中国电机工程学报 2007 27 (23): 105-109 ISSN: 0258-8013 CN: 11-2107/TM

发电

平板热管微槽道传热面上纳米流体沸腾换热特性

熊建国[1];刘振华[1]

上海交通大学[1]

收稿日期 2006-9-29 修回日期 网络版发布日期 2007-11-15 接受日期

摘要
针对高热流密度负荷下大功率电力电子设备散热冷却，该文以带有微槽道强化传热面的小型重力型平板热管蒸发器为研究对象，以水-氧化铜纳米颗粒组成的纳米流体为工质，在不同运行压力和不同纳米流体浓度下对平板热管蒸发器的沸腾换热特性以及临界热通量(CHF)进行了实验研究。结果表明：压力对平板热管蒸发器的沸腾换热特性和CHF有强烈影响，沸腾换热系数和CHF随压力降低而大幅度增加。纳米流体浓度对沸腾换热系数和CHF也有重要影响，在低浓度时，沸腾换热系数和CHF随浓度增加而缓慢增加。但是在浓度超过1.0%时，浓度对CHF 的影响基本消失，换热特性反而恶化。研究证明，以水-氧化铜纳米颗粒组成的纳米流体可以明显地强化重力型热管蒸发器换热 特性。

关键词 散热冷却 纳米流体 沸腾换热 平板热管

分类号 TK121

Boiling Heat Transfer Characteristics of Nanofluids on Flat Heat Pipe Evaporator With Micro-grooved Surface

Abstract
Aim at cooling problem of electric power and electronic equipment with high heat flux, experimental study was performed to understand the nucleate boiling heat transfer and the critical heat flux (CHF) of the water based on CuO nanoparticles suspension (nanofluids) in the evaporator of a miniature flat heat pipe (MFHP) with micro-grooved surface at different pressures and particle concentrations of nanofluids. Results show that pressure has great influence on boiling heat transfer and CHF. The heat transfer enhancement effects of nanofluids increase greatly with the decrease of the pressure. The concentration of nanofluids also has significant influence on the boiling heat transfer of the nanofluids and the CHF. The heat transfer and the CHF increase slowly with increase of the concentration at low concentration. However, when the concentration exceeds to 1.0%, the CHF is basically close to a constant, and the heat transfer deteriorates. The study confirmed that the boiling heat transfer characteristics of MFHP's evaporator can be strengthened evidently by using water/CuO nanofluids.

Key words cooling nanofluid boiling flat heat pipe

DOI:

通讯作者 熊建国 john81172002@yahoo.com.cn;jianguox82@gmail.com;jianguox82@sjtu.edu.cn;xiong.jianguo@zte.com.cn

作者个人主页 熊建国 刘振华