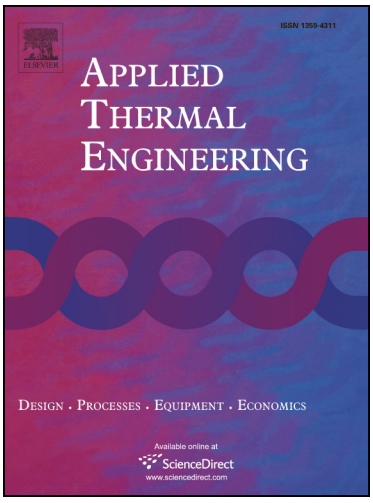

Research Paper

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Experimental investigation of R410A and R32 falling film evaporation on horizontal enhanced tubes

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Abstract

In this study, heat transfer performance on horizontal copper tubes of high pressure refrigerants R32 and R410A was investigated. An integrated fin (condensation enhanced) tube and three boiling enhanced tubes with 3-D different enhancement structures were tested. A plain tube was also tested for comparison. Effects of film flow rate, saturation temperature and heat flux on the falling film heat transfer coefficients were investigated. A tube bundle comprised of 6 enhanced boiling tubes was also tested to find the bundle effect. Experiments were carried out at saturation temperatures of 6, 10 and 16℃, heat fluxes from 20 to 150 $kW \cdot m^{-2}$ and film flow rates from 0.01$kg \cdot m^{-1} \cdot s^{-1}$ to 0.14$kg \cdot m^{-1} \cdot s^{-1}$. It is found that the effect of film Reynolds number on HTCs of enhanced tubes can be separated into two regimes, a quasi-plateau regime and a sharp decrease regime. HTCs increase with heat flux. Increase of saturation temperature has negligible effect on enhanced tubes as well as the tube bundle. The integrated fin tube performs best among the tubes tested. As a whole, R410A is inferior than R32. Tubes positioned below the top row possess the similar variation trend of HTCs with that of the first row but suffer an earlier dryout.

Key words: falling film evaporation, plain tube, enhanced tubes, nucleate boiling heat transfer, R410A, R32