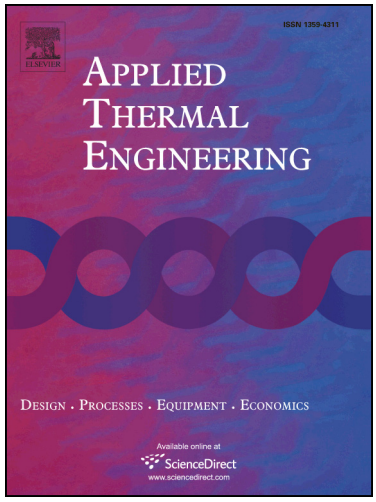

Operational characteristics of loop heat pipes with porous copper fiber sintered sheet as wick

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Operational characteristics of loop heat pipes with porous copper fiber sintered sheet as wick

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Abstract: Porous copper fiber sintered sheets (PCFSS) as wick are fabricated for loop heat pipes (LHP) using low-temperature solid-phase sintering technology and smooth and rough copper fiber as the manufacturing material. The operational characteristics of LHP with varied wick surface morphologies and filling ratios are analyzed. This study focuses on evaluating the following characteristics: thermal resistance characteristics under increasing and decreasing heat load patterns, evaporator surface thermal homogeneity, thermal inertia, and limit operational characteristics. Experimental results demonstrated that LHP with rough PCFSS exhibited lower thermal resistance. As compared to decreasing heat load conditions, relatively lower thermal resistance of LHP under increasing heat load conditions was obtained. The evaporator surface thermal homogeneity yielded improvement with rough PCFSS and increased filling ratio. A larger thermal inertia of LHP was observed when the low filling ratio was applied, and it will be improved when the filling ratio was increased and the smaller heat load variation intensity was selected. When rough PCFSS wick with 70% porosity and a deionized water filling ratio of 30% were selected, the LHP was able to effectively operate under 5~200 W heat load conditions and yielded prompt response to heat load variation.

Keywords: Loop heat pipe; Porous copper fiber sintered sheet; Surface morphology; Heat load; Surface thermal homogeneity; Thermal inertia

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