Department : Pure and Applied Physics		
Academic Year : 2022-23		
Sr. No.	**Programme Code**	**Name of the Programme**
01.		B.Sc. Physics
02.		B.Sc. Electronics
03.		B.Sc. Physics
04.		M.Sc. Physics

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

Signature and Seal of the Head

GURU GHASIDAS UNIVERSITY

Bilaspur (CG) – 495009, India

Door alarm with magnetic reed switch

A project dissertation submitted in a partial fulfilment of the requirements for the degree of

Bachelor of science (B.Sc.) in Electronics

By

NILESH KARSH

(B.Sc. Electronics 6th semester)

Under the guidance of

P. RAMBABU

Assistant Professor

Department of Pure and Applied Physics

Session (2022 – 2023)

Certificate from supervisor

This is to be certify that the report entitled " **Door alarm with reed switch"** carried out by **Nilesh Karsh** of **Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur,** for the partial fulfilment of requirements for the degree **Bachelor of Science in Electronics** at **GGV Bilaspur** is absolutely carried out by him under my supervision and guidance.

To best of our knowledge, these results have not been submitted by ~~her~~ him for the award of any other degree or diploma.

P. RAMBABU

(Assistant Professor)

Department of Pure and Applied Physics

Guru Ghasidas University , Bilaspur (C.G)

Approval Certificate

This is to certify that the report entitled "**Door alarm with reed switch**" by **Nilesh karsh** is approved for the degree of B.Sc. In Electronics.

Examiner

Dr M.N. Tripathi

Head of department

Department of Pure and Applied Physics,

Guru Ghasidas University,

Bilaspur (C.G),495009, India

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिक विभाग
Dept. of Pure & Applied Physics
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बिलासपुर (छ.ग.)/Bilaspur (C.G.)

Door Alarm

Door sensors are an essential component of your home security system: they let you know when someone is entering your home. These devices are made up of two parts, which form a circuit when they're kept parallel to each other.

Security door alarms are simple electronic devices that trigger when an intruder or trespasser tries to gain access to any designated area.

This is a digital home security system with alarm feature which can monitor password for entrance, magnetic door lock and motion detector. The goal of this project is to utilize the after-market parts and build an integrated home security system.

incorporated password and magnetic lock for door and motionsensor. Hence the security system will sound an alert when there is an attempt of break-in.

A **security alarm** is a system designed to detect intrusions, such as unauthorized entry, into a building or other areas, such as a home or school. Security alarms protect against burglary (theft) or property damage, as well as against intruders. Examples include personal systems, neighborhood security alerts, car alarms, and prisons.

Some alarm systems serve a single purpose of burglary protection; combination systems provide fire and intrusion protection. Intrusion-alarm systems are combined with closed-circuit television surveillance (CCTV) systems to record intruders' activities and interface to access control systems for electrically locked doors. There are many types of security systems. Homeowners typically have small, self-contained noisemakers. These devices can also be complicated, multirole systems with computer monitoring and control. It may even include a two-way voice which allows communication between the panel and monitoring station.

DELAY TIMER USING 555 IC

A

Project Report Submitted

in Partial Fulfilment for the Degree of

BACHELOR OF SCIENCE ELECTRONCS

By

OM GUPTA

ROLL NO.: 20209016

ENROLLMENT NO.: GGV/20/07416

SESSION: 2020-2023

Under the Guidance

OF

Dr. Pradip Das

Associate Professor

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALA

BILASPUR- 495009 (C.G.), INDIA

July, 2023

FORWARDING CERTIFICATE

This is certified that OM GUPTA has carried out the project in the Department Pure & Applied physics GGV, Bilaspur, (CG) on the topic "DELAY TIMER USING 555 IC" . This project is submitted for the partial fulfilment of requirement for the degree of B.sc. Electronics and for the examiner's evolution, I wish him very success in his life.

Dr. M. N. Tripathi
Head of department
Dept. of pure & applied physics
GGV, Bilaspur 495009 (C.G.)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

GURU GHASIDAS VISHWAVIDYALAYA

JULY 2023

Department of Pure and Applied Physics
Guru Ghasidas viswadyalaya (A Central University)
Bilaspur (C.G.) 495009, INDIA

DATE: 20/07/23

CERTIFICATE

This is to certify that **OM GUPTA** has carried out the project under my supervision in the Department Of Pure & Applied physics, Guru Ghasidas Vishwavidyalaya Bilaspur C.G. on the topic "DELAY TIMER USING 555 IC". To the best of our knowledge the work presented in this project is original and has not been submitted anywhere.

Supervisor

Dr. Pradip Das
Assistant Professor

CHAPTER 1

ABSTRACT:

This exercise presents the configuration and operation of a delay timer using the 555 timer IC. The 555 timer IC is configured in a monostable mode that provides a fixed-duration delay when triggered. The timer circuit consists of resistors, capacitor, power supply, triggering mechanism and output mechanism. The 555 timer is connected to a power supply to supply the necessary voltage to the IC. Resistors and capacitors are inserted to determine the time delay. The desired delay can be obtained by choosing the appropriate values for the resistors and capacitors. Activation requires a prolonged triggering device such as a pushbutton or sensor. An output device, such as an LED or relay, is connected to the output pin of the 555 timer IC to indicate the time delay For stability, a bypass capacitor is optionally added to the power supply of the 555 timer IC. This helps to reduce any noise or interference that may affect the performance of the circuit. Once the circuit is energized, when the triggering mechanism is activated, the output pin of the 555 timer IC goes high and high for the specified delay time After the delay time has elapsed, the output pin returns to state in a low-level. Using the 555 timer IC, the delay timer circuit can be used in applications where timing and delay functions are required. It provides a simple and reliable solution for successful delays in the electronics industry.

DELAY TIMER USING 555 IC

A

Project Report Submitted

in Partial Fulfilment for the Degree of

BACHELOR OF SCIENCE ELECTRONCS

By

OM GUPTA

ROLL NO.: 20209016

ENROLLMENT NO.: GGV/20/07416

SESSION: 2020-2023

Under the Guidance

OF

Dr. Pradip Das

Associate Professor

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALA

BILASPUR- 495009 (C.G.), INDIA

July, 2023

FORWARDING CERTIFICATE

This is certified that OM GUPTA has carried out the project in the Department Pure & Applied physics GGV, Bilaspur, (CG) on the topic "DELAY TIMER USING 555 IC" . This project is submitted for the partial fulfilment of requirement for the degree of B.sc. Electronics and for the examiner's evolution, I wish him very success in his life.

Dr. M. N. Tripathi
Head of department
Dept. of pure & applied physics
GGV, Bilaspur 495009 (C.G.)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

GURU GHASIDAS VISHWAVIDYALAYA

JULY 2023

Department of Pure and Applied Physics
Guru Ghasidas viswadyalaya (A Central University)
Bilaspur (C.G.) 495009, INDIA

DATE: 20/07/23

CERTIFICATE

This is to certify that **OM GUPTA** has carried out the project under my supervision in the Department Of Pure & Applied physics, Guru Ghasidas Vishwavidyalaya Bilaspur C.G. on the topic "DELAY TIMER USING 555 IC". To the best of our knowledge the work presented in this project is original and has not been submitted anywhere.

Supervisor

Dr. Pradip Das
Assistant Professor

CHAPTER 1

ABSTRACT:

This exercise presents the configuration and operation of a delay timer using the 555 timer IC. The 555 timer IC is configured in a monostable mode that provides a fixed-duration delay when triggered. The timer circuit consists of resistors, capacitor, power supply, triggering mechanism and output mechanism. The 555 timer is connected to a power supply to supply the necessary voltage to the IC. Resistors and capacitors are inserted to determine the time delay. The desired delay can be obtained by choosing the appropriate values for the resistors and capacitors. Activation requires a prolonged triggering device such as a pushbutton or sensor. An output device, such as an LED or relay, is connected to the output pin of the 555 timer IC to indicate the time delay For stability, a bypass capacitor is optionally added to the power supply of the 555 timer IC. This helps to reduce any noise or interference that may affect the performance of the circuit. Once the circuit is energized, when the triggering mechanism is activated, the output pin of the 555 timer IC goes high and high for the specified delay time After the delay time has elapsed, the output pin returns to state in a low-level. Using the 555 timer IC, the delay timer circuit can be used in applications where timing and delay functions are required. It provides a simple and reliable solution for successful delays in the electronics industry.

Transistor-Transistor Logic

A project report submitted in partial fulfillment for the degree of

BACHELOR OF SCIENCE IN ELECTRONICS

By

POOJA DEWANGAN

Roll No.: 20209017

Enrollment No.: GGV/20/07417

Session: 2020-2023

Under the guidance of

Dr. Shiv Poojan Patel

Department of Pure and Applied physics

GURU GHASIDAS VISHWAVIDYALAYA
BILASPUR-495009 (C.G.) INDIA

July 2023

CERTIFICATE

This is to certify that the report entitled "**Transistor-Transistor Logic**" carried out by Pooja Dewangan of department of pure and applied physics Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.) 495009 for the partial fulfillment of the requirements for the degree of Bachelor of Science in Electronics at GGV Bilaspur is absolutely carried out by her under my supervision and guidance

To the best of out knowledge, these have not been submitted her for the award of any other degree or diploma

Dr. Shiv Poojan Patel

Department of Pure and Applied physics

GURU GHASIDAS VISHWAVIDYALAYA

BILASPUR-495009 (C.G.) INDIA

APPROVAL CERTIFICATE

This is to certified that the report entitled "**Transistor-Transistor Logic**" by Pooja Dewangan is approved for the degree of B.Sc. in Electronics

Examiner

Dr. M.N Tripathi

Head of the department

Department of Pure and Applied physics

GURU GHASIDAS VISHWAVIDYALAYA

BILASPUR-495009 (C.G.) INDIA

ABSTRACT

Transistor-Transistor Logic (TTL) is a class of integrated circuits which maintain logic states and achieve switching with the help of bipolar transistors. One of the prominent features of Transistor-Transistor Logic signals is the ability of the inputs of the gate rise to the logical "1" if left unconnected. It acts as a NAND Gate

APROJECTREPORT

ON

"LASERSCURITYALARM"

Submittedinpartialfulfilmentof

"GraduationinElectronics"

Session2020-2023

GURUGHASIDASVISWAVIDYALAYABILASPUR(C.G.)

DEPARTMENTOFPURE&APPLIEDPHYSICS

COURSE-BScElectronics(sem-6)

SUBMITTEDTO:-

DR.DINESHUTHRA

SUBMITTEDBY:-

PRANAVPATNAIK

CERTIFICATE

This is to certify that PRANAV PATNAIK, student of B.sc Honours ELECTRONICS (6th Semester) has successfully completed herelectronics project on " LASER SECURITY ALARM " Under the Supervision of Dr.Dinesh Uthra during the academic session 2020-2023 as per the guidelines issued bythe university.

Dr. M.N Tripathi
(Head of department)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

CHAPTER1

ABSTRACT:

Laser security systems are advanced technological solutions usedtodetectanddeterunauthorizedaccessorintrusionsin varioussettings.Thesesystemsemploylaserbeamstocreate an invisible barrier, and when the barrier is breached, they trigger an alarm or activate a security response. This abstract provides a concise overview of laser security systems, their basic functioning, and their applications.

The laser security system consists of laser emitters that emit laser beams across a designated area, and corresponding detectors or receivers that monitor these beams for interruptions. When an object or person crosses the laser beams and interrupts their path, the system detects the breach.Subsequently,analarmistriggered,andappropriate securitymeasuresareinitiated.Thesemeasuresmayinclude sounding audible alarms, notifying security personnel, activating surveillance cameras, or deploying physical security mechanisms like locking doors or activating lights.

Laser security systems offer adjustable sensitivity levels to accountfordifferentenvironmentalconditionsandsecurity requirements. This adjustability minimizes false alarms caused by factors such as wind-blown objects or small animals. Additionally, laser security systems can be integrated with other security measures, including surveillance cameras, access control systems, and motion sensors, to provide comprehensive protection.

PROJECT REPORT

ON

"AUDIO MIXER"

SESSION 2020-2023

BY

PRANJAL SINGH

B.Sc. ELECTRONICS (HON'S)

Roll no. – 20209019

Enrolment No. – GGV/20/07419

Under the Supervision

DR. ALKA SINGH

Report submitted in partial fulfilment for the

Degree of **Bachelor of Science Electronics**

DEPARTMENT OF PURE & APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAYA

JULY 2023

Department of Pure and Applied Physics
Guru Ghasidas Vishwavidyalaya (A Central University)
Bilaspur (C.G.) 495009, INDIA

DATE: 20/7/23

CERTIFICATE

This is to certify that **PRANJAL SINGH** has carried out the project under my supervision in the department of pure and applied physics, Guru Ghasidas Vishwavidyalaya Bilaspur C.G on the topic " AUDIO MIXER " .To the best of our knowledge the work presented in this project is original and has not been submitted anywhere.

Supervisor

DR. ALKA SINGH
Professor

FORWARDING CERTIFICATE

This is certified that PRANJAL SINGH has carried out the project in the department of dept. Of pure Applied physics GGV ,Bilaspur, (CG) on the topic "**AUDIO MIXER**" . This project is submitted for the partial fulfillment of requirement for the degree of B.sc. Electronics and for the examiner's evolution, I wish him very success in his life.

Dr. MN Tripathi
Head of department
Dept. of pure and applied physics
GGV, Bilaspur 495009 (C.G.)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

CHAPTER 1

ABSTRACTS

The abstract provides a brief and concise overview of the entire document, highlighting the main objectives, methodologies, findings, and conclusions. It serves as a snapshot of the entire work, giving readers an understanding of the content without having to read the entire document.

In this document, we present a detailed analysis of a specific electronic project - a summing amplifier circuit. The project aims to combine multiple input signals and produce an amplified output signal that is the sum of all the input signals. The circuit is based on the principle of an inverting operational amplifier.

INTRODUCTION

The introduction sets the stage for the document, providing an overview of the topic and the purpose of the work. In this section, we will introduce the topic of the summing amplifier circuit and its significance in analog signal processing.

1.1 Background:

A PROJECT REPORT

ON

"GAS LEAKAGE DETECTION SYSTEM"

Submitted in partial fulfilment of

"Bachelor in Electronics"

SESSION 2022-2023

GURU GHASIDAS VISWAVIDYALAYA BILASPUR (C.G.)

DEPARTMENT OF PURE & APPLIED PHYSICS

COURSE –BSc. Electronics Honours (sem VI)

SUBMITTED TO

Dr. SHALINTA TIGGA

SUBMITTED BY

PRERNA PRAJAPATI

CERTIFICATE

This is to certify that PRERNA PRAJAPATI, student of B.sc electronics Honours (6th Semester) has successfully completed her electronics project on "GAS LEAKAGE DETECTION SYSTEM" Under the Supervision of Dr. SHALINTA TIGGA during the academic session 2022-2023 as per the guidelines issued by the university.

Shalinta
20/07/2023

Dr. Shalinta tigga

CERTIFICATE

This is to certify that PRERNA PRAJAPATI, student of B.sc electronics Honours (6th Semester) has successfully completed her electronics project on "GAS LEAKAGE DETECTION SYSTEM" Under the Supervision of Dr. M.N.Tripathi during the academic session 2022-2023 as per the guidelines issued by the university

Dr. M.N Tripathi
(Head of department)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

CHAPTER 1

Abstract:

Gas leakage poses a significant risk in various environments, ranging from residential buildings to industrial facilities. To mitigate this hazard, a gas leakage detection system has been developed. The system utilizes advanced sensors to monitor the surrounding air for the presence of specific gases, such as natural gas, propane, carbon monoxide, or methane.

