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NUMERICAL STUDY OF BUBBLE GROWTH AND HEAT TRANSFER IN MICROCHANNEL USING DYNAMIC CONTACT ANGLE MODELS

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ABSTRACT In this paper, a numerical study is performed to investigate the bubble dynamics and heat transfer characteristics during flow boiling in a microchannel considering dynamic contact angle models reported in the literature. A two-dimensional domain is chosen where continuity and momentum equations are solved in two phases using Finite Volume Method (FVM) based Semi-Explicit Pressure Projection Method. The unsteady bubble interface and bubble growth are identified by DGLSM (Dual-Grid Level Set Method) based numerical model. The results suggest that Kalliadasis and Chang model predicts the bubble growth closest to the experimental value and is more accurate compared to the static contact angle model. Further, the effects of wall superheat and system pressure on bubble dynamics and heat transfer are studied. It is found that the system pressure and wall superheat have significant effects on the bubble growth characteristics. The transient Nusselt number shows a decreasing trend with the dynamic contact angle model similar to the static contact angle model.

KEYWORDS Two-phase flow, microchannel, numerical, dynamic, level-set method.