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工程热物理

卧式螺旋管内R134a沸腾两相传热特性实验研究

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摘要：

在蒸发温度为5~15℃，热流密度范围为5~20 kW×m-2，工质质量流速变化范围为100~400 kgm-2s-1和干度范围为0.1~0.8的条件下，采用低电压、大电流的直流电源直接电加热的方法，对R134a在卧式螺旋管内的沸腾两相流传热特性进行了实验研究。结果表明，传热系数随工质干度和质量流速的增加而显著增加；热流密度对传热系数的影响也比较明显，传热系数随着热流密度的增加而增加，干度较小时热流密度对传热系数的影响更为明显；系统压力的变化对传热系数的影响较小。通过对实验数据的非线性回归分析，发展了R134a卧式螺旋管内流动沸腾局部传热系数的计算关联式。

关键词： 沸腾两相流 传热特性 卧式螺旋管 R134a

Experimental Investigations on Two-phase Flow Boiling Heat transfer of R134a in Helically Coiled Tube

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Abstract:

Experimental investigations on two-phase flow boiling heat transfer of R134a in helically coiled tube were carried out. DC power of low voltage and high current was adopted to heat the test section directly to boiling the R134a flowing in it, and the experiments were studied at saturation temperature from 5 to 15℃, with the refrigerant mass flux varying from 100 to 400 kg×m-2×s-1, heat flux varying from 5 to 20 kW×m-2, and the vapor quality ranging from 0.1 to 0.8. The results show that the heat transfer coefficients increase distinctly with the rising of the vapor quality and the mass velocity, and rise with the increasing of the heat fluxes and notablely at the low vapor quality conditions. The heat transfer coefficients are affected slightly by the system pressures. The new correlation is developed for predicting the local boiling heat transfer coefficients through the regression analysis on the test data.

Keywords: two-phase flow boiling heat transfer horizontal helically coiled tube R134a

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