The gas sensors, deployed strategically throughout the area, detect any abnormal gas concentrations. The sensor data is collected and processed by a central control unit, which analysis the readings to determine the presence of a gas leak. In the event of a gas leak, the system triggers a series of safety measures to prevent potential accidents and harm to individuals and property.

The gas leakage detection system is equipped with various alarms and indicators to alert occupants of the area about the potential danger. These include audible alarms, visual indicators (such as flashing lights), and remote notifications to authorized personnel or building management systems. Furthermore, the system can be integrated with ventilation systems or gas shut-off valves to automatically reduce the gas concentration or cut off the gas supply in the affected area.

Regular monitoring, maintenance, and calibration of the system are essential to ensure its accuracy and reliability. Periodic inspections and sensor checks help to identify any faults or malfunctions, ensuring the system's effectiveness in detecting gas leaks promptly.

"DESIGN AND CONSTRUCTION OF AN ARDUINO-CONTROLLED ROBOTIC VEHICLE AVOIDING OBSTACLES"

A PROJECT REPORT IS SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF SCIENCE (HONS.)

IN

ELECTRONICS

By

Sakshi Dewangan

(Roll. No.- 20209023)

Under Guidance of

Dr. Awadhesh Kumar Dubey

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR- 495001, CG

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR- 495001, CG

CERTIFICATION

This is to certify that the project report entitled " " is submitted by **Miss Sakshi Dewangan (Roll No. – 20209023)** in partial fulfilment of requirements of project work for the award of Bachelor of Science in Electronics at Guru Ghasidas University, Bilaspur is an authentic work carried out by her under my supervision and guidance.

To the best of my knowledge, the matter embodied in Project Report has not been submitted to any other university/institute for award of any degree.

Supervisor's Signature:

30/07/23

External Examiner Signature:

Head of Department Signature:

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR- 495001, CG

ABSTRACT

This project focuses on creating and operating an intelligent robot car that can navigate around obstacles. The main goal is to develop a robot car capable of independently detecting obstacles in its path and changing direction accordingly, without any external guidance. The robot determines the best direction to avoid collisions by analysing sensor inputs and selecting the path with the greatest distance between the obstacle and the sensor.

To achieve this, an ultrasonic wave sensor was utilized to measure distances by emitting pulses. The movement of the servo motor (for sensor rotation) and the DC motors (for wheel movement) was controlled by a motor driver shield to enable obstacle avoidance. The Arduino microcontroller chip was responsible for receiving commands and serving as the central control unit for the robot car, managing both the sensor and car movements.

As a result of this implementation, the robot car successfully detected and circumvented obstacles within the range of the utilized Ultrasonic sensor's line of sight.

A PROJECT REPORT

ON

"CELL PHONE DETECTOR"

Submitted in partial fulfilment of
'Graduate in Electronics'

Year 2020-23

GURU GHASIDAS VISHWAVIDYALAYA

DEPARTMENT OF PURE & APPLIED PHYSICS
COURSE- BSc Electronics (semester 6)

Guided by-
Dr. Alka Singh

Submitted by-
Sandhya Rathore
(Roll no.- 20209024

Certificate

This is to certify that the work contained in the thesis entitled

"Cell Phone Detector"

Submitted by Sandhya Rathore (Roll No. 20209024) for the degree of

B.Sc. Honours Electronics from Guru Ghasidas Vishwavidyalaya, Bilaspur, is
A record of bonafide research work carried out by her under direct supervision and
Guidance by Dr. Alka Singh during the academic year
2020-2023

I consider it that the thesis has reached the standards and fulfils the requirements
Of the rules and regulations relating to the nature of the degree. The contents embodied
In the thesis have not been submitted for the award of any other degree and diploma at this
Or any other university.

Research supervisor
Dr. Alka Singh
Professor – Dept. of Pure
and Applied Physics

Head of Department
Dr. MN Tripathi
Department of Pure and
Applied Physics

विभागाध्यक्ष / H.O.D.
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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

Abstract

This handy, cell phone detector can sense the presence of an activated cell phone from a distance of one and half meters. It can be used to prevent use of mobile phone in examination hall, confidential rooms etc. it is also useful for detecting the use of mobile phone for spying and unauthorized video transmission. The circuit can detect the incoming and outgoing call, SMS and video transmission even if the mobile phone is kept silent mode. The moment the bug detects RF transmission signal from an activated mobile phone, the LED starts blinking. The blinking continues until the signal transmission ceases. Assemble the circuit on a general purpose PCB as compact as possible and enclosed in a box. As mentioned earlier, capacitor C3 should have a lead length of 18mm with lead spacing of 8mm. carefully solder the capacitor in standing position with each spacing of the leads. The response can be optimized by trimming the lead length of C3 for the desired frequency. You may use a short telescopic antenna.

Use the miniature 5V battery of a remote control and a small buzzer to make the gadget pocket size. The unit will give the warning indication if someone uses Mobile phone within a radius of 1.5 meters.

AUTOMATIC FAN SYSTEM

A

Project report submitted

In partial fulfilment for the degree of

BACHELOR OF SCIENCE ELECTRONCS

By

SWARAJ SINGH KANWAR

ROLL NO. : 20209029

ENROLLMENT NO. :GGV/20/07429

SESSION: 2020-2023

Under the guidance

OF

Dr. DINESH UTHRA

Assistant professor

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALA

BILASPUR- 495009 (C.G.), INDIA July, 2023

Certificate from the Supervisor

This is to certify that the report entitled "AUTOMATIC FAN SYSTEM " carried out by SWARAJ SINGH KANWAR, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN ELECTRONICS, at GGV, Bilaspur, is absolutely carried out by him under my supervision and guidance. To the best of our knowledge, these have not been submitted by him for the award of any other degree or diploma.

Dr. DINESH UTHRA

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA

KONI BILASPUR(C.G),495009,INDIA

Approval Certificate

This is to certify that the report entitled "AUTOMATIC FAN SYSTEM " by SWARAJ SINGH KANWAR, is approved for the degree of B.Sc. in electronics.

Examiner

Dr. M.N. Tripathi

Head of the department Department of Pure and Applied Physics, GURU GHASIDAS VISHWAVIDYALAY, BILASPUR- 495009 (C.G.),INDIA

विभागाध्यक्ष / H.O.D.
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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

ABSTRACT

This abstract focuses on the automatic fan control system's purpose, benefits, and limitations. The system aims to regulate the operation of a fan based on the ambient light conditions, providing energy efficiency, convenience, and optimal cooling. By activating the fan only when needed, the system reduces energy waste and offers cost savings. However, it has limitations related to light dependency, lack of precision, and the inability to account for other factors.

SOCIAL DISTANCING ALARM

A

Project report submitted

In partial fulfilment for the degree of

BACHELOR OF SCIENCE ELECTRONCS

By

SWATI SINGH THAKUR

ROLL NO. : 20209030

ENROLLMENT NO. :GGV/20/07430

SESSION: 2020-2023

Under the guidance

OF

Dr. Alka singh

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALA

BILASPUR- 495009 (C.G.), INDIA July, 2023

Certificate from the Supervisor

This is to certify that the report entitled "SOCIAL DISTANCING ALARM USING TSOP IR SENSOR" carried out by SWATI SINGH THAKUR, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN ELECTRONICS, at GGV, Bilaspur, is absolutely carried out by him under my supervision and guidance. To the best of our knowledge, these have not been submitted by him for the award of any other degree or diploma.

Dr. Alka singh

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA

Abstract

Internet Of things in the 21st generations can fight against COVID-19. COVID-19 is a global pandemic which has brough general changes to human life. Internet Of things COVID-19 virus can be reduced with the help of social distancing and sanitizing. Social distancing can reduce the risk of COVID. To main physical distancing between people, we have made a project which will help people to maintain a 2 meter of distancing between them using TSOP IR sensor. Physical distancing will be pat

GURU GHASIDAS VISHWAVIDYALAYA

Bilaspur (C.G)

A project report on

PIEZOELECTRICITY

submitted in partial fulfillment for degree of

Bachelor of science (B.Sc.) in Electronics

In semester 6th

Made by:

TUSHAR SONI

(B.Sc. Electronics 6th sem)

Guided by:

Dr.SHALINTA TIGGA

(Assistant Professor)

Certificate from supervisor

This is to certify that the report entitled PIEZOELECTRICITY carried out by TUSHAR SONI of department of pure and applied physics, Guru Ghashidas University, Bilaspur for the partial fulfillment of requirements for the degree BACHELOR OF SCIENCE IN ELECTRONICS at GGV Bilaspur is absolutely carried out by him under my guidance and supervision.

To best of our knowledge, these results have not been submitted by him for the award if any other degree or diploma.

Shalinta 20/07/2023

Dr. SHALINTA TIGGA

Assistant professor,
Department of pure and applied physics,
GGV, Bilaspur

Approval certificate

This is to certify that the report entitled "PIEZOELECTRICITY" made by TUSHAR SONI is approved for the degree of B.Sc. Electronics (hons.) from the department of Pure and applied physics Guru Ghasidas University, Bilaspur (C.G).

Dr. M.N. TRIPATHI
Head of department,
Department of pure and applied physics,
Guru Ghasidas Vishwavidyalaya,
Bilaspur, (C.G.)

विभागाध्यक्ष / H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

2 Introduction

2.1 Piezoelectric Materials

Piezoelectric materials are materials that produce an electric current when they are placed under mechanical stress. The piezoelectric process is also reversible, so if you apply an electric current to these materials, they will actually change shape slightly (a maximum of 4%).

There are several materials that we have known for some time that posse's piezoelectric properties, including bone, proteins, crystals (e.g. quartz) and ceramics (e.g. lead zirconate titanate).

Fig 2.1: Piezoelectric crystal

To better understand this we need to grasp some basics on what is piezoelectricity.

2.2 Piezoelectricity

Piezoelectricity is the electric charge that accumulates in certain solid materials—such as crystals, certain ceramics, and biological matter such as bone, DNA, and various proteins—in response to applied mechanical stress. The word *piezoelectricity* means electricity resulting from pressure and latent heat.

To know what a piezoelectric material is one has to know what does the term piezoelectric stand for. In PIEZOELECTRICITY the term" piezo" stands for pressure or stress. Thus piezoelectricity is defined as "Electricity generated by application of mechanical stress or tension" and the materials that exhibit this property comes under the category of piezoelectric materials.

GURU GHASHIDAS VISHWAVIDYALAYA

BILASPUR-495001 (C.G)

Department of Pure & Applied Physics

Project Report on

FIRE DETECTOR ALARM

SESSION 2020-2023

By

Vikas Das

BSC. ELECTRONICS(HON'S)

Roll No. - 20209033

Enrollment No. - GGV/20/07433

Under the Supervision

DR. AWADHESH KUMAR DUBEY

Report Submitted in partial fulfillment for the

Degree of **Bachelor of science Electronics**

CERTIFICATE

This is to certify that the work contained in the thesis entitled "Fire Detector Alarm" submitted by Vikas Das(Roll. No.: 20209033) for the award of the degree of Bechelor to the Guru Ghashidas Vishwavidyalaya Bilaspur , is a record of bonafide research works carried out by him under my direct supervision and guidance.

I considered that the thesis has reached the standards and fulfilling the requirements of the rules and regulations relating to the nature of the degree. The contents embodied in the thesis have not been submitted for the award of any other degree in this or any other university.

..... 20/07/23	.....	.....
Dr. Awadhesh Dubey	Pro. M.N.Tripathi	.....
Internal examiner	HOD	External examiner

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शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

Date:.....

Place: Guru Ghashidas Vishwvidyalaya Bilaspur (C.G)

ABSTRACT

Fire Alarm Circuit and Smoke sensor are a part of the security system which help in detecting or preventing damage . Installing Fire Alarm System and Smoke Sensor in commercial building like offices, movie theaters, shopping malls and other public place is an absolute necessity that can help prevent an evitable catastrophe.

These alarms may be activated automatically from smoke detectors, and heat detectors or may also be activated via manual fire alarm activation devices such as manual call points or pull stations. Alarms can be either motorized bells or wall mountable sounders or horns. The primary thought in the present field advance arecomputerizations, power utilization, and expense adequacy.

Automation is implied for the decrease risk of human neglection. Two sensors viz.The Temperature sensor and Air quality sensor which are utilized as a part of the Fire Detection System to recognize a fire .

The temperature sensor records the temperature of the room. The Air quality sensor detects if there is any gas present in the room. Fundamentally it acts as the mind of the entire framework.

A PROJECT REPORT
ON

"DUAL AXIS SOLAR TRACKER SYSTEM"

Submitted in partial fulfilment of

'Bachelor in Electronics'

SESSION: 2022-2023

GURU GHASIDAS VISWAVIDYALAYA BILASPUR (C.G.)

DEPARTMENT OF PURE & APPLIED PHYSICS

COURSE -BSc Electronics (Sem.-6)

GUIDED BY:-

Dr.Shalinta Tigga

SUBMITTED BY:-

Vivek kumar

(roll. No -20209034)

CERTIFICATE

This is to certify that VIVEK KUMAR GAVEL, student of B.sc Honours ELECTRONICS (6th Semester has successfully completed her electronics project on " DUAL AXIS SOLAR TRACKER SYSTEM" Under the Supervision of Dr SHALINTA TIGGA during the academic session 2022-2023 as per the guidelines issued by the university.

Salinta
20/07/2023

Supervised by,

Dr. Salinta Tigga

(Assistant Professor)

CERTIFICATE

This is to certify that VIVEK KUMAR GAVEL, student of B.sc Honours ELECTRONICS (6th Semester has successfully completed her electronics project on " DUAL AXIS SOLAR TRACKER SYSTEM" Under the Supervision of Dr SHALINTA TIGGA during the academic session 2022-2023 as per the guidelines issued by the university.

Salinta 20/07/2023

Supervised by,

Dr. Salinta Tigga

(Assistant Professor)

FORWARDING CERTIFICATE

This is to certify that Vivek kumar roll no . 20209034 has carried out the project in Department of Pure & applied physics Guru Ghasidas Vishwavidyalaya (A Central University) , Bilaspur (C.G.) on the topic " DUAL AXIS SOLAR TRACKER " . This project is submitted for the partial fulfilment of requirements of the degree of B.Sc . in Electronics is forwarded to examiner for evaluation . I wish him every success in life .

Dr. M. N. Tripathi

(Professor)

Head of Department

Dept. Of Pure & Applied Physics

Bilaspur (C.G.) 495009 India

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शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)
Bilaspur (C.G.)

