

传递现象

R410A-油混合物在7 mm直强化管和C形强化管内流动沸腾的摩擦压降特性

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摘要

实验研究了环保制冷剂R410A-润滑油混合物在直强化管和C形强化管内流动沸腾的摩擦压降特性。实验测试管为内螺纹强化管, 外径为7.0 mm。实验工况的蒸发温度为5℃, 质流密度为200~400 kg·m⁻²·s⁻¹, 热流密度为7.56~15.1 kW·m⁻², 入口干度为0.1~0.7, 平均油浓度为0~5%。实验结果表明, R410A-油混合物在直强化管和C形强化管内流动沸腾的摩擦压降随平均油浓度和质流密度的增大而增大。基于混合物性开发了R410A-油混合物在直强化管和C形强化管内流动沸腾的压降关联式。直强化管内的摩擦压降关联式与97%以上的实验数据的偏差均在±10%以内; C形强化管内的摩擦压降关联式与95%的实验数据的误差在±15%以内。

关键词

[R410A](#) [油](#) [C形](#) [强化管](#) [压降](#) [关联式](#)

分类号

Frictional pressure drop characteristics of R410A-oil mixture flow boiling in 7 mm straight and C-shape enhanced tubes

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Abstract

An experimental study of frictional pressure drop characteristics of R410A-oil mixture flow boiling inside straight and C-shape horizontal enhanced tubes was performed. The test tube was an internally spiral grooved tube with the outer diameter of 7.0 mm. Experimental parameters included evaporating temperature 5℃, mass flux from 200 kg·m⁻²·s⁻¹ to 400 kg·m⁻²·s⁻¹, heat flux from 7.56 kW·m⁻² to 15.1 kW·m⁻², inlet vapor quality from 0.1 to 0.7, and oil concentration from 0 to 5%. The test result showed that frictional pressure drop of R410A-oil mixture flow boiling inside straight and C-shape enhanced tubes increased with increasing oil concentration and mass flux. New correlations of frictional pressure drop for R410A-oil mixture flow boiling inside the straight enhanced tube and C-shape enhanced tube were developed respectively based on the mixture properties. The new frictional pressure drop correlation for the straight enhanced tube could agree with 97% of the experimental data within deviation of ±10%, and the frictional pressure drop correlation for the C-shape enhanced tube could agree with 95% of the experimental data within deviation of ±15%.

Key words

[R410A](#) [oil](#) [C-shape](#) [enhanced tube](#) [pressure drop](#) [correlation](#)

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