

论文

脉动热管传热性能实验研究

李燕, 贾力

北京交通大学机械与电子控制工程学院

摘要:

建立了铜管脉动热管实验台, 分析水冷条件下充液率、工质、倾斜角和是否为闭回路等因素对脉动热管传热性能的影响。研究表明: 随着充液率的增加, 整体热阻变大, 原因是管内的工作流体增加, 流动摩擦阻力增大, 气泡的份额减小, 脉动驱动力减小, 加热段冷却段的温差增大; 选用蒸馏水、无水乙醇以及丙酮为工质时, 丙酮在脉动热管中更容易形成循环流动而使得传热性能增强, 热阻最低; 不同倾斜角的实验中, 垂直底加热时脉动热管热阻最低, 表明重力在工质回流到冷却段起到重要的作用; 环路型脉动热管传热性能在相同条件下要比非闭合回路脉动热管传热性能好。

关键词: 脉动热管 传热性能 影响因素

Experimental Research on Heat Transfer Performance of Pulsating Heat Pipe

LI Yan, JIA Li

School of Mechanical and Electronic Control Engineering, Beijing Jiaotong University

Abstract:

The experimental system was set up for copper pulsating heat pipe. The influence of filling ratio, working fluid, inclining angle and closed or unclosed end on performance of heat transfer in pulsating heat pipe (PHP) were studied carefully. The results indicate that the thermal resistance of PHP increases with filling ratio. The reason is that the flow friction between the fluid and the wall is increased and the driving force for the oscillation and transporting heat from the evaporator to the condenser is decreased with increasing of filling ratio. The overall thermal resistance increases owing to increasing of the temperature difference between the heating section and condensation section. The water, ethanol and acetone were selected as working fluids in this research. The thermal resistance of acetone is the lowest at the same condition since it is easier to form circulation flow for acetone in the pipe. The thermal resistance of PHP in vertical bottom heat is the lowest for all inclining angles since the gravitation plays an important role for working liquid to turn back to condensation section. The heat transfer performance of looped PHP is better than un-looped PHP since it is easier to form circulation flow in looped PHP.

Keywords: pulsating heat pipe performance of heat transfer influence factors

收稿日期 2008-08-12 修回日期 网络版发布日期 2009-04-20

DOI:

基金项目:

国家自然科学基金项目(50776006); 国家高技术研究发展计划项目(863计划)(2006AA05Z228)。

通讯作者: 贾力

作者简介:

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