INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

Name of the Student	:	Bukke Kiran Naik
Roll Number	:	1461003001
Programme of Study	:	Ph.D.

Thesis Title: Design and Performance Assessments of Solar Driven Liquid Desiccant Air Conditioning System Components

Name of Thesis Supervisor(s)	:	Prof. P. Muthukumar
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SHORT ABSTRACT

In recent years, solar driven liquid desiccant based air conditioning system (ACS) has been projected as a promising alternative for handling large latent loads (> 50 TR or 176 kW) compared to solid desiccant, vapour compression and vapour absorption based ACSs. Dehumidifier, regenerator and solar collector are the key components of solar driven liquid desiccant based ACS. In this thesis, developed thermal models for assessing the heat and mass transfer characteristics at the air desiccant interface of the counter and cross parallel flow liquid desiccant dehumidifier/regenerator. Developed numerical models for analysing the heat transfer characteristics of the evacuated U – tube solar collector. Introduced modified Lewis number (Lewis number interms of thermal and moisture effectiveness) for simplifying the approach to predict the heat and mass transfer coefficients of the liquid desiccant dehumidifier/regenerator. Developed a concept of working fluid transition time for an evacuated U – tube solar collector to analyse the time taken by a working fluid to attain a steady state condition. Fabricated the experimental setup, liquid desiccant dehumidification/regeneration system of 18 kW capacity and the evacuated U-tube solar collector system to obtain a working fluid temperature difference of 35 ^{o}C. Developed experimental correlations for predicting the specific humidity difference between the inlet and exit of the liquid desiccant dehumidifier/regenerator, working fluid transition time of the evacuated U – tube solar collector in terms of known inlet parameters. Introduced a concept of entransy dissipation theory for optimizing and predicting different paths to enhance the performance of the liquid desiccant regenerator. Investigated the energy exchange and exergetic performance of the liquid desiccant regenerator and evacuated U-tube solar collector.