

A

Dissertation Report on

**STEADY STATE HEAT FLOW CHARACTERISTICS IN A
CYLINDRICAL HEAT EXCHANGER CONTAINING SALT
MIXTURE ($\text{KNO}_3\text{-NaNO}_3$) AND NANO PARTICLES
($\text{Al}_2\text{O}_3/\text{SiO}_2/\text{Graphite}$)**

Submitted in fulfillment of the requirements of the degree of
MASTERS OF TECHNOLOGY

By

Shrikant Ramnath Sabale

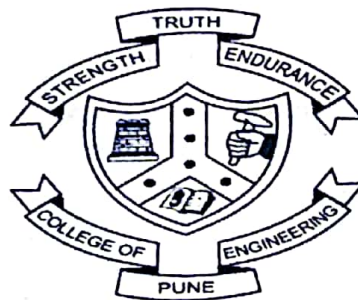
(MIS No. 121646013)

Guide

Prof. V. Poddar

Advisor

Dr. S. Banerjee



**Department of Metallurgy and Materials Science
COLLEGE OF ENGINEERING PUNE
2017-2018**

ABSTRACT

Concentrated solar power (CSP) system use general thermodynamic cycle to produce electricity and thus the system efficiency is mainly determined by the working temperature of heat transfer fluid (HTF).

Organic-based HTFs (e.g., mineral oil, ethylene glycol, etc.) were firstly used for this application. However, this has limited the working temperature up to 300°C.

Recently a binary liquid salt ($\text{NaNO}_3\text{-KNO}_3$; also termed as "solar salt") has been introduced and adapted in the most recent CSP plants. This solar salt is also used as thermal energy storage (TES) medium. The project aims towards study state heat flow characteristics like Thermal conductivity, Specific Heat of the solar salt ($\text{NaNO}_3\text{-KNO}_3$) in innovative heat exchanger. Thermal conductivity is important heat flow characteristic which is determined by appropriate instrumentation and applying proper methodology. Here we used the Specially Designed cylindrical Heat Exchanger in which Heating is done from the core and it flows radially. It is most important to achieve steady state condition in a Heat Exchanger to study heat flow characteristics.

Specific heat of the solar salt and its solar salt with Nano particles Dopants is determined by using DSC. Effect of Nano particles ($\text{Al}_2\text{O}_3/\text{SiO}_2/\text{Gr.}$) addition to the solar salt is studied at different wt. %.