VISVESVARAYA TECHNOLOGICAL UNIVERSITY

"Jnana Sangama" Belagavi – 590010

PROJECT REPORT ON

"ZINC OXIDE AND ZINC INDIUM SULFIDE ($ZnO@ZnIn_2S_4$) CORE-SHELL NANOCOMPOSITE FOR PHOTO ELECTROCHEMICAL ENERGY HARVESTING"

Submitted in partial fulfillment of the requirements for the award of degree

BACHELOR OF ENGINEERING

IN

ELECTRONICS & COMMUNICATION ENGINEERING

Submitted By

AKSHATHA RANGANATH	4AL17EC007
CHETHAN KUMAR	4AL17EC021
DHAVALA	4AL17EC027
MAHESH H	4AL17EC048

Under the Guidance of

Dr. MRINMOY MISHRA

Associate professor

Department of E&C Engineering

ALVA'S

Education Foundation®

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY

MOODBIDRI – 574 225.

2020-2021

ALVA'S INSTITUTE OF ENGINEERING & TECHNOLOGY

MOODBIDRI – 574 225

(Affiliated to VTU, **BELAGAVI**)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the project work entitled "**ZINC OXIDE AND ZINC INDIUM SULFIDE ($ZnO@ZnIn_2S_4$) CORE-SHELL NANOCOMPOSITE FOR PHOTO ELECTROCHEMICAL ENERGY HARVESTING**" *is a bona fide work carried out by*

AKSHATHA RANGANATH	**4AL17EC007**
CHETHAN KUMAR	**4AL17EC021**
DHAVALA	**4AL17EC027**
MAHESH H	**4AL17EC048**

in partial fulfillment for the award of **BACHELOR OF ENGINEERING** in **ELECTRONICS & COMMUNICATION ENGINEERING** of the **VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI** during the year 2020–2021. It is certified that all corrections/suggestions indicated for Internal Assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the Bachelor of Engineering Degree.

Signature of the Guide	**Signature of the H.O.D**	**Signature of the Principal**
Dr. Mrinmoy Mishra	**Dr. D V Manjunatha**	**Dr. Peter Fernandes**
	Dept. Of Electronics & Communication Alva's Institute of Engg. & Technology Mijar, Moodbidri - 574 225	Alva's Institute of Engg. & Technology Mijar, Moodbidri - 574 225, D.K.

EXTERNAL VIVA

Name of the Examiners	Signature with date
1.....	.....
2.....	.....

ABSTRACT

Solar light is an ideal energy source to overcome the crisis of energy shortage and severe environment problems. In the past decades, photocatalysis technology has aroused tremendous interests. ZnO nanomaterial is the most widely used catalytic material for a variety of photocatalytic applications such as water splitting, self-cleaning, wastewater treatment, bacterial inactivation, and air and soil purification. The reasons behind the frequent use of ZnO are its low cost, long-term chemical stability, and nontoxicity. As a layered structure ternary metal chalcogenide, zinc indium sulfide ($ZnIn_2S_4$) is a typical visible-light-responsive photocatalyst which has a tunable band gap for wider light absorption. Recently, $ZnIn_2S_4$ has been widely utilized in photocatalytic applications. Its photocatalytic performance is largely dependent on its structure, morphology and optical characteristics. To further improve the efficiency of carrier generation and separation of charge carriers the $ZnIn_2S_4$@ZnO core-shell nanocomposite needs to be prepared.

This project the synthesis of Core shell nanomaterial by using chemical precipitation method is done as it is cost-effective and environmentally friendly. Nanomaterial based on thin film fabrication is done which is used as the working electrode in the work station. Application of thin film is energy harvesting. We also show the results of different analysis done with the novelty material synthesized and also discusses its surface morphology.