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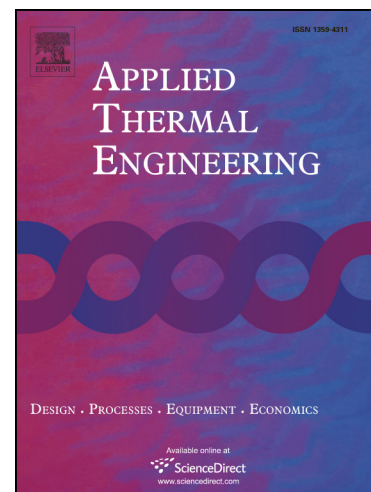
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An innovative practical battery thermal management system based on phase change materials: Numerical and experimental investigations

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ABSTRACT

The market of electric vehicles still faces some impediment to its optimal development. Electric batteries play an important role in this context since they are the key element in an electric vehicle (EV). Improving the energy performance of batteries will certainly improve the autonomy and reliability of EVs and thus their market penetration. To achieve this objective, battery thermal management systems are necessary to keep the temperature below security limits and make the temperature distribution as uniform as possible inside the battery pack and its cells. In this paper, a new solution to integrate and improve the thermal heat transfer of a phase change material (PCM) inside a battery thermal management system (BTMS) is proposed and the effect of the PCM melting temperature on the system performance is investigated. Two numerical models have been built and their results were the input of a small size PCM-based BTMS prototype development. Experimental results showed that the novel system was able to reduce the system temperature by at least 5°C, compared to the reference, upon completion of the phase change process inside the PCM.

KEYWORDS

Thermal management, Electric battery, Phase change material, Modelling, System development, System testing.

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