

Can phase change materials be used for battery thermal management?

In this review article the phase change materials for battery thermal management of electric and hybrid vehicles are described. The challenges and future prospects for mitigating the battery life through TMS of EVs and HEVs by using PCMs are also described. The following key points and conclusions have been drawn based on the detailed description:

What is battery thermal management system (BTMS) based on phase change materials?

It is expected to provide some innovative ideas for the advancement of such promising technology. The authors declare no conflict of interest. Battery thermal management system (BTMS) based on phase change materials (PCMs) is simple in structure while presenting outstanding performance, but the core bottleneck hindering the industrializat...

Can phase change materials reduce transient thermal challenges?

Phase change materials (PCMs) have shown promise for mitigating transient thermal challenges. Fluid leakage and low effective thermal conductivity limit PCM adoption. Furthermore, the thermal capacitance of PCMs diminishes as their latent load is exhausted, creating an unsustainable cooling effect that is transitory.

What is a phase change material (PCM) based BTMS?

A phase change material (PCM)-based BTMS stands out at present because of its cost-effectiveness and ability to maintain temperature uniformity. The crux of employing PCM in BTMS lies in preserving the structural integrity of the PCM material and ensuring its thermal conductivity matches the required specifications.

What is a phase change material?

Among all passive thermal control strategies, phase change materials (PCMs) are one of the most promising. [22, 23] The PCM works by using a solid-liquid phase transition, [24, 25] thus enabling the absorption of heat at a relatively constant temperature. Hence, high density cooling can be achieved at a regulated temperature.

What is a phase change material (PCM)?

PCM refers to a substance that could absorb or release latent heat to keep the temperature as almost constant, and what is widely used in the field of thermal management because of the special characteristics.

2.1. Classification of Phase Change Materials There were a large variety of classification standards for PCMs.

The next areas of investigation for enhanced (composite) phase change materials (EPCM) used in li-ion battery thermal management systems (BTMS) are as follows: (i) investigating various porous carriers, such as MOF ...

Battery phase change material shape processing technology

As battery technologies continue advancing to meet expanding demands, phase change materials (PCMs) present a promising thermal management solution. From ...

The solid-liquid phase change material has a significant heat dissipation effect in the thermal management of battery. However, the melting of solid phase change material will lead to the leakage of phase change material from the battery pack, which will affect the heat dissipation performance of PCM.

Phase change material (PCM), a prominent TES technology, effectively stores and releases latent heat during the phase change process. PCMs have been extensively applied in solar thermal storage, industrial waste heat recovery, construction, and especially lithium-ion battery thermal management (BTM) [2].

Towards phase change materials for thermal energy storage: Classification, improvements and applications in the building sector. Appl Sci. 2021;11(4):1490. doi: 10.3390/app11041490 . Leong KY, Abdul Rahman MR, Gurunathan BA. Nano-enhanced phase change materials: A review of thermo-physical properties, applications and challenges.

Passive battery thermal management systems (BTMSs) are critical for mitigation of battery thermal runaway (TR). Phase change materials (PCMs) have shown promise for ...

One promising thermal management technology is the use of phase change materials (PCMs), which can store and absorb a significant amount of heat released from the surrounding heat source within a narrow temperature range during the ...

A high-quality thermal management system is crucial for addressing the thermal safety concerns of lithium ion batteries. Despite the utilization of phase change materials (PCMs) in battery thermal management, there is still a need to raise thermal conductivity, shape stability, and flame retardancy in order to effectively mitigate battery safety risks.

Owing to the numerous advantages, many researchers have applied the PCMs on battery thermal management and achieved commendable outcomes. Yao et al. [9] employed the composite PCM with nano-scaled polymer framework in a pouch battery pack. They found that the maximum temperature and the maximum temperature difference of battery were 46.82 °C ...

It is then mixed with paraffin and heated in a constant temperature water bath at 80-90 °C. Once the paraffin is fully melted, a high-speed stirrer thoroughly mixes the melted composite phase change material. After cooling and solidification, the paraffin-expanded graphite composite phase change material sample is prepared.

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