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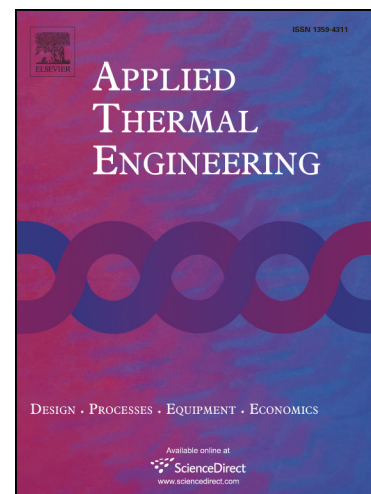
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An experimental study of an anti-gravity vapor chamber with a tree-shaped evaporator

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Abstract: A new anti-gravity vapor chamber is proposed in this study in which a tree-shaped groove is configured on the evaporator's surface, and the formed cavity is embedded with hybrid mesh wick. The thermal performances of the anti-gravity vapor chamber with a tree-shaped evaporator surface are experimentally studied and compared with those elicited from a corresponding chamber with a smooth evaporator surface. The effects of the filling rate, cavity height, and wick structure on the heat transfer performance of the anti-gravity vapor chamber are examined and analyzed. The results indicate that the thermal performance of the anti-gravity vapor chamber is greatly improved by the combination of tree-shaped grooves and hybrid mesh wick. The introduction of mesh wick eliminates the wall temperature fluctuation of the evaporator in the vapor chamber. The tree-shaped groove induces vapor distributed flow and enhances the thermal performance of the anti-gravity vapor chamber. The thermal resistance of the vapor chamber decreases first and then increases with increases of the liquid filling rate. The optimum liquid filling rate is 60%. The thermal resistance of the anti-gravity vapor chamber decreases as the cavity height decreases. The vapor chamber with an 80/200 mesh hybrid wick facilitates the reversed motion of condensate backflow and vapor flow, thereby leading to better heat transfer performance as compared to the 80 and 200 mesh wicks.

Key words: vapor chamber; groove; anti-gravity; tree-shaped

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