# CHAPTER 6

# CONCLUDING REMARKS

The FC-72 transient saturated and subcooled flow boiling heat transfer and associated bubble characteristics on a small heated circular copper flat plate flush mounted on the bottom of a rectangular channel have been experimentally investigated. The effects of the mean level and oscillation amplitude and period of the coolant mass flux, inlet liquid subcooling, and the imposed heat flux on the transient FC-72 flow boiling heat transfer coefficients and associated bubble characteristics such as the mean bubble departure diameter, bubble departure frequency, and active nucleation site density have been examined in detail. Major results presented in chapters 4 and 5 can be summarized as follows:

(1) The time-average boiling curves for the transient subcooled and saturated flow boiling of FC-72 are not affected to a noticeable degree by the amplitude and period of the coolant mass flux oscillation. In fact, they resemble that for the stable flow boiling. Similar trend is noted for the time-average boiling heat transfer coefficients.

(2) In the transient saturated flow boiling of FC-72 subject to a time-periodic coolant mass flux oscillation, significant temporal oscillations in the heated surface temperature, boiling heat transfer coefficient, boiling departure diameter and frequency, and active nucleation site density appear for the imposed heat flux slightly higher than that for ONB. These physical quantities oscillate at the same frequency as the mass flux. At a higher imposed heat flux and for a larger amplitude of the mass flux oscillation these oscillations are stronger. The effects of the period of the mass flux oscillation are slight. However, these oscillation are

only slightly affected by the period of the mass flux oscillation. Moreover, the bubbles become smaller and more dispersed when the coolant mass flux increases with time. The opposite processes take place for a decreasing coolant mass flux. Furthermore, reductions in the size of the departing bubbles and active nucleation site density and augmentation in the bubble departure frequency result in the time duration in which the mass flux is rising. When the mass flux is sinking the opposite processes occur.

(3) The temporal variations of the heat transfer and associated bubble characters in the transient FC-72 subcooled flow boiling affected by the coolant mass flux oscillation qualitatively resemble those for the transient saturated flow boiling. Some differences do exist. An increase in the inlet liquid subcooling results in stronger oscillations in the boiling heat transfer coefficient.