CHAPTER 1

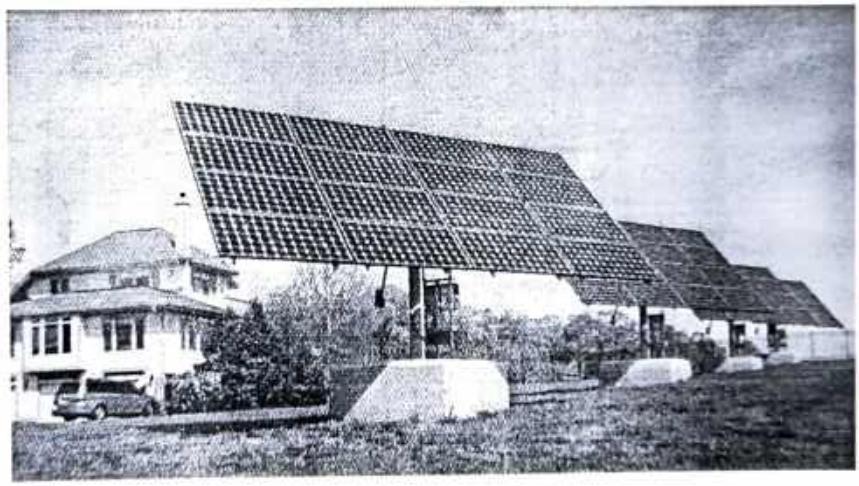
INTRODCTION

A dual axis tracker rotates the solar panels from East to West and North to South to provide direct exposure to sunlight. But how does this happen?

The presence of two axes in this tracker, i.e., the primary axis and secondary axis, facilitate convenient movement of the solar panels in all directions.

The most attractive feature of this device is that it helps generate nearly 40% more power than a fixed solar panel. Amazing, right?

Wondering how exactly the solar tracking system does that? The following section will help you understand just that.



It is designed and engineered to increase the efficiency of solar panels throughout the year. Its significant features include the following:

– It can adjust the panels in all 4 directions according to the sun's position.

– The sensors and algorithm keep a record of the seasonal changes and lay timing for accurate panel positioning.

– It increases solar energy generation all around the year.

The amount of power required to move the solar panel must be deducted from the total amount of power gained in order to accurately record the total power gain.

A

Project report submitted on

PHOTOVOLTAIC CELL

in partial fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

By

Abhijeet Panda

ROLL NO. :20208002

ENROLLMENT NO.: GGV/20/07602

SESSION: 2020-2023

Under the guidance

Of

Dr. M.N. Tripathi

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR- 495009 (C.G.), INDIA

July, 2023

Certificate from the Supervisor

This is to certify that the report entitled "**PHOTOVOLTAIC CELL**" carried out by Abhijeet Panda, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN PHYSICS, at GGV, Bilaspur, is absolutely carried out by him under my supervision and guidance.

To the best of our knowledge, these have not been submitted by him for the award of any other degree or diploma.

Dr. M.N. Tripathi
Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA
Bilaspur (C.G.), 495009, INDIA

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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

CHAPTER 1

1.1 INTRODUCTION

Photovoltaics is the process of converting sunlight directly into electricity using solar cells. Today it is a rapidly growing and increasingly important renewable alternative to conventional fossil fuel electricity generation, but compared to other electricity generating technologies, it is a relative newcomer, with the first practical photovoltaic devices demonstrated in the 1950s. Research and development of photovoltaics received its first major boost from the space industry in the 1960s which required a power supply separate from "grid" power for satellite applications. These space solar cells were several thousand times more expensive than they are today and the perceived need for an electricity generation method apart from grid power was still a decade away, but solar cells became an interesting scientific variation to the rapidly expanding silicon transistor development with several potentially specialized niche markets. It took the oil crisis in the 1970s to focus world attention on the desirability of alternate energy sources for terrestrial use, which in turn promoted the investigation of photovoltaics as a means of generating terrestrial power. Although the oil crisis proved short-lived and the financial incentive to develop solar cells abated, solar cells had entered the arena as a power generating technology. Their application and advantage to the "remote" power supply area was quickly recognized and prompted the development of terrestrial photovoltaics industry. Small scale transportable applications (such as calculators and watches) were utilised and remote power applications began to benefit from photovoltaics. In the 1980s research into silicon solar cells paid off and solar cells began to increase their efficiency. In 1985 silicon solar cells achieved the milestone of 20% efficiency. Over the next decade, the photovoltaic industry experienced steady growth rates of between 15% and 20%, largely promoted by the remote power supply market. The year 1997 saw a growth rate of 38%. This growth has continued over decades, and today solar cells are recognized not only as a means for providing power and increased quality of life to those who do not have grid access, but they are also a means of powering the grid, providing substantial fractions of the grid electricity in leading locations today. The increasing market for, and profile of photovoltaics, means that they have become a huge business with more than 100 GW deployed each year. Photovoltaic systems are now often deployed with batteries attached so that the system can continue providing electricity even after the sun has set.

GURU GHASIDAS VISHWAVIDYALAYA

Hertzsprung Russel Diagram Analysis

Using TOPCAT

A project dissertation submitted in a partial fulfillment of the requirements for the degree of

Bachelor of Science (B.Sc.) in Physics

By

Abhishek Burman

(B.Sc. Physics Hons. 6th sem.)

Under the guidance of

Dr. Parijat Thakur

Professor

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) - 495009

JULY 2023

Approval Certificate

This is to certify that the report entitled **"Hertzsprung-Russel Diagram Analysis using TOPCAT"** by **Abhishek Burman** is approved for the degree of B.Sc. in Physics.

Prof. M. N. Tripathi

Head of department

Department of Pure and Applied Physics,

Guru Ghasidas Vishwavidyalaya,

Bilaspur (C.G.), 495009

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INTRODUCTION

STARS, those twinkling bright spots we see in the dark skies, have an exciting history associated with themselves. They carry a story, the story of the Universe- its birth and its death. There is elegance in the way they evolve, in the enormous time scales of their evolution as well as the gigantism of their vastness itself are inconceivable to the human limitations. Nevertheless, our minds' curiosity and fascination have forced these colossal entities to open up and present themselves to our still-curious minds. Yet, a lot remains unknown out there, and the search is still on. Let, us go through the series of their evolution and learn the basic Physical Laws involved in their formation, till their death.

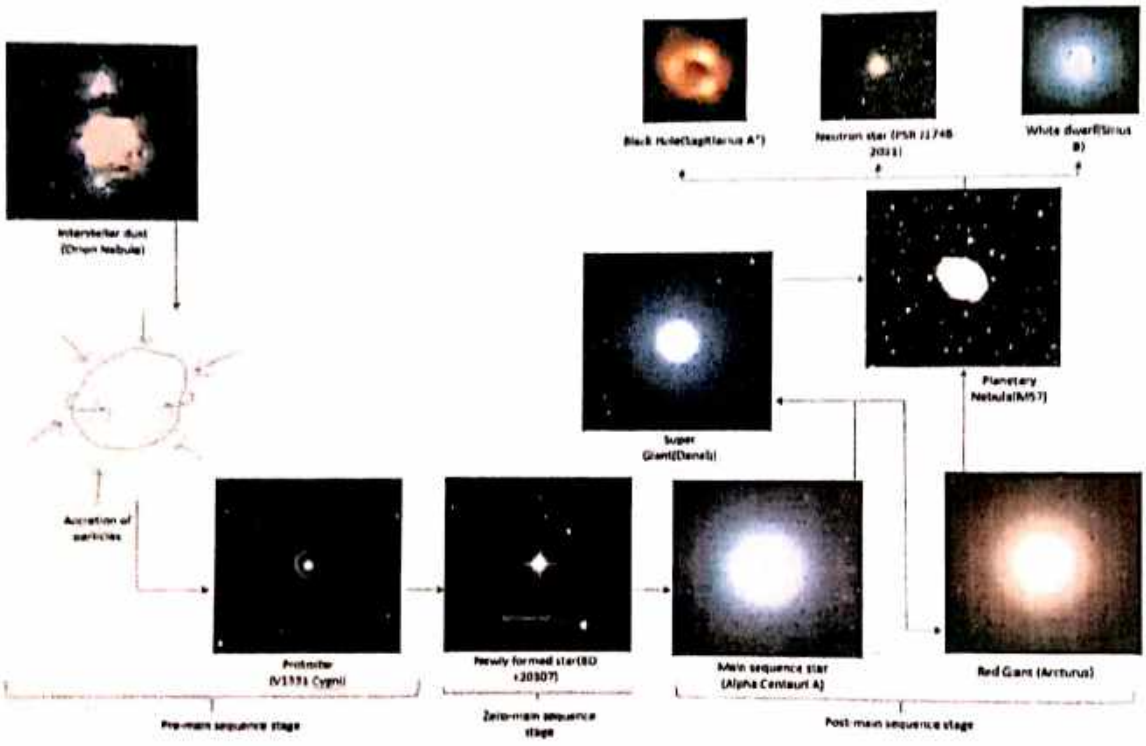

FIG. Stellar Evolution

Pre-main sequence :-

A star's true journey starts from the formation of a protostar. The interstellar dust as well as the molecular clouds in space which mostly comprise of Hydrogen and Helium, formed from the explosion of previous parent stars during the supernovae events, start coming together due to the gravity and form a dense clump of these molecules. This is called the collapsing stage. All this

A Review On Pulse Laser Deposition Technique And Development In The Fabrication Of The Nano Materials

A project report submitted in partial Fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

By

AJAY MASIH

ROLL NO : 20208006

ENROLLMENT NO : GGV/20/07606

SESSION : 2020 - 2023

Under the guidance

Of

Dr. JAI SINGH

Department of pure and applied physics

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR - 495001 (C.G.), INDIA

Approval Certificate

This is to certify that the report entitled "**A Review on pulse Laser Deposition Technique And Development In The Fabrication Of Nanomaterials**" by AJAY MASIH is approved for the degree of B.Sc. in Physics.

Prof. M.N. Tripathi

Head of the department Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA BILASPUR-495009 (C.G.), INDIA

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बिलासपुर (छ.ग.) / Bilaspur (C.G.)

Introduction

The synthesis of nanoparticles has attracted considerable interest during the last decade due to their potential applications in medicine, energy and environmental remediation. However, nanoparticles were used by the ancient cultures of Egypt and Rome in amazing works of art. Much of today's nanotechnology is focused on the systematic synthesis and characterization of new nanomaterials with enhanced properties and applications.

Pulsed Laser Synthesis (PLS) has been used to fabricate a wide range of nanomaterials, which have shown a variety of chemical, optical, magnetic, and electronic properties. PLS technique for the fabrication of materials can be traced back to the invention of the pulsed ruby laser in the mid-1960. For decades, researchers have focused on the synthesis of different materials using this technique in liquid and gas phases with solid, liquid and gaseous precursors. There are different experimental setups for the synthesis of nanostructures using PLS, which depend on the precursor materials, the laser parameters and the ambient conditions. The appropriate selection of parameters is essential in minimizing unwanted by-products and increase the yield of the intended nanostructured materials. PLS has demonstrated excellent suitability for the synthesis of a wide range of nanoparticles in terms of the yield and size homogeneity of the produced nanomaterials. Hence, PLS has potential for the industrial manufacturing of such nanostructures.

In particular, an array of carbon-based nanostructures can be obtained by changing the PLS conditions and parameters. Through the application of spectroscopic and microscopy techniques, we obtained a comprehensive understanding of the nanomaterials' composition and structure.

SINGLE ELECTRON TRANSISTOR BASED ON TWO DIMENSION MATERIALS

A

Project dissertation submitted

In partial fulfilment of the requirement for the degree of

Bachelor of Science (B.Sc.) in Physics

Department of Pure and Applied Physics,
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.),
India

Session: 2022-2023

Supervisor
Dr. ARUN KUMAR SINGH
(Associate professor)

Submitted by
ANKIT SHARMA
B.Sc. Physics VI Sem.
Roll no. 20208008

Department of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), India
(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)

CERTIFICATE

This is to certify that Mr. Ankit Sharma has carried out the project in the department of Pure and Applied Physics , Guru Ghasidas University , Bilaspur (C.G.) . On the topic "**Single Electron Transistor Based on Two Dimension Materials**". This report is submitted for partial fulfillment of the requirement for the degree of B.Sc. in Physics and for Examiner's evaluation.

I wish every success in his life.

Date: 20/7/23

Place : Bilaspur

Dr. M.N. Tripathi
Head of the Department
Department Of Pure and Applied Physics

Scanned with CamScanner

Introduction

- Many electron simultaneously participate from the source to the drain current in the conventional MOSFET, electron in SET devices are transferred one-by-one through the channel.
- A single-electron transistor (SET) is a type of transistor that operates by controlling the flow of single electrons through a channel between two electrodes.
- It consists of a tiny island of conductive material (typically a metallic nanoparticle or a quantum dot).
- Island placed between two larger electrodes by thin insulator, known as the source and drain electrodes.The distance b/w source and drain is few nm
- In SET electron tunnel one by one from source to drain through dot.
- SET device is based on an intrinsically quantum phenomenon known as tunnel effect
- A 2D particle-based SET is a type of single-electron transistor that uses a two-dimensional array of metallic or semiconducting particles to control the flow of individual electron.
- The operation of a 2D particle-based SET is similar to that of a traditional SET.But the 2D material have unique properties so construction and structure of single electron transistor will be small change
- However, the use of a 2D array of particles provides several advantages over traditional SETs
- Single electron transistor is a type of transistor
- There are many types of field effect transistor and MOFSET is one of those.
- To understand the Single electron transistor we have to first understand about MOFSET.

Study on ZnO-Ag based Nano composite material.

A
Project report submitted
in partial fulfillment for the degree of
BACHELOR OF SCIENCE IN PHYSICS

By

Archit Dwivedi

ROLL NO. :20208010
ENROLLMENT NO. : GGV/20/07610
SESSION: 2020-2023

Under the guidance

Of

Dr. R.K. Pandey

Department of Pure and Applied Physics
GURU GHASIDAS VISHWAVIDYALAY
BILASPUR- 495009 (C.G.), INDIA

July, 2023

Certificate from the Supervisor

This is to certify that the report entitled **"Study on Zno-Ag based Nano composite material"** carried out by Archit Dwivedi, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN PHYSICS, at GGV, Bilaspur, is absolutely carried out by him under my sypervision and guidance.

To the best of our knowledge, these have not been submitted by him for the award of any other degree or diploma.

20-7-2023

Dr. R.K. Pandey

Deparment of Pure and
Applied Physics
GURU GHASIDAS
VISHWAVIDYALAYA
Bilaspur (C.G.), 495009, INDIA

INTRODUCTION

Nanocomposites: Nanocomposite is a multiphase solid material where one of the phases has one, two or three dimensions of less than 100 nanometers (nm) or structures having Nano-scale repeat distances between the different phases that make up the material.

The idea behind Nanocomposites is to use building blocks with dimensions in nanometer range to design and create new materials with unprecedented flexibility and improvement in their physical properties.

In the broadest sense this definition can include porous media, colloids, gels and copolymers, but is more usually taken to mean the solid combination of a bulk matrix and nano-dimensional phase(s) differing in properties due to dissimilarities in structure and chemistry. The mechanical, electrical, thermal, optical, electrochemical, catalytic properties of the nanocomposite will differ markedly from that of the component materials. Size limits for these effects have been proposed.

Synthesis: (1.a) In a Berzelius beaker containing 30 mL of ethanol and 10 mL of deionized water,0.8925 g of zinc nitrate hexahydrate was dissolved by stirring for 20 min. Next, 1.0425 g of SDBS and 3 g of potassium hydroxide were added. The solution was stirred for 30 min, transferred to a 45 mL Teflon-lined stainless-steel pressure vessel (autoclave) and placed in the preheated oven at 100 ◦C for 10 h. After cooling to room temperature, the solution was centrifuged. Then the obtained powder was washed several times with ethanol and deionized water. The resulting product was oven-dried at 60 ◦C for 12 h. This sample was coded Z1. Another synthesis was performed following the same procedure as in above but without the addition of deionized water. In addition, this sample was washed only with ethanol. The sample was coded Z2.

