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传递现象

碳纳米管悬浮液强化小型重力型热管换热特性

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摘要

对水基多壁碳纳米管悬浮液强化小型重力型热管换热特性进行了实验研究。碳纳米管悬浮液质量分数为0. 1%～3%，热管运行压力为7. 45、12. 38和19. 97 kPa。实验结果发现，用质量分数为2. 0%的碳纳米管悬浮液替代去离子水后，热管蒸发段换热性能大幅度提高，临界热通量最大提高了120%。热管运行压力对蒸发段沸腾传热系数有明显影响，压力越小，碳纳米管悬浮液对沸腾换热特性的强化作用越显著。壁面热通量对蒸发段沸腾换热特性也有明显影响，低热通量时碳纳米管悬浮液的强化换热作用不明显，到高热通量时，其强化换热作用显著。

关键词

重力型热管 纳米流体 碳纳米管悬浮液 强化换热 沸腾

分类号

Heat transfer enhancement of small thermosyphon using carbon nanotube suspensions

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Abstract

A heat transfer experiment was performed to investigate the heat transfer performance of a small thermosyphon using carbon nanotube（CNT）suspensions. The study was focused on the effects of the mass concentration of the CNT suspension and the operating pressure of the thermosyphon on the heat transfer and critical heat flux（CHF）in the evaporator. The CNT concentration ranged from 0. 1% to 3%(mass) and the operating pressures of the thermosyphon varied from 7. 45 kPa to 19. 97 kPa. The experimental results showed that CNT suspensions could significantly enhance heat transfer coefficient and CHF in the evaporator under sub-atmospheric pressures. Under the pressure of 7. 45 kPa，the heat transfer coefficient and CHF of the evaporator increased by 40 % and 120 % when water was replaced by 2. 0% CNT suspension. Wall heat flux had remarkable influence on the heat transfer of CNT suspensions. The enhanced heat transfer effect was weak at a low heat flux and it gradually increased with the increase of wall heat flux.

Key words thermosyphon nanofluid CNT suspension heat transfer enhancement boilingng

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