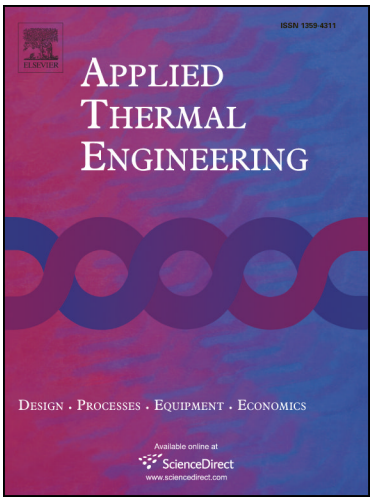

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Multi-objective design of microvascular panels for battery cooling applications

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Abstract

Building on a recently developed optimization method based on an interface-enriched generalized finite element method, multiple objective functions are considered for the optimization of 2D networks of microchannels embedded in battery-cooling panels. The objective functions considered in this study are a differentiable alternative to the maximum temperature (the p-mean of the temperature), the pressure drop and the variance of the temperature. The ε-constraint method and the normalized normal constraint method are used to generate the pressure-temperature Pareto optimal front of the multi-objective optimization problem. The effects of different operating constraints/conditions such as localization of heat sources, prescribed pump power and imposed flow rate on the optimal designs are investigated. In addition to the topology of the embedded network, the cross sections of the microchannels are also introduced as design parameters to further improve the pressure drop of the designs. The resulting variable-cross-section optimized design is validated with experiment.

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