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# MODELLING OF SUBCOOLED BOILING FOR THE ULTRA-HIGH PRESSURE CONDITION: THE INFLUENCE OF OPERATING PARAMETERS

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**ABSTRACT** The subcooled boiling flow is an importance process in liquid-vapour phase change and it couples the nucleation, growth, departure and inhomogeneous dispersion of vapour bubbles as a result of heat and mass transfer and momentum exchange between the two phases. With the increase of pressure in steam generator and energy convertors, it becomes physical impossible to measure the local flow structure inside the tube. In this work, the subcooled subcooled boiling flow in vertical heated tubes was numerically studied under high pressure conditions. The RPI wall boiling model was used to describe the near-wall physical phenomenon of the subcooled boiling flow based on the Eulerian-Eulerian framework. Extension of the RPI model to super high pressure conditions has been done in our previous work [Gu et al. 2017]. Based on the validated results, the ultra-high pressure condition of about 15 MPa was considered in this work and the influence of operating parameters, including mass flow rate, heat flux and inlet subcooling were mainly studied. The local distributions of void fraction, partitions of the heat flux and surface heat transfer coefficient under the different operating conditions were analysed. From the results in this work, the subcooled flow patterns for the ultra-high pressure conditions were clearly demonstrated and the influences of operating parameters were better understand.

**KEYWORDS:** Subcooled boiling; RPI wall boiling model; Ultra-high pressure; Liquid-vapour phase change; Operating parameters; Numerical modelling.