CHAPTER VII
CONCLUSIONS

1. Exergy analysis reveals that absorption type dehumidification process is energy efficient.

2. Dehumidification of air, using calcium chloride as the dessicant solution, is a liquid film controlled process. Hence increase of interfacial area increases the heat and mass transfer rates.

3. The equilibrium curves drawn for calcium chloride solution and water vapour, apart from helping in locating the operating line for effective mass transfer in the dehumidification process, also indicate the solubility limits of calcium chloride solution, which is an important criteria in the design of the system.

4. The critical temperature, which depends on the inlet concentration of the dessicant solution and the inlet temperature of the air, below which only mass transfer is positive in dehumidification, is defined and predicted.

5. The retarding effect of the decrease in the interfacial area on mass transfer is predicted for increases in concentration of the dessicant solution.

6. Flooding in three phase fluidized bed systems depends on bed packing and it affects the temperature distribution in the bed.
7. Temperature does not remain constant along the bed height. Initially the variation is due to larger release of heat of solution at the top and later it is because of flooding at the bottom.

8. The temperature and concentration in the radial direction is found to be uniform.

9. The shape of the materials does not have significant change in temperature and concentration.

10. For dehumidification, systems with very low contact time will be more effective.

11. For the dehumidification process, there is a critical velocity of air, which will introduce a residence time, above which only the mass transfer from air to the dessicant solution will take place.

12. Diffusion of heat and mass into the inner layers of the dessicant solution film is very slow and before the changes in temperature and concentration are transferred to the subsequent layers, the residence time lapses and the solution film collapses.

13. Heat and mass transfer from the bubble phase is only marginal and is not affected very much by solution flow rate.

14. With the restrictions imposed by the assumptions for the analysis, the experimental results of Nu and Sh match well with the theoretical predictions.
15. Percentage change in relative humidity is found to be about 25 percent more in the case of a countercurrent three phase fluidized bed system as compared to packed beds.

16. A new parameter Moisture Transfer Number has been defined and the design correlations, between the variation of relative humidity in the bed and the MTN, for both dehumidification and regeneration, have been obtained.