EFFECT OF ELECTROMAGNETIC FIELD ON HUMAN HEALTH

A

Project Report Submitted

In partial fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

By

Aryan Singh

Roll no. 20208011

Registration no. GGV/20/07611

SESSION: 2020-2023

Under the guidance

Of

Dr. M.P. SHARMA

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA

BILASPUR (C.G.), INDIA

Approval Certificate

This is to certify that the report entitled "EFFECT OF ELECTROMAGNETIC FIELD ON HUMAN HEALTH" carried out by **Aryan Singh**, is approved for the degree of B.Sc. in Physics.

Examiner

Prof. M. N. Tripathi
Head of Department
Department of Pure and Applied Physics
GURU GHASIDAS VISHWAVIDYALAYA
Bilaspur (C.G.), 495009, INDIA

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Dept. of Pure & Applied Physics
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

WHY TO INVEST TIME IN THIS PROJECT

- First of all we should understand the need to invest our time in this project. So In 1996, a multidisciplinary research project was launched by WHO which includes various research and surveys to find out whether EMF affects human health or not.
- It was found that though EMF's are not that much of a concern for human beings at present. But if not handled with care and precaution then it might become a threat for us in near future.

SOME IMPORTANT DATA –

1.The International EMF Project –

- A large, multidisciplinary research effort was launched by WHO (World Health Organization) in 1996.
- Current knowledge and available resources of key international and national agencies and scientific institutions are accumulated by International EMF Project.

2. AFFECTS-

- general health
- pregnancy outcome
- Cataracts
- Cancer

Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.) India

(A Central University Established by Central Universities Act 2009 No.25 of 2009)

"DEPARTMENT OF PURE AND APPLIED PHYSICS"

REVIEW ON THE TOPIC - "Dielectric- The Energy Storage Material"

Submitted in partial fulfillment of the requirement for the award of Bachelor of Science Degree "IN PHYSICS"

To GURU GHASIDAS VISHWAVIDYALAYA BILASPUR C.G.

By,

Bhavya Sahu

B.Sc. Physics Honors 6th Semester

Roll No. – 20208012

Enrolment No. – GGV/20/07312

Under the Guidance of

Dr. Goverdhan Reddy Turpu

DEPARTMENT OF PURE AND APPLIED PHYSICS

Guru Ghasidas Vishwavidyalaya Bilaspur C.G. India

(A Central University Established by Central Universities Act 2009 No.25 of 2009)

CERTIFICATE

This is to certify that Bhavya Sahu has carried out the review on the topic "Dielectric- The Energy Storage Material" in the Department of Pure and Applied Physics, *Guru Ghasidas Vishwavidyalaya, Bilaspur* under my supervision. She worked diligently and methodically and has collected the literature very sincerely and carefully. To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend the project report to be forwarded to the respective examiners for evaluation.

Submitted by,
Bhavya Sahu

Supervised by,
Dr. Goverdhan Reddy Turpu

1.INTRODUCTION

Energy storage now a days is becoming an imperative part of renewable energy. With the massive growth of renewable energy sources, energy storage can play a substantial role in renewable energy integration in India. It is beneficial for entire supply chain mainly due to enhanced electric power quality, dependability and better grid stability. Thus, lowering renewable energy intermittency, with increased user-friendliness and accessibility of electrical energy in remote places and reduction in harmful emissions.

Because of the global air pollution, energy deficiency and climate change, various new energy generation technologies ,such as solar, wind and thermal energy, are developed to replace the fossil fuel energy resources with cleaner renewable sources. It in turn leads to the high demand of the devices for effectively storing, absorbing, and supplying the electricity. According to the energy-storage time, the commercial devices for electric energy storage are generally divided into two classes: short term and long term. Usually, battery is the long-term one, capacitor is the short-term one. Batteries possess high energy-density but their power density is quite low (typically lower than 500 W/kg) because of the slow movement of the charge carriers, which are mainly used for the long-term and stable energy supply. Differently, capacitors usually have high power density (10^1-10^6W/kg for electrochemical super capacitor and up to 108W/kg for dielectric capacitor), while their energy density is small (typically below 30 W h/kg), which are usually used to generate a pulsed voltage or current. Fig:- 1 gives the diagram of power density as a function of energy density of above mentioned energy-stored devices. Currently, the commercially used conventional dielectric capacitors are mainly made of dielectric polymers or dielectric ceramics, In contrast to conventional dielectric capacitors, although electrochemical super capacitors have a moderate energy density, their power density still does not meet the requirement in some super-high-power electronics and systems, such as electric gun, directed energy weapon, active armor, and so on. Moreover, electrochemical super capacitors usually also possess a complex physical structure, a rather small maximum operating voltage (below 3.0 V), high leakage current of about micro-amperes (low energy efficiency) and limited cycling lift(105Þ, which also prevent their application in some advanced pulsed power systems. Therefore, it could be concluded that, if the energy-storage density of the dielectric capacitors could be improved to be competitive with electrochemical super-capacitors or even batteries, their application field would be greatly expanded. For example, dielectric capacitors with high energy-storage density will further promote the compact electronic and electrical systems toward miniaturization, lightweight, and integration.

GURU GHASIDAS UNIVERSITY

"TIGHT BINDING MODEL"

A Project submitted in a partial fulfilment of the requirements for the degree of

BACHELOR OF SCIENCE in PHYSICS (HONOURS)

by

CHANDRABHAN KASHYAP

(B.sc. physics 6th Sem.)

Enroll.No. : GGV/20/07613

Roll No. : 20208013

Under Guidance of

P. RAMBABU

ASSISTANT Professor

Guru Ghasidas Vishwavidyalaya Bilaspur

DEPARTMENT OF PURE & APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAYA BILASPUR (C.G.)

(Central University Established by the Central University Act 2009 No. 25 of 2009)

APPROVAL CERTIFICATE

This is to certify that the report "**TIGHT BINDING MODEL**" by **CHANDRABHAN KASHYAP** is approved for the degree of **BACHELOR OF SCIENCE in PHYSICS**, at **GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR.**

Dr. M. N. Tripathi

Head of the Department

Department of Pure and applied physics

Guru Ghasidas Vishwavidyalaya Bilaspur

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

1) WHY WE USE TIGHT BINDING MODEL ?

The tight binding model is used in condensed matter physics to describe the behavior of electrons in a solid. It is particularly useful for understanding the electronic properties of materials with a crystalline structure, such as metals, semiconductors, and insulators. The model assumes that the electrons are tightly bound to the atomic cores and can only move between neighboring atoms. This simplifies the problem of calculating the electronic structure of a solid, making it possible to predict properties such as conductivity, magnetism, and optical behavior. The tight binding model is also useful for studying the effects of impurities, defects, and other types of disorder on the electronic properties of materials.

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

(A Central University established by the Central University Act 2009)

Project on the topic

ELECTRON MICROSCOPY

Guided by:

Dr. S. P. Patel

(Assistant Professor)

Submitted by:

Dushyant Kumar

(B.sc Honours Physics)

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

(A Central University established by the Central University Act 2009)

Certificate

This is to certify that Dushyant Kumar , student of B.sc Honours Physics (6th Semester) has successfully completed her physics project on " Electron Microscopy" Under the Supervision of Dr. S. P. Patel during the academic session 2022-2023 as per the guidelines issued by the university.

Shiv Pujan Patel

Dr. S.P. Patel

(Assistant Professor)

Dr. M.N Tripathi

(Head of Department)

INTRODUCTION

Electron microscopy is a scientific technique that uses a beam of electrons to image the structure and properties of materials at extremely high resolutions. It is a powerful tool for investigating the atomic and molecular structures of materials, including biological tissues, cells, and molecules.

In contrast to traditional light microscopy, which uses visible light to image specimens, electron microscopy uses a beam of electrons that has much shorter wavelengths, allowing for much higher resolution imaging. Electron microscopes come in two main types: transmission electron microscopes (TEM) and scanning electron microscopes (SEM).

TEM involves passing an electron beam through an ultra-thin sample and detecting the electrons that have passed through the sample to create an image. SEM involves scanning a focused beam of electrons over the surface of a sample, detecting the electrons that are scattered or emitted from the sample to create an image.

Electron microscopy requires specialized equipment and expertise, as well as careful sample preparation to avoid artifacts and other imaging artifacts. However, it has a wide range of applications in materials science, nanotechnology, biology, and many other fields, making it an essential tool for scientific research and development.

It allows researchers to study the composition, morphology, crystallography, and chemical properties of samples at a detailed level.

Electron microscopy has greatly contributed to advancements in scientific research, leading to new discoveries and insights into the microscopic world.

Electron microscopes were developed due to the limitations of Light Microscopes which are limited by the physics of light.

Artificial Intelligence in Domain of Physics

Project report submitted
in partial fulfillment of the requirement for the degree of

Department of Pure and Applied Physics

By

Garima Singh Thakur
Roll No 20208016

Under the Supervision of

Dr. Dinesh Uthra

DEPARTMENT OF PURE AND APPLIED PHYSICS
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CERTIFICATE

This is to certify that the project Report entitled "**Artificial Intelligence in Domain of Physics**" project is being submitted by Garima Singh Thakur In partial fulfillment for 6th Semester of Bachelor of Science in Department of Pure and Applied Physics is a record of bonafide work carried out under my guidance and supervision. The results embodied in this project Report have not been submitted to any other University or Institute for the award of any Degree or any Diploma or any purpose whatsoever

Head of Department

Prof. M.N. Tripathi
Department of pure and Applied Physics
Guru Ghasidas Central University ,Bilaspur,CG

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Signature of Supervisor

Dr. Dinesh Uthra

ABSTRACT

This report examines the utilization of artificial intelligence (AI) in the field of physics and its profound impact on scientific research and practical applications. Through the integration of AI methodologies with traditional physics frameworks, researchers have achieved remarkable breakthroughs in understanding the fundamental laws of the universe, predicting complex phenomena, and designing novel materials. The report explores diverse applications of AI in subfields such as astrophysics, quantum mechanics, and computational modeling, highlighting the transformative capabilities of machine learning algorithms, deep learning, and neural networks. Moreover, it addresses the challenges and ethical considerations associated with the integration of AI in physics, emphasizing the importance of responsible practices and transparent approaches. By harnessing the power of AI, physicists are paving the way for accelerated scientific progress and shaping a future where science and technology converge to advance our understanding of the universe.

A Project Report

on

The detailed study of Radio & Micro wave and their applications

GURU GHASIDAS VISHWAVIDYALAYA,BILASPUR (CG.)

Department of Pure and Applied Physics

Session - 2022- 2023

A dissertation in Partial Fulfilment for the Degree of

Bachelor of Science in Physics

Submitted By

HIMANSHU DIXENA

B.Sc. PHYSICS (hons) 6th semester

Under the Supervision of

DR. R. VIJAYA KUMAR

Department Of Pure and Applied Physics

Approval Certificate

This is to certify that the report entitled "The detailed study of Radio & Micro wave and their applications" carried out by Mr.Himanshu Dixena, is approved for the degree of B.Sc. in Physics

---

Examiner

Prof. M. N. Tripathi
(Head of Department)
Department of Pure and Applied Physics
GURU GHASIDAS VISHWAVIDYALAYA
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

Chapter:-1
LITERATURE REVIEW

The historical development of the electromagnetic spectrum, beginning with James Clerk Maxwell's theory of electromagnetism in the 19th century, has laid the foundation for modern physics. Researchers have explored the spectrum properties, including wavelength, frequency, and energy, leading to the classification and organization of different regions based on their unique characteristics.

X-rays were first observed and documented in 1895 by Wilhelm Conrad Röntgen, a German scientist who found them quite by accident when experimenting with vacuum tubes. A week after he first observed them, he took an X-ray photograph of his wife's hand, which clearly e revealed her wedding ring and her bones. The photograph electrified the general public and aroused great scientific interest in the new form of radiation. Röntgen called it "X" to indicate it was an unknown type of radiation. The name stuck, although many of his colleagues suggested calling them Röntgen rays.While Röntgen first observed the effects of X-rays in 1895, it wasn't until 1912 that scientists were able to conclude that they
were, indeed, another form of light."

Left: Portrait of Wilhelm Conrad Röntgen who is credited with discovering X-rays. Right: Mrs. Röntgen's hand, the **first X-ray** picture of the human body ever taken.

The discovery of microwave radiation is attributed to multiple scientists. In 1886, German physicist Heinrich Hertz conducted experiments that confirmed the existence of electromagnetic waves predicted by James Clerk Maxwell's theory. Hertz's work laid the foundation for the understanding of radio waves and their properties.
However, the specific discovery of microwaves as a distinct part of the electromagnetic spectrum is often credited to American engineer and inventor Percy Spencer. In 1945, while working for the Raytheon Corporation, Spencer noticed that a candy bar in his pocket melted when he was near an active magnetron, a component used in radar systems. Intrigued by this observation, he conducted further experiments and realized that the microwaves produced

Kardar–Parisi–Zhang (KPZ) Equation

DISSERTATION

Submitted by:

Himanshu Ghritlahare

In partial fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDALAYA,KONI (BILASPUR)

CERTIFICATE

This is to certify that the entitled **Kardar–Parisi–Zhang (KPZ) Equation"**, submitted to the Department of Pure And Applied Physics ,Guru Ghasidas University, India in partial fulfillment of the requirements for the award of the Degree of Bachelor of Science in Physics is a record of original research work done by HIMANSHU GHRITLAHARE**(ROLLNO. 20208020)** in the Central University of Chhattisgarh under my guidance. It is further certified that to the best of our knowledge the dissertation has not been the basis for the award on any degree/diploma/associate ship/fellowship or similar title of any other candidate of any University.

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20/07/23

Name of The Supervisor: Dr. Awadhesh Kumar Dubey

Name of Department: Department of Pure And Applied Physics (GGU)

1.1 INTERFACE-

a solid interface is defined as a small number of atomic layers separating two solids in close contact, where the properties are significantly different from those of the bulk material in which it is separated. For example, a metal film deposited on a semiconductor crystal, thus separated by the metal-semiconductor interface, from the mass of the semiconductor.

an interface is the boundary between two spatial regions occupied by different matter, or by matter in different physical states. The interface between matter and air, or matter and vacuum, is called a surface, and studied in surface science. In thermal equilibrium, the regions in contact are called phases, and the interface is called a phase boundary. An example for an interface out of equilibrium is the grain boundary in polycrystalline matter.

The importance of the interface depends on the type of system: the bigger the quotient area/volume, the greater the effect the interface will have. Consequently, interfaces are very important in systems with large interface area-to-volume ratios, such as colloids.

Interfaces can be flat or curved. For example, oil droplets in a salad dressing are spherical but the interface between water and air in a glass of water is mostly flat.

Department of Pure and Applied Physics
GURU GHASIDAS VISHWAVIDYALAYA BILASPUR (C.G.)

THERMOLUMINESCENCE

A

Project report submitted
in partial fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

By HIMANSH MISHRA

ROLL NO. :20208018

ENROLLMENT NO.: GGV/20/07618

SESSION: 2022-2023

Under the guidance
of

Dr. Shalinta Tigga

BILASPUR- 495009 (C.G.), INDIA

July, 2023

Approval Certificate

This is to certify that the report entitled **"Thermoluminescence"** by Himansh Mishra, is approved for the degree of B. Sc. in Physics.

