CHAPTER 8

CONCLUSION

The study aimed at developing a stable, economical and convenient solar refrigerator that can be installed and operated in primary health centres and rural hospitals in rural areas has been completed with satisfactory results. Utilization of thermolumenscence properties to study the stability of the Molecular Sieve used in the refrigerator has yielded the desired results. Use of TL to evaluate the stability of zeolite is a novel application of TL. The Molecular Sieve 13X manufactured in India is found to be stable upto 800 degree C which is four times higher than the maximum temperature that is possible using a flat plate solar collector. Also the 13X is found to remain active and potent even after five years of operation which again indicate the suitability of Indian make 13X.

Though some attempts were made elsewhere in India to use the 13X for solar refrigerator applications, all those attempts were restricted to laboratory level studies only. For the first time, a working prototype model was developed as a result of this study and the model was field tested for over two years to cover all the seasons. Also an Engineered model of the prototype was developed taking into consideration the operational and maintenance requirements in the field.

The performance studies on the two models have, clearly and beyond any doubts, proved the feasibility of a solar thermal

refrigerator based on the solid adsorption cycle. This refrigerator can be used for storing vaccines and other essential drugs in primary health centres and rural hospitals that do not have reliable supply of grid power. This refrigerator can be used to replace the present method of daily transportation of vaccines in cold boxes kept cool using ice for the cold chain operations. Storing the vaccines safely at the site will result in elimination of the troublesome daily transport of vaccines and also reduce the extent of damage caused to the vaccines.

In order to make the system more convenient, one could scale up the model to produce larger quantities of ice which can provide a few days of 'no sun autonomy'. In order to have three days of autonomy a minimum of 3 kgs ice production in 24 hours would be essential. Having already established all the design parameters scaling up of the system can be done without difficulty.

The solar refrigerator based on zeolite-water adsorption cycle is a CFC free technology. All over the world, currently, efforts are being directed towards eco friendly refrigeration technologies. Hence the work done under this study is in the right direction and is right on time.

Scope of using other type of zeolites and different adsorbent - desorbent combinations for refrigeration applications can be investigated in further research.