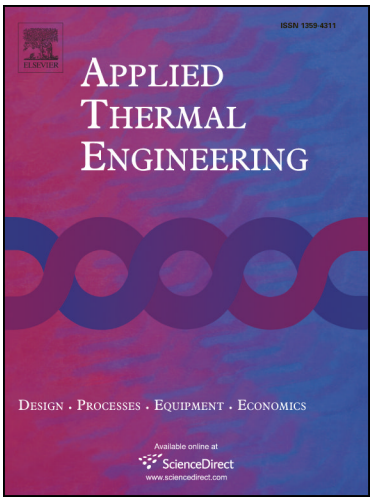

Research Paper

Air adsorption on the gas-liquid interface in vapor condensation across horizontal tube

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Air adsorption on the gas-liquid interface in vapor condensation across horizontal tube

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Abstract：Air adsorption on the gas-liquid interface in vapor condensation across horizontal tube was investigated experimentally. An air hole with a diameter of 0.006 m was opened at z = 0.755 m and θ = 50° on the jacket tube wall. A total of 16 thermistors were mounted uniformly on the horizontal tube wall along the circumference of z = 0.27 m and z = 0.72 m to measure wall temperature. The relative air content, ending difference, heat transfer coefficient and Nusselt number were calculated, and the in-leakage air adsorption process on the gas-liquid interface was analysed. The key factors that affect air adsorption on the gas-liquid interface are relative air content, heat load, pressure, and temperature. The air adsorption amount on the gas-liquid interface improves with the increase in relative air content and reduces with the increase in heat load. The air adsorption on the gas-liquid interface in the condensation of vapor over the horizontal tube has a similar change rule as Langmuir's isothermal adsorption law. The air adsorption amount on the gas-liquid interface increases with the increase in pressure and the reduction in temperature. Higher vapor condensation decreases the air adsorption amount on the gas-liquid interface, causing the adsorption equilibrium to move towards desorption. The error between the variation of experimental in-leakage air mass flux with the pressure drop rate and the results from a formula recommended by America Heat Exchange Institute (HEI) is within -28%–23%. The present experimental results were compared with the results of the works of Nusselt (1916), Sherkriladze and Gomelauri (1966), Rose (1984), Fujii et al. (1972) and Chen and Lin (2009).