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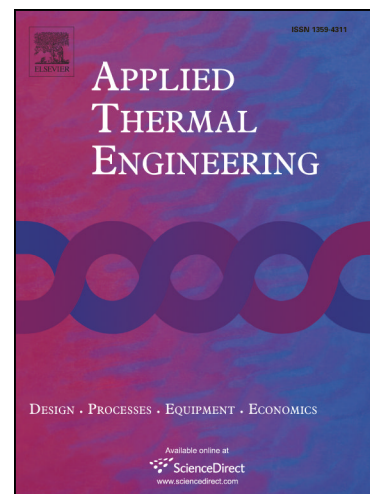
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# Reverse Layered Air Flow for Li-ion Battery Thermal Management

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## Abstract

This study proposes a novel reverse layered air flow for Li-ion battery thermal management to improve the temperature consistency of the battery pack. In this new thermal management structure, the partitions are transversely arranged in the battery box, and divide the cooling flow field into polylaminate flow channels. The cooling air in the adjacent channels flows in the opposite direction, and exchanges heat through the transverse partitions. The partitions are made of diathermanous material to strengthen the air counter current heating exchanging in the adjacent channels, enhance heat dissipation and decrease temperature difference of the battery pack. This paper compares the reverse layered air flow with the unidirectional air flow by three-dimensional computational fluid dynamics. The results of the CFD model are validated with the experimental results. The results show that the reverse layered air flow can lower the highest temperature and the maximum average temperature difference of the battery pack than that of the unidirectional air flow. Additionally, adding rectifier grids at the entrance the highest temperature reduces by 0.5 °C, and the maximum average temperature difference reduces by 0.6 °C (54.5% reduction). Finally, the parameters such as the distance between the cells and the air inlet velocity are optimized, and the optimal parameters are obtained, which can guide the design of novel thermal management.

**Keywords:** Li-ion battery; Reverse layered air flow; Thermal management; Electric vehicle;

## Nomenclature

RLAF (the reverse layered air flow)

UDAF (the unidirectional air flow)

OMXTD (the overall maximum temperature difference)

HT (the highest temperature)

MXATD (the maximum average temperature difference)

AR (the airflow resistance)

DVAF (the different velocity of airflow)

TOAF (the temperature of outlet airflow )

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