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Letter to the Editors

In the paper by J. Mitrovic, "The flow and heat transfer in the wedge-shaped liquid film formed during the growth of a vapor bubble", published in the Int. J. Heat Mass Transfer Vol. 41, No. 12, pp. 1771–1785, 1998, several inaccurate statements have been made. It is somewhat disappointing to note that Dr. Mitrovic neither read the reference [9] of his paper carefully nor tried to study the reference [30] which formed the basis of the work reported in reference [9]. It has been clearly stated in both papers that the developed model was for vapor stems supporting mushroom type of bubbles formed in fully developed nucleate boiling. It was also discussed that the time taken for the formation of vapor stems was assumed to be much smaller than the time for which the vapor stems existed on the heater surface. As such quasi-static analysis was justified. No attempt was made in the paper to model the transient growth of a vapor bubble. In the analysis we had used lubrication type of theory and had neglected interia and convection terms in the momentum and energy equations respectively. We had also assumed that the velocity normal to the heater was much smaller than the radial velocity but, as the author has acknowledged, vertical velocity at the interface was included in the energy balance. Through order of magnitude analysis it can be shown that the assumptions we made are not unrealistic and lead to little error in the final solution.

When micro-layer becomes only a few molecules thick, the temperature of the outer layer of the molecules approaches the wall temperature and the heat flux across the micro-layer becomes zero. This in turn leads to no flow of liquid near the triple point. From the analysis we were able to determine stable shapes of the vapor steps as a function of the magnitude of Hamakar's constant and wall superheat. A comparison of the predictions with the available data was also made.

Dr. Mitrovic, on the other hand, has made only qualitative arguments based on his perception of the physics of the process without providing any concrete validation. He shows that at the triple point the heat flux should be infinite. How is this possible considering the fact that molecules sticking to the wall will not evaporate even at a temperature equal to the wall temperature? There are several other physically incorrect statements in the paper. For example, in reference to Fig. 2d, the statement, "Due to proximity of the surface, the mass flow rate $d\mathring{m}_L$ in this channel is very low but the heat flux at the 'outlet' of the channel is very large."

Finally, it would have been useful if Dr. Mitrovic had done some quantitative analysis of the stem size and microlayer thickness, based on his perceptions, and compared his results with the data and/or predictions from models of others.

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