Prof. M. N. Tripathi

Head of the department
Department of Pure and Applied Physics,

Guru Ghasidas Vishwavidyalaya
Bilaspur- 495009 (C.G.), India

INTRODUCTION

LUMINESCENCE: Luminescence is the "spontaneous emission of radiation from an electronically excited species (or from a vibrationally excited species) not in thermal equilibrium with its environment", according to IUPAC definition. A luminescent object is emitting "cold light", in contrast to "incandescence", where an object only emits light after heating. Generally, emission of light is due to the movement of electrons between different energy levels within an atom after excitation by external factors.

Luminescence is "cold light", light from other sources of energy, which can take place at normal and lower temperatures. There are several varieties of luminescence, each named according to what the source of energy is, or what the trigger for the luminescence is. Luminescence is a collective term for different phenomena where a substance emits light without being strongly heated, i.e., the emission is not simply thermal radiation. This definition is also reflected by the term "cold light".

It is in contrast to light emitted from incandescent bodies, such as burning wood or coal, molten iron, and wire heated by an electric current. Luminescence may be seen in neon and fluorescent lamps; television, radar, and X-ray fluoroscope screens; organic substances such as luminol or the luciferins in fireflies and glowworms; certain pigments used in outdoor advertising; and also natural electrical phenomena such as lightning and the aurora borealis. In all these phenomena, light emission does not result from the material being above room temperature, and so luminescence is often called cold light. The practical value of luminescent materials lies in their capacity to transform invisible forms of energy into visible light.

A

Project Report on

"PHOTONIC CRYSTALS"

Submitted for

Partial fulfillment of the requirement of the degree of

Bachelor of Science

In Physics

By

Jayanti Tandan

Roll no. 20208022

Under the Supervision of

Dr. Sandhya Yadav

Assistant Professor

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.)

2022-23

DEPARTMENT OF PURE AND APPLIED PHYSICS

Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.) India

(A Central University Established by Central Universities Act 2009 No.25 of 2009)

CERTIFICATE

This is to certify that **Jayanti Tandan**, roll no. 20208022bearing enrollment no. GGV/20/07647 has carried out the project on the topic **"Photonic Crystals"** in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur under my supervision. She worked diligently and methodically and collected the literature very sincerely and carefully. To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend the project report be forwarded to the respective examiners for evaluation.I wish her all success in his life and career.

Yadav 20/07/2023

Supervised by,

Dr. Sandhya Yadav

Assistant Professor

Dept. of Pure & Applied physic

GGV, Bilaspur

1. INTRODUCTION

A photonic crystal is an optical nanostructure in which the refractive index changes periodically. This light directly affects propagation in the same way that the structure of natural crystals causes the diffraction of X-rays and the atomic lattice (crystal structure) of semiconductors affects the conductivity of electrons. Photonic crystals occur in nature in the form of structural coloration and animal reflectors [1].

Photonic crystals are artificial materials engineered to control and manipulate the behavior of light .They are made up of a periodic arrangement of tiny structures or features that interact with light waves. The structures in a photonic crystal are designed at a scale comparable to the wavelength of light. Photonic crystals can be fabricated for one, two, or three dimensions. Photonic crystals offer promising possibilities for advancing technologies in areas such as photonics, nanotechnology, and optoelectronics [2].

Figure 1: The opal in this bracelet contains a natural photonic crystal.

A Project Report on
"Detailed Study on Fullerene"

GURU GHASIDAS UNIVERSITY

A Project submitted in a partial fulfilment of the requirements for the degree of

Bachelor of Science in Physics (Honour)

SPERVISED BY

DR. R. VIJAYA KUMAR

(Assistant Professor)

SUBMITTED BY:

KAILASH AHIRE

Roll No. -20208023

Enrollment No.- GGV\20\07623

Department of Pure and Applied Physics

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(Central University Established by the central university act 2009 No. 25 of 2009)

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2022-2023

APPROVAL CERTIFICATE

This is to certify that the report **"FULERENE"** by **KAILASH AHIRE** is approved for the degree of **BACHELOR OF SCIENCE in PHYSICS,** at

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR.

Dr. M. N. Tripathi

Head of the Department

Department of Pure and applied physics

Guru Ghasidas Vishwavidyalaya Bilaspur

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FULLERENE

❖ INDTRODUCTION AND HISTORY:-

Fullerene is a molecule composed entirely of carbon atoms, arranged in a unique structure. It was first discovered in 1985 by Richard Smalley, Robert Curl, and Harold Kroto, for which they were awarded the Nobel Prize in Chemistry in 1996.

Prof Robert F. Curl Jr
Rice University, Houston
TX, USA

Prof Sir Harold W. Kroto
University of Sussex
Brighton, England

Prof Richard E. Smalley
Rice University, Houston
TX, USA

Fullerene was first discovered in 1985 by Richard Smalley, Robert Curl, and Harold Kroto. They were conducting experiments to understand the formation of carbon chains in interstellar space. Using a laser vaporization technique, they were able to produce a new form of carbon clusters, which they named buckminsterfullerene (C60) after the architect Buckminster Fuller.

Their discovery was significant as it challenged the prevailing belief that carbon could only exist in two forms: graphite and diamond. Fullerene represented a third form of carbon, with unique properties and a distinct structure. The

A

Project report submitted on

PERVOKSITE SOLAR CELL

in partial fulfillment for the degree of

BACHELOR OF SCIENCE IN PHYSICS

By

Kshitiz Kumar

ROLL NO. :20208002 ENROLLMENT NO.:
GGV/20/07602SESSION: 2020-2023

Under the guidance

Of

Dr. M.N. Tripathi

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAY

BILASPUR- 495009 (C.G.), INDIA

July, 2023

Certificate from the Supervisor

This is to certify that the report entitled **"Enhancing Solar Cell Structure for Optimal Power Generation"** carried out by Kshitiz Kumar, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirements for the degree of BACHELOR OF SCIENCE IN PHYSICS, at GGV, Bilaspur, is absolutely carried out by him under my supervision and guidance.

To the best of our knowledge, these have not been submitted by him for the award of any other degree or diploma.

Dr. M. N.Tripathi
Department of Pure and
Applied Physics
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Introduction

Solar energy is indeed a promising solution to the energy challenges faced by our generation. It is abundant, renewable, and environmentally friendly. Solar energy is derived from the sun, which continuously emits vast amounts of energy in the form of heat and radiation. By harnessing this energy, we can generate electricity and fulfill our energy needs in a sustainable manner. Solar technologies utilize various methods to convert sunlight into usable energy. One such method is through photovoltaic (PV) panels, which directly convert sunlight into electricity. PV panels consist of multiple solar cells made from semiconducting materials like silicon. When sunlight hits these cells, it excites the electrons within them, generating an electric current. This current can be used to power electrical devices or stored in batteries for later use. The advantages of solar energy are numerous. Firstly, it is a renewable resource, meaning it will not deplete over time. The sun is expected to continue radiating energy for billions of years, ensuring a long-term and sustainable energy source. Additionally, solar energy is abundant and widely accessible. It can be harnessed in various locations around the world, making it a viable option for both developed and developing regions. Another significant advantage is the environmental friendliness of solar energy. Unlike fossil fuels, which release harmful greenhouse gases when burned, solar energy generation produces no emissions or pollutants. This reduces air pollution, mitigates climate change, and helps protect the environment. Solar energy systems also offer decentralization and energy independence. By installing solar panels on individual homes or buildings, energy can be generated locally, reducing reliance on centralized power grids. This decentralization enhances energy security and resilience, especially in remote areas or during natural disasters. Furthermore, solar energy has experienced significant advancements and cost reductions in recent years. The efficiency of solar panels has improved, allowing for greater energy output. At the same time, the cost of manufacturing and installing solar systems has decreased, making solar energy increasingly competitive with traditional energy sources. However, it's important to acknowledge some challenges associated with solar energy. One limitation is its intermittent nature. Solar power generation is dependent on sunlight, so energy production fluctuates throughout the day and is absent during nighttime or adverse weather conditions. Effective energy storage and grid integration systems are essential to address this issue and ensure a consistent power supply. Despite these challenges, solar energy holds immense potential as a stable, efficient, and low-cost energy source. Continued research and development in solar technologies, alongside supportive policies and investments, can further accelerate the adoption of solar energy and contribute to a more sustainable future.

GURU GHASIDAS VISHWAVIDYALAYA

HUBBLE REDSHIFT DISTANCE RELATION USING CLEA

A project dissertation submitted in a partial fulfillment of the requirements for the degree of

Bachelor of Science (B.Sc.) in Physics

By

Kuldeep Patel

(B.Sc. Physics Hons. 6th semester)

Under the guidance of

Prof. Parijat Thakur

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)-495009

JULY 2023

Certificate from supervisor

This is to be certify that the report entitled **"Hubble Redshift Distance Relation using Clea"** carried out by **KULDEEP PATEL** of **Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur,** for the partial fulfillment of requirements for the degree **Bachelor of Science in Physics** at **GGV Bilaspur** is absolutely carried out by him under my supervision and guidance.

To best of our knowledge, these results have not been submitted by him for the award of any other degree of diploma.

Parijat Thakur
20/07/2023

Dr. PARIJAT THAKUR

Professor

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

Introduction

A singularity, even smaller than an atom having infinite density and energy, explodes leaving large amount of energy. This unleashing and unimaginable explosion of energy from a singularity is said to be Big Bang. From that instant, universe begin to expand, rapidly stretching and cooling. As the universe expanded matter and energy condense to subatomic particles, primarily proton, neutron and electron. Overtime these particles combined to form the first atom. These atoms were mostly hydrogen and helium. These atoms scattered throughout the expanding of the universe. With in these vast cosmic clouds of gas and dust, gravity began to take hold. According to our current understanding the gravity arises due to space-time curvature caused by massive object. This concept is described by the Einstein's theory of general relativity.

Regions of slightly higher density attracted more matter towards them, forming clumps and pockets of gas. Over millions of years, these clumps grew denser and hotter as gravity pulled the gas inward. Eventually, the temperatures and pressures at the core of these clumps became so intense that nuclear fusion ignited, and the stars were born. These early stars, known as population III stars, were much larger and hotter than the stars we see today. They burned through their nuclear fuel rapidly, shining brilliantly before eventually running out and undergoing explosions known as supernovae. These explosive events scattered heavier elements produced in their cores throughout the universe, enriching the interstellar medium.

As time passed, the enriched interstellar medium began to give rise to a new generation of stars, known as population II stars. These stars formed from clouds of gas and dust that contained heavier elements from previous generations of stars. The presence of these elements allowed for the formation of more diverse planetary systems. By the combination of these stars and interstellar medium galaxies were formed.

A galaxy is a vast system of stars, gas, dust, and other celestial objects bound together by gravity. It is a fundamental building block of the universe and contains billions to trillions of stars, along with various other components. Galaxies come in different shapes, sizes, and structures, and they can be classified into several main types some of them are spiral galaxy, elliptical galaxy, irregular galaxies, lenticular galaxies, dwarf galaxies etc.

"EARTHQUAKE DETECTOR"

A

PROJECT REPORT SUBMITTED

IN PARTIAL FULFILLMENT FOR THE DEGREE OF

BACHELOR OF SCIENCE IN PHYSICS

By

NAMAN AGRAWAL

ROLL NO.-20209012

ENROLLMENT NO.-GGV/20/07412

SESSION- 2020-23

UNDER THE GUIDANCE

OF

DR.R.K. PANDEY

Department of Pure& Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur(C.G.)

Department of Pure& Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur(C.G.)
India

(A central university Established by the Central university act 2009 No 25 of 2009)

APPROVAL CERTIFICATE

This is the certify that the project entitled,"**DESIGN AND DEVLOPMENTOF DRONE**" submitted by Mr.Dewanshu Singh Thakur is approved for the award of **Bachleor Of Science (Hons) in Electronics.**

DR.MN TRIPATHI

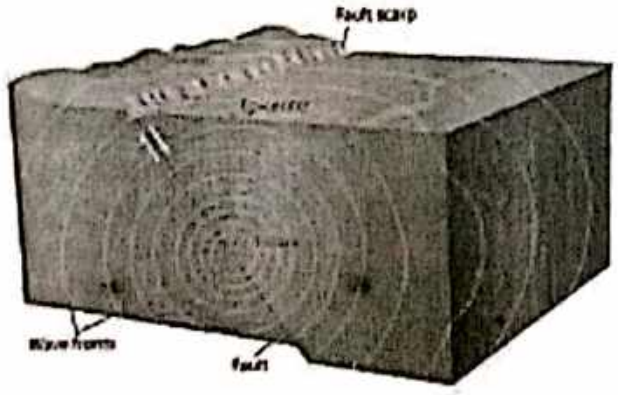
Date:.....Head of Department of Pure & Applied physics

Dept. of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

INTRODUCTION

An earthquake is what happens when two blocks of the earth suddenly slip past one another. The surface where they slip is called the fault or fault plane. The location below the earth's surface where the earthquake starts is called the hypocenter, and the location directly above it on the surface of the earth is called the epicenter.

Seismic waves radiate from the focus of an earthquake



Sometimes an earthquake has foreshocks. These are smaller earthquakes that happen in the same place as the larger earthquake that follows. Scientists can't tell that an earthquake is a foreshock until the larger earthquake happens. The largest, main earthquake is called the mainshock. Mainshocks always have aftershocks that follow. These are smaller earthquakes

Studies on Synthesis and Characterization of Cu Doped ZnO Thin Film for Photovoltaic Application

Project Report Submitted

in partial fulfillment for the Degree of

BACHELOR OF SCIENCE

By

Namrata Patel

SESSION : 2022-2023

Under guidance

Of

Dr. R. K . Pandey

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA

BILASPUR – 495009 (C.G.), INDIA

Certificate from the supervisor

This is to certify that the report entitled "**Studies on Synthesis and Characterization of Cu Doped ZnO Thin Film for Photovoltaic Application**" carried out by Namrata Patel, of Department of Pure and Applied Physics, Bilaspur, for the partial fulfillment of the requirement for the degree of BACHELORS OF SCIENCE , at Guru Ghasidas Vishwavidyalaya, Bilaspur, is absolutely carried out by her under my supervision and guidance.

To the best of our knowledge, these results have not been submitted by her for the award of any other degree or diploma.

20-7-2023

Dr R.K. PANDEY

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur

Abstract

The light from the Sun is a non-vanishing renewable source of energy which is free from environmental pollution and noise. It can easily compensate the energy drawn from the non-renewable sources of energy such as fossil fuels and petroleum deposits inside the earth. The fabrication of solar cells has passed through a large number of improvement steps from one generation to another. Silicon based solar cells were the first generation solar cells grown on Si wafers, mainly single crystals. Further development to thin films, dye sensitized solar cells and organic solar cells enhanced the cell efficiency. The development is basically hindered by the cost and efficiency. In order to choose the right solar cell for a specific geographic location, we are required to understand fundamental mechanisms and functions of several solar technologies that are widely studied. In this article, we have reviewed a progressive development in the solar cell research from one generation to other, and discussed about their future trends and aspects. The article also tries to emphasize the various practices and methods to promote the benefits of solar energy.

GURU GHASIDAS VISHWAVIDYALAYA

A review on Sodium Ion Batteries:an alternative to lithium based batteries

A project dissertation submitted in a partial fulfillment of the requirements for the degree of

Bachelor of Science (B.Sc.) in Physics

By

NIKHIL NAIK

(B.Sc. Physics Hons. 6th sem)

Under the guidance of

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Assistant Professor

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JULY 2023

Approval Certificate

This is to certify that the report entitled **"A review on Sodium Ion Batteries:an alternative to lithium based batteries"** by **Nikhil Naik** is approved for the degree of B.Sc. in Physics.

Examiner

Dr. M. N. Tripathi

Head of department

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1) INTRODUCTION

Rechargeable batteries play a crucial role in our modern society by providing on-demand electrical energy for various applications. Over the past 10-20 years, there has been a significant increase in research and development focused on lithium-ion battery (LIB) technology due to the growing demand for better batteries. Initially, portable consumer electronics drove this development, but two other factors have recently brought battery research into the spotlight.

Firstly, electric vehicles (EVs), after several attempts in the past century, are finally expected to reach the mass market in the coming years. This has led to increased emphasis on battery research to develop high-performance batteries suitable for EVs. Secondly, stationary grid storage has gained attention as a means to store excess electrical energy generated by wind and solar power on a large scale and at a low cost. Additionally, other markets such as small smart devices using thin-film battery technology and robotics are also expected to become more relevant.

The applications mentioned have diverse requirements, and no single battery type can fulfill all of them. As a result, researchers are currently exploring different battery chemistries that aim to increase energy density (Wh/kg, Wh/L) or decrease costs (EUR/kWh) compared to the state-of-the-art LIB technology. However, other parameters such as safety, cycle and calendar life, and temperature range are also important considerations.

Despite significant efforts in battery research, only a few rechargeable battery systems have achieved significant market shares. Lead-acid battery technology, the oldest of the bunch, still dominates the market in terms of yearly energy storage capacity. It is cost-effective and widely used in automotive applications as starting batteries and for auxiliary power supply. However, its drawbacks

A project report

on

The detailed study of UV Radiation & IR Radiation And their applications

DEPARTMENT OF PURE AND APPLIED PHYSICS
GURU GHASIDAS VISHWAVIDYALAYA,BILASPUR (C.G)

(Session 2022-23)

A

Project dissertation submitted

In partial fulfilment of the requirement for the degree of

Bachelor of Science in Physics Honors.

Submitted By:

Preet Kumar Sahu

Enrollment Number: GGV/20/07642

Roll No.: 20208042

Under the Supervision of:

Dr. R. Vijaya Kumar

Assistant Professor

Department of Pure & Applied Physics

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(A Central University Established by the Central Universities Act 2009 No. 25 of 2009)

CERTIFICATE

This is to certify that the project dissertation entitled as **"The detailed study of UV and IR Radiation and their application"** submitted by **Mr. Preet Kumar Sahu** Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for the partial fulfilment of the requirement for the degree of Bachelor of Science in Physics is an original work carried out by him under my supervision and guidance.

To the best of my knowledge, the matter embodied in the project dissertation has not been submitted to any other University/ Institute for theaward of any Degree or Diploma.

Date:.....

Place : Bilaspur

Dr. R. Vijaya Kumar

Assistant Professor

Department Of Pure and Applied Physics

ABSTRACT

Tellurite oxide (TeO2) is a transparent material with a wide range of infrared (IR) transmission. This makes it a promising material for applications in IR optics, such as filters, lenses, and windows.

The interaction of IR radiation with TeO2 glass is complex and depends on a number of factors, including the wavelength of the radiation, the concentration of TeO2 in the glass, and the temperature of the glass.

The word spectroscopy is used to refer to the broad area of science dealing with the absorption, emission, or scattering of electromagnetic radiation by molecules, ions, atoms, or nuclei. Spectroscopic techniques are some of the most widely used analytical methods in the world today. These techniques are useful in determining both the identity of unknown substances and their concentration in solution.

UV radiation interacts with tellurium oxide (TeO2) glass in a few different ways. First, the UV photons can be absorbed by the TeO2 molecules, which can then excite electrons into higher energy levels. This can lead to the emission of visible light, which is why TeO2 glass is often used in fluorescent lamps.

GURU GHASIDAS VISHWAVIDYALAYA BILASPUR (C.G)

(A Central University Established by central university Act 2009)

"DERPARTMENT OF PURE AND APPLIED PHYSICS"

PROJECT ON -" DYNAMICS OF PHASE SEPARATION"

Submitted in partial fulfilment of the requirement for the award of

Bachelor of Science Degree "IN PHYSICS"

To GURU GHASIDAS VISHWAVIDYALAYA BILASPUR C.G.

Under the guidance of

Dr. Awadhesh Kumar Dubey

Pritee Bhuarya

B.Sc. Physics

Honours 6th Sem.

Roll No. – 20208043

Enrollment No. -GGV/20/07643

DEPARTMENT OF PURE APPLIED PHYSICS

Guru Ghasidas Vishwavidyalaya, Bilaspur C.G. India

(A Central University Established by Central Universities Act 2009)

CERTIFICATE

This is to certify that Pritee Bhuarya has carried out the Project on the topic "DYNAMICS OF PHASE SEPARATION" in the Department of Pure And Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur Under my Supervision. She Worked diligently and methodically and has collected the literature very sincerely and carefully. To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend the project report to be forwarded to the respective examiners for evaluation.

Submitted by

Pritee Bhuarya

20/07/23

Supervised by,

Dr. Awadhesh Kumar Dubey

Chapter 1

INTRODUCTION

There has been tremendous interest in the rich science of phase-transitions from many decades. Dynamics of phase-separation in homogeneous binary mixtures has also been studied and explored among physicist in great deal. When the binary (AB) mixture is quenched rapidly below a critical temperature it evolves towards the new equilibrium states by coarsening of domains rich in either components A or B. There has been several aspects and methods to understand the physics of this quite interesting phenomenon such as theoretical, experimental or computational. We study the same in this dissertation using methods of computational physics. We start with basic definitions and move to other discussions gradually followed by results and discussion.

1.1 Ising Model

Ferromagnetic and anti-ferromagnetic materials are modeled using the Ising Model developed by Dr. Ernst Ising. One of the simplest statistical models to show phase transition is the 2-D square lattice Ising Model. There is no phase transition in the 1-D Ising Model. Every atom is represented by its dipole moment or spin. The spin is a quantum mechanical quantity which causes the electron to only exist in two states. The magnetic field of the electron is either pointing "up" or "down". Below the critical temperature Tc, a finite fraction of spins become spontaneously polarized giving rise to a macroscopic magnetic field.

Let us look at an array of N fixed points called lattice sites with each site having an associated spin denoted by $\{S_i\}$ where i is the index denoting a single lattice site. Here Si = ± 1. The two-state (spin-1/2)

Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.) India

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"DEPARTMENT OF PURE AND APPLIED PHYSICS"

PROJECT ON- "CARBON NANOTUBES."

Submitted in partial fulfillment of the requirement for the award of Bachelor of Science Degree "IN PHYSICS"

Ritika Valecha

B.Sc. Physics Honors 6th Semester

Roll No. – 20208046

Enrolment No. – GGV/20/7046

Under the Guidance Of

Dr.Awdhesh Kumar Dubey

DEPARTMENT OF PURE AND APPLIED PHYSICS

Guru Ghasidas Vishwavidyalaya Bilaspur C.G. India

(A Central University Established by Central Universities Act 2009 No.25 of 2009)

CERTIFICATE

This is to certify that Ritika Valechahas carried out the project on the topic CARBON NANOTUBES" in the Department of Pure and Applied Physics, *Guru Ghasidas Vishwavidyalaya, Bilaspur* under my supervision. She worked diligently and methodically and has collected the literature very sincerely and carefully. To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend the project report to be forwarded to the respective examiners for evaluation.

19/07/23

Submitted by
Ritika Valecha

Supervised by
Dr. Awdhesh Kumar Dubey

INTRODUCTION

Carbon nanotubes (CNTs) are a remarkable form of carbon allotropes with unique properties and structures. They are cylindrical carbon structures composed of graphene sheets rolled up into seamless tubes. CNTs can vary in diameter, length, and arrangement of their carbon atoms, resulting in different properties and applications.

First discovered in 1991 by SumioIijima, carbon nanotubes quickly gained attention due to their exceptional mechanical strength, electrical conductivity, and thermal conductivity. These properties make them highly attractive for a wide range of applications in various fields, including materials science, electronics, energy storage, and medicine.

One of the defining characteristics of carbon nanotubes is their high aspect ratio. With diameters on the nanometer scale and lengths reaching up to several centimeters, CNTs possess an extraordinary surface-to-volume ratio. This property enables them to exhibit remarkable mechanical strength, surpassing most other known materials, while maintaining low weight. Carbon nanotubes are estimated to be about 100 times stronger than steel at one-sixth of its weight.

CARBON NANOTUBES BASED SUPERCONDUCTOR

A

Project dissertation submitted
In partial fulfilment of the requirement for the degree of

Bachelor of Science (B.Sc.) Honours in Physics

SUPERVISION

Dr. ARUN KUMAR SINGH

ASSOCIATED PROFESSOR

SUBMITTED BY

S. SUPRIM CHATURVEDI

B.Sc. PHYSICS (Hons) 6th SEM

ROLL NO – 20208047

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SESSION: 2022 - 2023

GURU GHASIDAS VISHWAVIDYALAYA BILASPUR, CHHATTISGARH

(Central University Established by the Central Universities Act, 2009 No.25 of 2009)

DEPARTMENT OF PURE AND APPLIED PHYSICS

CERTIFICATE

This is to certify that S. SUPRIM CHATURVEDI has carried out the project in the department of Pure and Applied Physics , Guru Ghasidas University , Bilaspur (C.G) . On the topic "CARBON NANOTUBES BASED SUPERCONDUCTOR". This report is submitted for partial fulfilment of the requirement for the degree of B.Sc. in Physics and for Examiner's evaluation.

I wish every success in his life.

Date:.....

Place : Bilaspur

Dr. M.N. TRIPATHI

(Professor)

Head of the Department

Department of Pure and Applied Physics

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❖ CARBON NANOTUBES (CNTs) –

Carbon nanotubes (CNTs) are one of the wonders of modern science discovered. CNTs is one of the most important nanomaterials at present time. CNTs have been regarded as the stiffest and the strongest material ever developed and received considerable interest in research because of their unique atomic structure, dimension and attractive properties.

Fig.1. Carbon Nanotube

❖ DISCOVERY OF CARBON NANOTUBES -

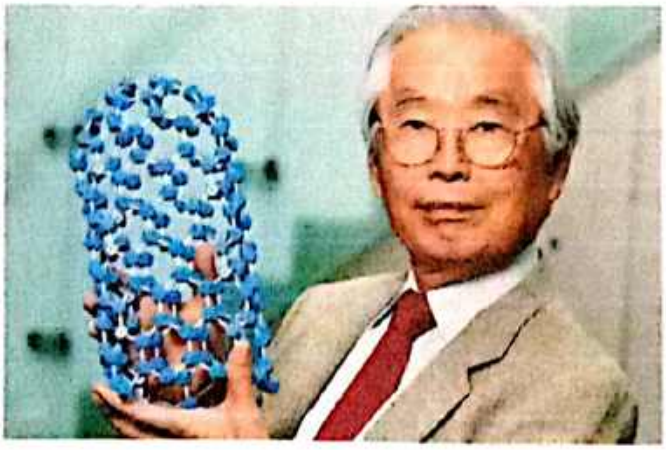

Fig 2. Image of SUMIO IIJIMA

Before 1991, only two allotropes of carbon were known namely diamond and graphite. Graphite and diamond are chemically same and made up of carbon, but they are physically different. But In 1991, Japanese Physicist SUMIO IIJIMA discovered another allotrope of carbon that is Carbon Nanotubes (CNTs).

GURU GHASIDAS VISHWAVIDYALAYA

ULTRAFAST OPTICS

A project dissertation submitted in a partial fulfillment of the requirements for the degree of

Bachelor of Science (B.Sc.) in Physics

By

SAMIKSHA VAISHNAV

(B.Sc. Physics Hons. 6th sem)

Under the guidance of

Dr. Rajesh Sharma

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JULY 2023

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This is to certify that the report entitled **"ULTRAFAST OPTICS"** by **Samiksha Vaishnav** is approved for the degree of B.Sc. in Physics.

Examiner

Dr. M. N. Tripathi

Head of department

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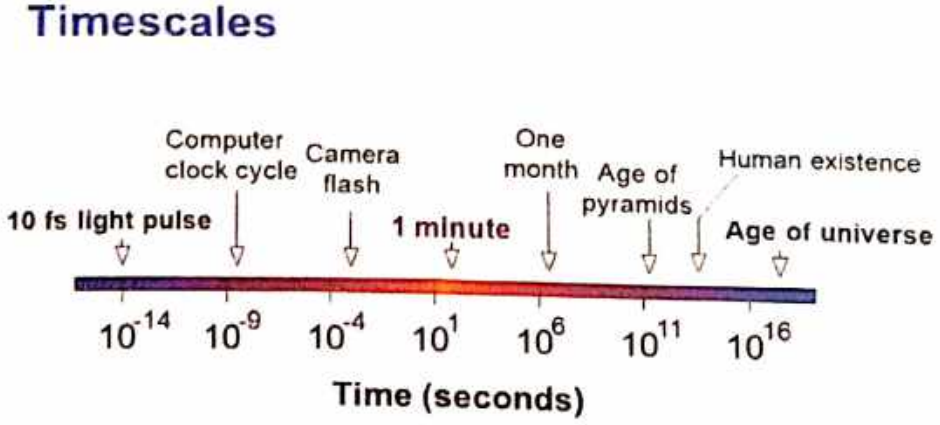
Chapter 1

Intoduction

Ultrafast optics is a fascinating and rapidly advancing field of study that deals with the generation, manipulation, and measurement of extremely short pulses of light. It encompasses the understanding and control of light pulses with durations on the femtosecond (10^-15 seconds) and attosecond (10^-18 seconds) time scales. Ultrafast optics has revolutionized various disciplines, including physics, chemistry, biology, and materials science, by providing unprecedented temporal resolution to investigate and manipulate ultrafast processes.

The key characteristic of ultrafast optics is the ability to create optical pulses with incredibly short durations. These pulses are typically generated using lasers, which are capable of emitting coherent and intense light. By employing techniques such as mode-locking or chirped pulse amplification, laser pulses can be compressed to durations as short as a few femtoseconds or even attoseconds.

The ultrafast timescales accessible in this field allow researchers to investigate and control phenomena that occur at the atomic and molecular levels. For example, it enables the observation of electron motion within atoms, the study of chemical reactions in real-time, and the manipulation of material properties on ultrafast time scales. Additionally, ultrafast optics has found applications in diverse areas, such



10 fs is to 1 minute as 1 minute is to the age of the universe

Alternatively, 10 fs is to 1 sec as 5 cents is to the US national debt

A PROJECT REPORT

Entitled

"SYNTHESIS OF MULTIFERROIC MATERIAL ($YMnO_3$)"

Submitted for

The partial fulfillment of the degree of

MASTER OF SCIENCE (PHYSICS)

Session - 2022-23

Submitted by

AASTHA PRASAD

M.Sc. Physics 4th Semester

Roll No. 21110101

Enrollment No.- GGV/21/07801

Under the Guidance of

Dr. DINESH UTHRA

ASSISTANT PROFESSOR

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This is to certify that, **Aastha Prasad** has carried out review project in the **Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.** on the topic **"Synthesis of Multiferroic Material ($YMnO_3$)"**. This project is Submitted as partial fulfillment for degree of **M.Sc. in Physics** and forwarded to examiner for evaluation.

