Abstract Submitted
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A more general Force Balance Model to predict Bubble Departure and Lift-off Diameters in flow boiling[1] RAVIKISHORE KOMMAJOSYULA, Massachusetts Inst of Tech-MIT, THOMAS MAZZOCCO, WALTER AMBROSINI, University of Pisa, EMILIO BAGLIETTO, Massachusetts Inst of Tech-MIT — Accurate prediction of Bubble Departure and Lift-off Diameters is key for development of closures in two-phase Eulerian CFD simulation of Flow Boiling, owing to its sensitivity in the Heat Flux partitioning approach. Several models ranging from simple correlations to solving complex force balance models have been proposed in literature; however, they rely on data-fitting for specific databases, and have shown to be inapplicable for general flow applications. The aim of this study is to extend the approach by proposing a more consistent and general formulation that accounts for relevant forces acting on the Bubble at the point of Departure and Lift-off. Among the key features of the model, the Bubble Inclination angle is treated as an unknown to be inferred along with the Departure Diameter, and the relative velocity of the bubble sliding on the surface, is modeled to determine the Lift-off Diameter. A novel expression is developed for the bubble growth force in terms of flow quantities, based on extensive data analysis. The model has been validated using 6 different experimental databases with varying flow conditions and 3 fluids. Results show high accuracy of predictions over a broad range, outperforming existing models both in terms of accuracy and generality.

[1]CASL - The Consortium for Advanced Simulation of LWRs

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