in energy storage and conversion applications (Fig.1).

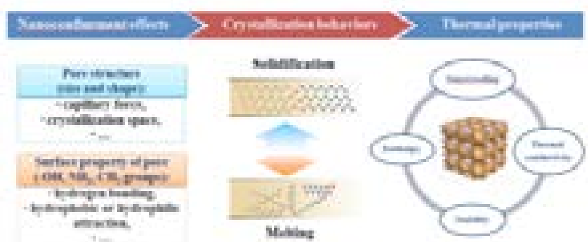

Fig. 1. Scheme of the nanoconfinement effects of the nanoporous support on the thermal properties of shape stabilized composite PCMs.

Recent Publications

1. X. Chen, H. Gao, M. Yang, W. Dong, X. Huang, A. Li, C. Dong, G. Wang (2018) Highly graphitized 3D network carbon for shape-stabilized composite PCMs with superior thermal energy harvesting. Nano Energy 49: 86-94.
2. H. Gao, J. Wang, X. Chen, G. Wang, X. Huang, A. Li, W. Dong (2018) Nanoconfinement effects on thermal properties of nanoporous shape-stabilized composite PCMs: A review. Nano Energy 53: 769-797.
3. A. Li, C. Dong, W. Dong, D.G. Atinafu, H. Gao, X. Chen, G. Wang (2018) Hierarchical 3D Reduced Graphene Porous-Carbon-Based PCMs for Superior Thermal Energy Storage Performance. ACS Appl Mater Interfaces 10: 32093-32101.

4. A. Li, J. Wang, C. Dong, W. Dong, D.G. Atinafu, X. Chen, H. Gao, G. Wang (2018) Core-sheath structural carbon materials for integrated enhancement of thermal conductivity and capacity. Applied Energy 217: 369-376
5. X. Huang, X. Chen, A. Li, D. Atinafu, H. Gao, W. Dong, G. Wang (2019) Shape-stabilized phase change materials based on porous supports for thermal energy storage applications. Chemical Engineering Journal 356: 641-661.

Biography

Ge Wang received her PhD in Chemistry from the Michigan Technological University in 2002. Currently she is a professor and PhD supervisor in the School of Material Science and Engineering at the University of Science and Technology Beijing. In 2012, she became a special chair professor endowed by the Chang Jiang Scholars Program of the Ministry of Education. Her research interests focus on creating complex materials structures with nanoscale precision using physical or chemical approaches, and studying the functionalities in energy, catalysis, biomedicine and environment applications, etc.

Notes: