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Developments in Predicting Subcooled Flow Boiling CHF

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Abstract

A two-phase flow model was developed to predict a critical heat flux (CHF) in the subcooled and low quality flow boiling. The CHF formula was derived from the local conservation equations of mass, energy and momentum, together with appropriate constitutive relations. The limiting transverse interchange of mass flux crossing the interface of the bubbly layer and core region is represented, in the local momentum conservation equation, by taking account of the convective shear effects due to the drag force on the wall-attached bubbles. Comparison between the predictions by the proposed model and the experimental CHF data from several sources shows good agreement over a wide range of flow conditions (2 P 20 MPa, 1 D 37.5 mm, 0.035 L 6 m, 450 G 7500 kg/m<sup>2</sup>s, exit 0.8). Also the model correctly accounts for the effects of flow variables.