Numerical study of single bubbles with dynamic contact angle during nucleate pool boiling

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Received 2 October 2005; received in revised form 27 June 2006
Available online 12 September 2006

Abstract

Nucleate pool boiling is typically characterized by cyclic growth and departure of vapor bubbles from a heated wall. It has been experimentally observed that the contact angle at the bubble base varies during the ebullition cycle. In the present numerical study, a static contact angle model and dynamic contact angle models based on the contact line velocity and the sign of the contact line velocity have been used at the base of a vapor bubble growing on a heated wall. The complete Navier–Stokes equations are solved and the liquid–vapor interface is captured using the level-set technique. The effect of dynamic contact angle on bubble dynamics and vapor volume growth rate is compared with results obtained with the static contact angle model.