Dr. M.N. TRIPATHI

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CHAPTER 1

INTRODUCTION

INTRODUCTION: -

Studying the physical characteristics of innovative multiferroic materials is one of the current condensed matter physics' hot topics. The magnetoelectric effect and the ability to influence magnetic characteristics with an electric field, as well as the reverse, are inherent properties of such materials. This link between the magnetic and ferroelectric order parameters is a fundamental property of such materials. The materials for magnetic and electrical field sensors, data storage devices, and microelectronic components can all be made from multiferroic compounds.

If the R element has a large ionic radius, like that of La, Pr, Nd, Sm, Eu, Gd, and Tb, the manganites with the general formula $REMnO_3$, where RE is a rare-earth ion, crystallize in the orthorhombic structure with the Pnma space group. Contrarily, compounds containing rare-earth elements with smaller ionic radii (such as Ho, Er, Tm, Yb, Lu, Y, and Sc) have a hexagonal crystal shape and the polar P63cm space group. The combination of multiferroic processes with the geometrically frustrated triangular lattice's low-dimensional magnetism, accomplished through massive magnetoelastic coupling, is what makes these compounds so intriguing.

The hexagonal manganites crystal structure is made up of noncoplanar layers of rare earth ions that are sandwiched between two-dimensional triangular lattices of Mn ions in ab planes. The magnetic characteristics of the hexagonal systems show a clear reliance on the RE element's ionic radius. $YMnO_3$ exhibits a long-range antiferromagnetic (AFM) order of $\Gamma 1$ or $\Gamma 3$ irreducible representation symmetry, whereas others with smaller radius of RE element, such as $LuMnO_3$, exhibit a different long-range AFM structure of $\Gamma 2$ or $\Gamma 4$ irreducible representation symmetry. This contrasts with the absence of a long-range magnetic order in $InMnO_3$ with the largest value of radius of RE element.

Due to its intriguing physical implications and prospective uses in cutting-edge products like nonvolatile memory and multifunction devices, MULTIFERROIC materials attracted a lot of attention. Depending on the radius of the rare earth ions, rare earth manganite can either form an orthorhombic or hexagonal structure, making it a significant class of

"STRUCTURAL CHARACTERIZATION & OPTICAL PROPERTIES OF MgO:Eu^{3+} PHOSPHORS SYNTHESIZED BY COMBUSTION TECHNIQUE"

SUBMITTED AS PARTIAL FULFILLMENT OF

Master of Science (Physics)

SESSION – 2022-23

SUBMITTED BY:

ALFRED KUMBHAR

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ENROLLMENT NO. – GGV/21/07805

GUIDED BY:

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Certificate

This is to certify that **Mr. ALFRED KUMBHAR** has carried out project on the topic **"Structural Characterization & Optical properties of MgO:Eu^{3+} Phosphors synthesized by Combustion technique"** in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G. under my supervision.

He has worked diligently, meticulously and methodically and collected the literature very sincerely and carefully.

I recommend the project report to be forwarded to the respective examiners for Evaluation. I wish her all the success in her carrier and life.

Supervised By

Dr. R. P. Patel

Associate Professor,

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya

Bilaspur, C.G.

"STRUCTURAL CHARACTERIZATION & OPTICAL PROPERTIES OF $K_2SrP_2O_7$: Ce^{3+} PHOSPHORS SYNTHESIZED BY COMBUSTION TECHNIQUE"

SUBMITTED AS PARTIAL FULFILLMENT OF

Master of Science (Physics)

SESSION – 2022-23

SUBMITTED BY:

ANKIT KUMAR

M.Sc. PHYSICS 4TH SEMESTER

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Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Forwarding Certificate

This is to certify that ANKIT KUMAR has carried out review project in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G. on the topic "Structural Characterization & Optical properties of $K_2SrP_2O_7:Ce^{3+}$ Phosphors synthesized by Combustion technique". This project is Submitted as partial fulfillment for degree of M.Sc. in Physics and forwarded to examiner for evaluation.

Dr. M. N. Tripathi
Head of Department
Department of Pure and Applied Physics
Guru Ghasidas Vishwavidyalaya
Bilaspur, C.G.

External

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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.) / Bilaspur (C.G.)

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

Certificate

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He has worked diligently, meticulously and methodically and collected the literature very sincerely and carefully.

I recommend the project report to be forwarded to the respective examiners for Evaluation. I wish her all the success in her carrier and life.

Supervised By

Dr. R. P. Patel

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Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya

Bilaspur, C.G.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION-

$K_2SrP_2O_7$ is a chemical compound that falls under the category of inorganic compounds. It is composed of the elements potassium (K), strontium (Sr), phosphorus (P), and oxygen (O). The compound's chemical formula indicates that it consists of two potassium (K) ions, one strontium (Sr^{2+}) ion, and two phosphate ($P_2O_7^{4-}$) ions. Here's a brief overview of its properties and potential applications:

- Chemical Structure: The chemical structure of $K_2SrP_2O_7$ consists of potassium ions (K^+) and strontium ions (Sr^{2+}) bound to phosphate ions ($P_2O_7^{4-}$) through ionic bonds. The phosphate ions, which contain phosphorus and oxygen atoms, form the backbone of the compound's structure.
- Physical Properties: $K_2SrP_2O_7$ is a solid substance at room temperature and is likely to have a crystalline structure. Its physical properties such as melting point, density, and solubility in various solvents would need to be determined through experimental analysis.
- Applications: The exact applications of $K_2SrP_2O_7$ might not be widely documented as of my knowledge cutoff in September 2021. However, compounds containing strontium and phosphorus have been used in various fields, including materials science and electronics. Strontium compounds, for example, have been used in the production of cathode ray tubes (CRTs) for TVs and monitors, as well as in pyrotechnics to produce red colors in fireworks.
- Research and Studies: If $K_2SrP_2O_7$ has been synthesized or studied, it could have potential applications in areas such as solid-state chemistry, materials synthesis, and possibly as a source of strontium and phosphate ions for specific reactions. As with any chemical compound, researchers might investigate its properties, behavior under different conditions, and potential uses.
- Safety and Handling: Like with handling any chemicals, proper safety measures should be taken when working with $K_2SrP_2O_7$. This includes wearing appropriate protective gear, working in a well-ventilated area, and following established protocols for handling and disposing of chemical substances.

"EFFECT OF MOLYBDENUM DOPING ON THE STRUCTURAL AND SPECTROSCOPIC PROPERTIES OF Ni-Zn SPINEL FERRITES PREPARED BY SOLID STATE REACTION METHOD"

SUBMITTED AS PARTIAL FULFILLMENT OF

Master of Science in Physics

SESSION: 2022-23

By

ASHUTOSH SINGH KSHATRIYA

M.Sc. PHYSICS 4TH SEMESTER

ROLL NO. – 21110116

ENROLLMENT NO. – GGV/21/07814

UNDER THE GUIDANCE OF

Dr. M.P. SHARMA

ASSISTANT PROFESSOR

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(A Central University Established by the Central University Act 2009 No 25 of 2009)

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

APPROVAL CERTIFICATE

This is to certify that **Mr. Ashutosh Singh Kshatriya** has carried out the dissertation report entitled "**Effect of Molybdenum doping on the Structural and Spectroscopic Properties of Ni-Zn Spinel Ferrites prepared by Solid State Reaction method**" in the **Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.** under my guidance and supervision. To the best of my knowledge, the work presented in this project is entirely original and is fit for evaluation for the **Master of Science (Physics)**. The diligent efforts put forth by **ASHUTOSH SINGH KSHATRIYA** have resulted in a well-structured and meticulously executed study.

The project report showcases a comprehensive exploration of the synthesis and characterization of Nickel Zinc Ferrite doped with Molybdenum. He has worked diligently, meticulously, and methodically on the designated work and collected the literature very sincerely and carefully.

I recommend the dissertation report to be forwarded to the respective examiners for the evaluation. I extend my heartfelt congratulations to **ASHUTOSH SINGH KSHATRIYA** for the successful completion of this project and wish them all the best for their future academic pursuits and endeavors.

Dr. M.P. Sharma

Assistant Professor

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya

Bilaspur (C.G)

(Supervisor)

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

FORWARDING CERTIFICATE

This is to certify that **Mr. Ashutosh Singh Kshatriya** has carried out the dissertation report entitled **"Effect of Molybdenum doping on the Structural and Spectroscopic Properties of Ni-Zn Spinel Ferrites prepared by Solid State Reaction method"** in the **Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.**.

This dissertation report is submitted as partial fulfilment for the degree **Master of Science in Physics** and forwarded this to the respective examiners for further evaluations.

Prof. M.N. Tripathi
Head of Department
Department of Pure & Applied Physics
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विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
Dept. of Pure & Applied Physics
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बिलासपुर (छ.ग.)/Bilaspur (C.G.)

ABSTRACT

This dissertation report represents a comprehensive investigation into the structural and spectroscopic properties of Molybdenum doped Ni-Zn spinel ferrites prepared based on the outcomes from the powder X-ray diffraction and Raman spectroscopic techniques. Pristine and Mo-doped Ni-Zn spinel ferrites were prepared by solid state reaction method using the metal oxides precursors. The aim is to gain a deeper understanding of the doping effects on the crystal structure, phase composition, and related properties of the parent Ni-Zn spinel ferrites. Here, the PXRD patterns revealed that the pristine $Ni_{0.5}Zn_{0.5}Fe_2O_4$ and Mo doped $Ni_{0.5}Zn_{0.5}Fe_2O_4$ samples are crystallized into cubic spinel structure with O_h^7 (Fd-3m) space group (SG#227). Also doped samples accompanied with a small fraction of impurity phases such as $FeMoO_4$ and Orthorhombic $Fe_2(MoO_4)_3$. Furthermore, Raman spectroscopic outcomes are in great agreement with the PXRD results. Pristine $Ni_{0.5}Zn_{0.5}Fe_2O_4$ depicted its characteristic Raman modes of spinel structure. Whereas the doped samples show the more prominent nature of Iron molybdate phases ($FeMoO_4$ and $Fe_2(MoO_4)_3$). Strikingly more prominent A_g mode of spinel phase were blue shifted in the doped samples.

The findings of this report contribute to the fundamental knowledge and may provide insights into its potential applications in areas such as magnetic storage devices, catalysis, and sensors in future perspectives.

Study Of Timing Analysis of Swift J1658.2–4242

A Project Dissertation Report Submitted

in

Partial Fulfilment of the Required for the Degree of

Master of science

In

Physics

SUBMITTED by

BHAVANA DHRUWEY

Roll No. 21110119

Supervisor

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Year : 2021-2023

Department Of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G), India

(A Central University Established by the Central University Act 2009 No.25 of 2009)

CERTIFICATE

This is certify that Bhavana Dhruwey has worked on post graduation project entitled "Timing Analysis of Swift J1658.2-4242" under the supervision of Dr. Parijat Thakur and this work has not been formed the basis for award of any other similar title . It represent entirely an independent work on the part of candidate

Parijat Thakur

Signature of Supervisor

Date: 17/08/2023

Place: Bilaspur (C.G.)

H.O.D(Physics)

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

ABSTRACT

This Dissertation project report entitled "Timing analysis of Swift J1658.2-4242" .The main objective of this project is to analysis the information about the properties of compact binary system, by studying the evolution of its parameter throughout the course of an observation.We provide the X-ray timing of the brand-new galactic X-ray transient Swift J1658.2-4242 detected with the Large Area X-ray Proportional Counter and Soft X-ray Telescope instruments on board Astrosat.Along with clear second harmonics and subharmonics, we find pronounced C-type quasi-periodic oscillations (QPOs) at frequencies about 1.5 Hz. Throughout the observation, the QPO first discovered at 1.56 Hz drifts to a higher centroid frequency of 1.74 Hz. At the second harmonic frequencies, the fractional rms appears to be constant, however at the QPO and subharmonic frequencies, the rms increases with photon energy. The source was determined to be a black hole X-ray binary in the hard-intermediate state based on timing characteristics.The tools used for this project are Astrosat ,LAXPC, SXT telescope .

GURU GHASIDAS UNIVERSITY

SIMULATION & ANAYASIS OF PEROVSKITE SOLAR CELL

A project dissertation submitted in a partial fulfilment of the requirements for the degree of

Master of Science (M.Sc.) In Physics

By

BIBHUDATTA PRADHAN

(M.Sc. Physics 4th Sem.)

Under the guidance of

Dr. ALKA SINGH

Assistant Professor

Department of Pure and Applied Physics

Guru Ghasidas University, Bilaspur (C.G)-495009, India

AUGUST 2023

Declaration

I hereby declare that the work presented in the project entitled "**SIMULATION & ANALYSIS OF PEROVSKITE SOLAR CELL**" submitted to the partial fulfilment of requirements for the degree, **Master of Science in Physics (Specialization in Material Science)** has been performed in the **Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur (C.G), 495009** under the supervision of **ALKA SINGH** is truly carried out by me.

The work presented in this project dissertation is original and remain intellectual property of **Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur (C.G), 495009, India.**

Bibhudatta Pradhan

BIBHUDATTA PRADHAN
Department of Pure and Applied Physics
Guru Ghasidas University,
Bilaspur (C.G), 495009, India

Certificate from Supervisor

This is to be certify that the report entitled "**SIMULATION & ANALYSIS OF PEROVSKITE SOLAR CELL**" carried out by **BIBHUDATTA PRADHAN** of **Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur,** for the partial fulfilment of requirements for the degree, **Master of Science in Physics (Specialization in Material Science)** at **Guru Ghasidas University Bilaspur** is absolutely carried out by him under my supervision and guidance.

To best of our knowledge, these results have not been submitted by him for the award of any other degree or diploma.

Dr. ALKA SINGH
Assistant Professor
Department of Pure and Applied Physics
Guru Ghasidas University,
Bilaspur (C.G), 495009, India

Approval Certificate

This is to certify that the report entitled "**SIMULATION & ANALYSIS OF PEROVSKITE SOLAR CELL**" carried out by **BIBHUDATTA PRADHAN** is approved for the degree of M.Sc. in Physics (Specialization in Material Science).

