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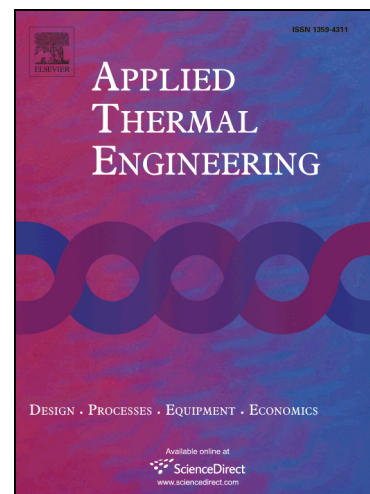
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Experimental study on the difference of heat transfer characteristics between vertical and horizontal flows of supercritical pressure water

Xianliang LEI^{*1}, Huixiong LI¹, Weiqiang Zhang¹, Nam T. Dinh², Yumeng Guo¹, Shuiqing Yu¹

¹State Key Laboratory of Multiphase Flow in Power Engineering, Xi'an Jiaotong University, China

²Department of Nuclear Engineering, North Carolina State University, USA

* xianlianglei@mail.xjtu.edu.cn Tel: +86-29-82665870 Fax: +86-29-82669033

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 ($\text{Ø}32 \text{ mm} \times 3 \text{ mm}$), covering a range of mass fluxes (G) from 200 to 600 $\text{kg} \cdot \text{m}^{-2} \cdot \text{s}^{-1}$, heat fluxes (q) up to 400 $\text{kW} \cdot \text{m}^{-2}$, 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

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