CHAPTER 6 CONCLUSION AND RECOMMENDATIONS FOR FUTURE WORK

This chapter presents the conclusion and recommendations for future work. In the part of the conclusion, the important conclusions of this thesis are summarized below.

6.1 Conclusions

An experimental investigation on the flow boiling heat transfer of R134a flowing through a multi- microchannel heat sink was performed in order to investigate the effects of mass flux, heat flux, saturation temperature and vapor quality on the flow boiling heat transfer and pressure drop characteristics. A test section having a number of channel of 27, and hydraulic diameter of 421 μm was investigated. The conclusions of this study are as follows:

1. The mass fluxes have a significant effect on the boiling curve of R134a in microchannels.
2. The average heat transfer coefficient increased with increasing wall heat flux in the mass flux ranging between 800-1200 kg/m^2 s. However, it is interesting to note the different trend of the average heat transfer for low mass flux (i.e., 400 kg/m^2s). This might be because the wall partial dry-out occurred.
3. The effect of saturation temperature and inlet vapor quality has a significant effect on the heat transfer characteristics.
4. The heat transfer coefficient data obtained from the present experiment are compared with four existing correlations. The correlation of Fang (2013) present fairly good predictions with MAE values of 12%.

5. An analysis of pressure drop components reveals that the frictional pressure drop influence over other three components (i.e., acceleration, sudden contraction and sudden expansion) for all conditions.
6. The pressure drop data show that, for the mass flux of 800 and 1200 kg/ms^2, the frictional pressure gradient increase with increasing heat flux, saturation temperature and inlet vapor quality but it are less effected by the mass flux of 400 kg/ms^2.
7. The frictional pressure gradient data from the experiment are compared with different prediction methods. The comparisons indicate that the methods based on homogeneous flow model agree well with the measured results.

6.2 Recommendations for future work

The following tasks are suggested for future work:

1. Expanding the heat transfer measurement database is suggested. Data for different fluids and substrate materials are desired over a large operational parameter range. Additional aspects such as flow instability, flow visualization, and flow pattern maps could be included. This database will help bring more complete understanding of micro-scale flow boiling and two-phase flow.
2. Well-characterized experimental setup should be conducted with high-speed flow visualization and transient temperature and pressure measurements. These transient measurements could be used to establish the necessary understanding in flow characteristics.