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Comparison of R744 and R134a heat transfer coefficients during flow boiling in a horizontal circular smooth tube

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Abstract

In last and recent years new regulamentations and protocols concerning the environmental impact of refrigerants have led to the research of new environmental friendly refrigerants. In this contest the carbon dioxide (R744) is considered as one of the most promising substitute of the actually most widely used refrigerant in commercial refrigeration: R134a. However, some technical and thermodynamic problems avoid a widespread use of R744 in refrigeration applications. Referring to the performances of R744 in refrigerating applications, they are influenced by the design of components. In order to study the heat transfer characteristics at refrigerant side during flow boiling of R744 and to compare its behaviour to that of R134a, the authors carried out experiments in several working conditions usually encountered in commercial refrigeration. In this work are presented the experimental results of heat transfer coefficients for R744 and a comparison with those for R134a in the whole range of vapour qualities for a heat flux equal to 10 kW/m^2 varying the mass flux between 200 and 350 kg/m^{2}s and the saturation temperature between -8.0 °C and +5.0 °C.

Key words

R134a, R744, heat transfer coefficient, flow-boiling, evaporator, refrigeration.

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