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Effect of Channel Aspect Ratio on Flow Boiling Characteristics within Rectangular Micro-passages

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Abstract **-** A numerical investigation on the effect of channel aspect ratio on a single bubble growth during saturated flow boiling conditions within square microchannels, is conducted in the present paper. The open-source toolbox OpenFOAM is applied for the simulations, utilising a user-enhanced Volume OF Fluid (VOF) solver. The solver enhancements include a treatment for spurious velocities dampening, the implementation of an improved dynamic contact angle sub-model for accurate prediction of wettability effects as well as the implementation of a phase-change model in the fluid domain, accounting for conjugate heat-transfer with a solid domain. It is shown that the variation of the aspect ratio of a microchannel has a significant effect in the local heat transfer coefficient, due to an enhancement of the single-phase heat transfer in combination with the alteration of the underpinned bubble growth dynamics, which result in different contributions of contact line versus liquid film evaporation.

Keywords**:** Flow boiling, Microchannels, Multiphase flow, VOF, Conjugate heat transfer