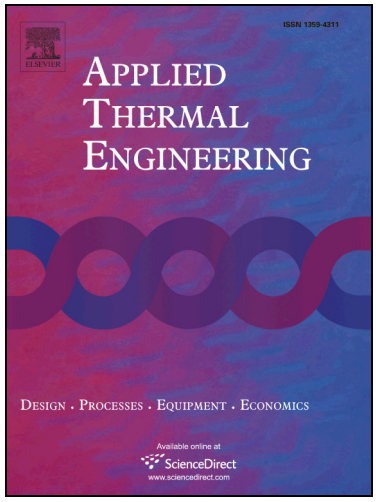

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Experimental study on the difference of heat transfer characteristics between vertical and horizontal flows of supercritical pressure water

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ABSTRACT

The present paper is devoted to investigating the difference of heat transfer characteristics between horizontal and vertical upward flows of supercritical pressure water. Experimental study is conducted with both horizontal and vertical upward tubes (∅32 mm×3 mm), covering a range of mass fluxes (G) from 200 to 600 kg·m^{-2}·s^{-1}, heat fluxes (q) up to 400 kW·m^{-2}, and pressure (P) from 23 to 28 MPa. Heat transfer characteristics are analyzed in detail for selected parameters. The results show at low q/G, an apparent heat transfer enhancement and insignificant difference in the two arrangements. However, when the q/G increases to a higher value (i.e. q/G>0.5), heat transfer deterioration occurs and a noticeable heat transfer discrepancy is detected, where the inner-wall temperature of vertical flow far exceeds that of horizontal flow. Dimensionless parameters, Bo^{+}, Kv, and BTH are adopted to analyze the effects of buoyancy force and thermal acceleration for both flows. The analysis suggests that mechanisms governing horizontal and vertical flows of supercritical