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Experimental study on the thermal management performance of phase change material coupled with heat pipe for cylindrical power battery pack

Jiateng Zhao, Peizhao Lv, Zhonghao Rao*

School of Electric Power Engineering, China University of Mining and Technology, Xuzhou 221116 China

Abstract

The battery thermal management technology is vital for the development of new energy vehicles. In order to understand the performance of the phase change material/heat pipes (PCM/HP) coupled thermal management system for cylindrical power battery, an PCM/HP coupled BTM module was designed and tested experimentally in detail. The results showed that the effect of temperature control based on PCM is improved comparing to air-based BTM under natural convection. The maximum temperature of PCM/HP coupled BTM can be controlled below 50℃ for longer time than those of the air-based case and PCM-based case under the same conditions. The temperature difference can be reduced about 33.6% through filling PCM and it can progress a decline of 28.9% further through embedding HP into the PCM. The maximum temperature difference of PCM/HP coupled BTM can be controlled below 5℃ for longer time than those of the two other cases, air-based BTM and PCM-based BTM. It is almost the same in the first 620s under different velocities, which are all less than 5℃.

Keywords：Battery thermal management, Phase change material, Heat pipe, Maximum temperature, Temperature difference

Corresponding author. Tel.: +86 516 83592000. E-mail address: raozhonghao@cumt.edu.cn.