

传递现象

## 汞-水混合工质脉动热管实验研究

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摘要

在恒定加热功率条件下, 考察了不同倾斜角时蒸发段壁面温度的脉动情况, 发现了汞-水脉动热管微倾角起振的特性; 在相同充液比下, 对比了汞-水混合工质与纯水工质脉动热管在微倾角时的运行特性; 对比了不同倾斜角下汞-水脉动热管的传热性能。实验结果表明: 工质汞的掺入能够有效辅助脉动热管的微倾角起振, 增加了脉动热管应用的灵活性。传热热阻随加热功率的增加而减小, 而在高加热功率下, 热阻大小基本不受倾斜角影响。实验中还发现汞-水脉动热管起振的临界热通量与热载荷施加的历史有关。

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分类号

## Experimental study of pulsating heat pipe with mercury and water as working fluid

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### Abstract

Experimental investigation was conducted on closed-loop pulsating heat pipe (CLPHP) working with a mixture of water and mercury. The temperature fluctuation of the evaporator section at different inclination angles was measured at constant heating load, and the phenomenon of start-oscillation in micro inclination angles was observed. Then the operation characteristics of Hg-H<sub>2</sub>O PHP and pure H<sub>2</sub>O PHP was compared in the same fill ratio. Lastly, a comparison of heat transfer performance of Hg-H<sub>2</sub>O PHP with different inclination angles was made. The results showed that the addition of mercury into water effectively assisted the start-oscillation in micro inclination angles which increased the application flexibility of the PHP system. Thermal resistance decreased as heating load increased. Up to a certain magnitude, different inclination angles had very close thermal resistance. It was discovered that the critical heat flux of start-oscillation was related to heating history.

**Key words** [closed-loop pulsating heat pipe](#) [electronic cooling](#) [start-oscillation](#) [temperature fluctuation](#) [heat transfer performance](#)

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