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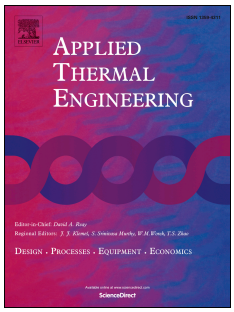


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# Thermal performance of a miniature loop heat pipe using water-copper nanofluid

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**Abstract:** The implementation of high power density coupled with limited space available in the cooling of electronics demands a highly efficient miniature loop heat pipe (mLHP). This study experimentally investigates the influence of a nanofluid on the thermal characteristics of a specially designed mLHP and explores the mechanism of heat transfer enhancement of the nanofluid in the mLHP. The nanofluid is composed of deionized water and Cu nanoparticles and has an average diameter of 50 nm. Reductions of 12.8% and 21.7% are achieved in the evaporator wall temperature and total thermal resistance, respectively, while the heat transfer coefficient (HTC) of the evaporator increases 19.5% when substituting the nanofluid with 1.0 wt% of deionized water at a heat load of 100 W. There is an optimal mass concentration for the nanofluids, which corresponds to the maximum heat transfer enhancement. The optimal mass concentration is 1.5 wt%. The thermal performance improvement of the mLHP using the nanofluid results from the reduction of the contact angle, the enhancement of boiling heat transfer, and a deposited nanoparticle coat on the boiling surface.

**Key words:** Miniature loop heat pipe; Nanofluid; Heat transfer enhancement; Electronics cooling