Examiner

Dr. M. N. Tripathi
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

ABSTRACT:
Objectives: Perovskite photovoltaic's are getting to be distinctly predominant option for the conventional solar cells achieving a maximum efficiency of 22.1%. This work is concerned about the design and analyses of lead-based perovskite solar cell model with the flexible architecture of lass/FTO/C60/CH3NH3PbI3/P3HT/Au. Method/Analysis: The analysis of solar cell architecture is done using the Solar Cell Capacitance Simulator(SCAPS). It is a computer-based software tool and is well adapted for the analyses of homo and heterojunctions, multi- junctions and Schottky barrier photovoltaic devices. This software tool runs and simulates based on the Poisson's and continuity equation of electrons and holes. For this model, it is used to optimize the various parameters such as thickness, the defect density of absorber layer, doping concentrations(ND and NA) of Electron Transport Material (ETM) and Hole Transport Material (HTM). Findings: The thickness of CH3NH3PbI3varied from 0.1μm to 0.6μm and the best results are observed at 50nm. The total defect density of the absorber varied from 1013 cm-3 to 1018 cm-3 and the minimum defect density of absorber layer is predicted as 1014cm-3. The ND or NA of the HTM and ETM varied from 1014 to 1019 cm-3and the PCE is maximum when ND and NA both kept at 1019cm-3. By tuning the thickness of absorber layer and doping concentrations, the predicted results are as follows; maximum power conversion efficiency(PCE)11%, short circuit current density (Jsc) 21.975197 mA/cm2.Improvements: With this proposed simulated model, the efficiency of the perovskite solar cell reaches to the 11%, which is an improvement of 2-3%, to the previous models, with the optimization of few material parameters. Hence this simulation work will provide the handy information in fabricating perovskite solar cells to reasonably choose material parameters and to achieve the high efficiency.

Keywords: Solar cell, Perovskite ,Simulation, SCAPS,Efficiency

A Project Report on

Theoretical Investigation of Cesium Antimony Bromide $Cs_3Sb_2Br_9$ base Solar cell using SCAPS-1D Solar Simulator.

Submitted for the Partial Fulfillment of

Degree of M.Sc. in Physics

by

Deepanjali Sahu

Roll No: 21110122

Registration No: GGV/20/07802

Under the Supervision of

Dr. Shiv Poojan Patel

Assistant Professor

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya (A Central University)

Session: 2021-2023

CERTIFICATE

This is to certify that the project dissertation entitled as **"Theoretical Investigation of Cesium Antimony Bromide ($Cs_3Sb_2Br_9$) using SCAPS-1D Solar Simulator"** submitted by **Miss Deepanjali Sahu** Department of Pure and Applied Physics, Guru GhasidasVishwavidyalaya, Bilaspur (C.G.) for the partial fulfilment of the requirement for the degree of Master of Science in Physics is an original work carried out by him under my supervision and guidance.

To the best of my knowledge, the matter embodied in the project dissertation has not been submitted to any other University/ Institute for the award of any Degree or Diploma.

Head of Department

(Prof. M.N.Tripathi)

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Date: 17/08/2023

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CONTENTS

Abstract

In this project, a novel $Cs_3Sb_2Br_9$ perovskite is presented for the absorber layer of perovskite solar cells (PSC). A Planar structure with $Cs_3Sb_2Br_9$ as a light harvesting material and $CuSbS_2$ as constant HTL(hole transport Layer) and three different TiO2, SnO_2, ZnO as ETL(electron transport layer) simulation occurred by using SCAPS-1D simulation software. Initially, the optimization is performed on the various material parameters of absorber layer such as thickness, bulk defect density and bandgap. The obtained optimal values for these parameters are 800nm, 1×10^{15} cm^{-3}, and 2.4 eV respectively. Finally, the proposed PSC structure with optimized absorber layer is achieved the maximum power conversion efficiency (PCE) of 9.06% for TiO_2 ,9.53% for SnO_2 and 9.20%for ZnO. Different Voc 1.7694 , 1.6903, 1.7550 and FF 79.07%, 88.11%, 80.78% for TiO_2, SnO_2, ZnO respectively at 390 nm wavelength near the visible range of solar spectrum. The obtained results of numerical simulations with $Cs_3Sb_2Br_9$ as absorber layer endorse the novel proposed PSC material as the main body of PSC And opens a better route towards the development of a cost effective, highly efficient (Pb) lead-free and environment friendly PSC.

Study of Organic Small Molecular Thin films for Transistor

A Project Dissertation

In partial fulfilment of the degree of

M.Sc. PHYSICS - 4th Semester

(Session 2021-23)

Submitted By

JIGNYAS PADHAN

GGV/21/07824

Under the supervision of

Dr. Arun Kumar Singh

(Associate Professor)

Department of Pure and Applied Physics

DEPARTMENT OF PURE AND APPLIED PHYSICSGURU

GHASIDAS VISHWAVIDHYALAYA, A CENTRAL UNIVERSITY

BILASPUR (C.G.)

CERTIFICATE

This is to certify that Mr. Jignyas Padhan has carried out the research work embodied in the present dissertation entitled "Study of Transistors and Devices made by Organic Small Molecular Thin films Deposition by Stamping Method" for the degree of the Master of Science in Physics is prepared under my supervision.

Arun Kumar Singh

Dr.Arun Kumar Singh (Associate Professor)

Supervisor

We recommend that this dissertation be placed before the examiners for evaluation.

M.N. Tripathi

Dr. M.N. Tripathi

(Professor)

Head of Department

Department of Pure and Applied Physics

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बिलासपुर (छ.ग.)/Bilaspur (C.G.)

INTRODUCTION

Thin film fabrication using 2,7-dioctyl[1]benzothieno[3,2-b]benzothiophene (C8BTBT) through the stamping method is an intricate and sophisticated process that embodies the convergence of advanced materials science and precise engineering techniques. This method offers a remarkable avenue for crafting high-performance transistors with exquisite precision and intricate details, making it an indispensable approach in the realm of cutting-edge electronics. The exquisite intricacies of this fabrication process intertwine with the innate properties of C8BTBT, creating a symphony of innovation that resonates through the finest echelons of modern semiconductor technology. A cost-effective and scalable solution for producing high-performance electronic devices is unveiled through a facile solution process for the fabrication of organic semiconductor devices. Utilizing the inherent self-organization properties of organic semiconductor C8BTBT, we engineer arrays of organic field-effect transistors that showcase exceptional field-effect mobility. This study represents a significant stride toward meeting the ever-increasing demand for large-area, low-cost production of cutting-edge electronic devices.

The fabrication of transistors through innovative techniques represents a pivotal endeavor in modern electronics, propelling the frontiers of miniaturization and functional diversity. Among the burgeoning methodologies, the utilization of C8-BTBT organic semiconductor, a remarkable material with exceptional charge transport properties, through the refined and versatile stamping method, stands as a beacon of advanced manufacturing. This synergistic convergence of cutting-edge organic materials and precision-driven stamping techniques heralds a new era in transistor technology, promising enhanced performance, scalability, and the potential for transformative applications across myriad domains. In this exploration, we delve into the intricate artistry of crafting transistors with C8-BTBT through the precise, yet adaptable, medium of stamping, unlocking the full spectrum of opportunities for next-generation electronics.

A) ORGANIC SEMICONDUCTOR

An organic semiconductor refers to a class of materials composed of organic (carbon-based) compounds that exhibit semiconducting properties. Unlike traditional inorganic semiconductors (e.g., silicon and gallium arsenide), organic semiconductors are based on carbon, hydrogen, nitrogen, and other lightweight elements. These materials have a unique electronic structure that allows them to conduct electricity at intermediate levels between conductors and insulators, making them suitable for various electronic applications.

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (CG)

A Project On

"Theoretical Aspects of a Glassy State"

Master of Science in Physics

Submitted By

KHUSHALEE CHOUHAN

Roll No.: 21110128

Under the Supervision of

Dr. Awadhesh Kumar Dubey

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This is to certify that the dissertation entitled **"Theoretical Aspects of a Glassy State"** submitted by **KHUSHALEE CHOUHAN**, Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, in partial fulfilment of the requirement for the degree of M.Sc. in physics is a project work carried by her.

Supervisor

Dr. Awadhesh Kumar Dubey

H. O. D

Dr. M. N. Tripathi

विभागाध्यक्ष/H.O.D.
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Guru Ghasidas Vishwavidyalaya
बिलासपुर (छ.ग.)/Bilaspur (C.G.)

Abstract

Materials in the glassy state have become an increasing focus of research and development and are found in a variety of commercial products and applications. While non-crystalline materials are not new, their often-unpredictable properties and behaviour continue to elude neat systems of classification. For purposes of teaching, there is presently a need for further explication of glasses, especially given their high importance and the wide extent of glassy materials in existence. This work is thus intended to address that need. Voronoi polyhedra have been used to represent amorphous (glassy) structures with considerable success; however, the system and procedure are not well taught and understood as, for example, are Miller Indices for describing crystals. The present article provides a practical update on results extracted from Voronoi polyhedra analyses of simulated and real physical systems. There is an alternative approach to characterization of amorphous and liquid structures, namely the binary radial distribution function, which is explained. Above all this article discusses the nature of the glassy state.

Synthesis and Photocatalytic application of Zinc Molybdenum

As partial fulfillment for the Degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

Kunal Sahu

Roll no. – 21110131

Under the Guidance of

Dr. Jai Singh (Associate Professor)

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAYA

Bilaspur (C.G.)

2022-23

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur(C.G.)

(A Central University Established by Central University act 2007 No.25 of 2009)

Certificate

This is to certify that **Mr. Kunal Sahu** has carried out a project on the topic **Synthesis and Photocataytic application of Zinc Molybdenum**. (A review Article) in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G> under my supervision.

He has worked diligently, meticulously, and methodically and collected the literature very sincerely and carefully. During this project work, he learned about the impact of photodegradation on the environment.

To the best of my knowledge, the work presented in this project is original and not submitted anywhere. I recommend the project report be forwarded to the respective examiners for evaluation. I wish him all the best for his future envedour.

Supervised by:
11.8.23

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Department of Pure and Applied Physics,

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(A Central University Established by Central University act 2007 No.25 of 2009)

Forwarding Certificate

This is to certify that **Mr. Kunal Sahu** has carried out a review project work in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G. in the topic **Synthesis and Photocataytic application of Zinc Molybdenum**. This project is submitted as a partial fulfillment for the degree of M.Sc. in Physics and forward to the examiner for evaluation.

Prof. M.N. Tripathi

Head of Department

Guru Ghasidas Vishwavidyalaya,

Bilaspur (C.G.)

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ABSTRACT

The present work reports the analysis of the structure, optical properties, and photocatalytic performance of ***Zinc Molybdenum Oxide (ZnMoO4)*** nanoparticles (NPs). ZnMO4 nanoparticles has synthesis by sol gel method, by using Zinc Nitrate and Sodium Molybdenum Oxide as solvent. Analysis of the synthesized Zinc Molybdenum Oxide is carried out by X-ray diffraction (XRD), Raman Spectroscopy, UV-vis spectroscopy. The UV photocatalytic performance of the ZnMoO4 (NPs) was evaluated through the discoloration of Methylene Blue as a model organic pollutant. The efficiency of the synthesized catalyst was tested as absorbent of methylene blue dye (MB) in aqueous solutions. The catalytic test of Zinc Molybdenum Oxide shows a very high activity. The concentration reduction progress and absorption of the dye were followed by an ultraviolet-visible (UV-vis) spectrophotometer.

To study the structure and phase transition of multiferroic composite ($BaTiO_3$-$LaFeO_3$)

A project dissertation submitted in a partial fulfilment of the requirements for the degree of

Master of Science in Physics

By

KUNDAN BISHAL

(M.Sc. Physics 4th Sem.)

Roll no.- 21110132

Under the guidance of

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Department of Pure and Applied Physics

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AUGUST 2023

Approval Certificate

This is to certify that the report entitled **"To study the structure and phase transition of multiferroic composite ($BaTiO_3$-$LaFeO_3$)"** carried out by **Kundan Bishal** is approved for the degree of M.Sc. in Physics (Specialization in Material Science).

Examiner sign

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Head of department

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"SYNTHESIS OF GLASS MATERIALS AND IT'S CHARACTERIZATION TECHNIQUES"

SUBMITTED AS PARTIAL FULFILLMENT OF

Master of Science in Physics

SESSION: 2022-23

By

KUNDAN SINGH

M.Sc. PHYSICS 4TH SEMESTER

ROLL NO. – 21110133

ENROLLMENT NO. – GGV/21/07830

UNDER THE GUIDANCE OF

Dr. R. VIJAYA KUMAR

ASSISTANT PROFESSOR

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(A Central University Established by the Central University Act 2009 No 25 of 2009)

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

APPROVAL CERTIFICATE

This is to certify that **Mr. Kundan Singh** has carried out the dissertation report entitled **"Synthesis Of Glass Materials And It's Characterization Techniques"** in the **Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.** under my guidance and supervision. To the best of my knowledge, the work presented in this project is entirely original and is fit for evaluation for the **Master of Science (Physics)**. The diligent efforts put forth by **KUNDAN SINGH** have resulted in a well-structured and meticulously executed study.

The project report showcases a comprehensive exploration of the synthesis and characterization of glass materials. He has worked diligently, meticulously, and methodically on the designated work and collected the literature very sincerely and carefully.

I recommend the dissertation report to be forwarded to the respective examiners for the evaluation. I extend my heartfelt congratulations to **KUNDAN SINGH** for the successful completion of this project and wish them all the best for their future academic pursuits and endeavors.

Dr. R. Vijaya Kumar
Assistant Professor
Department of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G)
(Supervisor)

ABSTRACT

Glass is a product of inorganic fusion obtained by cooling down molten inorganic materials to a rigid condition. Glass ceramics are known, which include an amorphous phase and one or more crystalline phases. Nowadays, glass Ceramics are used in different fields such as communications technology and electrical devices. Sintering is known as a shaping process for materials, such as glass and glass ceramics, with extremely high melting points. For instance, In the fabrication of semiconductors, impurities are usually introduced into the host lattice to modify their electrical and optical properties. Doping processes are mainly important for the creation of electronic junctions in silicon and For manufacturing of semiconductor devices. At present, phosphate glasses are commonly utilized for bulk laser applications.

However, they are not very suitable for integrated optics purposes, because of their poor chemical stability And low transition temperatures. Conversely, silicate glasses have much better chemical stability, which is important for ion exchange techniques to fabricate optical wave guides. Among oxide glasses, phosphate and silicate glasses are The two most important materials, and they have been used extensively for lasers and fiber. Compared with silicate glasses, phosphate glasses are more limited in their use because they are hydroscopic in nature and have a lower glass Transition temperature.

It describes glass preparation by the melt quench method and experimental techniques used in the characterization of glasses. Characterization techniques like X-ray diffraction techniques (XRD), Fourier transform infrared spectroscopy (FTIR); Thermal, UV analysis, microscopic hardness and dielectric studies and fluorescence spectroscopy etc. have been described in detail.

Luminescence properties of Eu^{3+} doped $Ba_3Al_2O_6$ phosphor

A Project Dissertation Submitted in Partial
Fulfilment for the Degree of M.Sc. in Physics
By

Mr. Nepal Dishri

Supervised by

Dr. Shalinta Tigga

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CERTIFICATE FROM SUPERVISOR

This is to certify that the dissertation entitled **"Luminescence properties of Eu^{3+} doped $Ba_3Al_2O_6$ Phosphor"** submitted by **"NEPAL DISHRI"** Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, in partial fulfilment of the requirement for the Degree of M.Sc. in Physics is an original work carried by him.

17/08/23

Supervisor - Dr. Shalinta Tigga

(Assistant Professor)

Dept. of Pure and Applied Physics

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CHAPTER-1

INTRODUCTION

"light" which is a form of electromagnetic radiation that visible to human eye. Light can be categorized into two types based on its source: Incandescence and Luminescence. Incandescence refers to the glow produced by heating an object or material, such as the bright light emitted by electric bulbs. On the other hand, luminescence is a general term used to describe various phenomena where a substance emits light physicist Eilhard Wiedemann in 1888, derived from the Latin word "lumen," which means "light." Materials that exhibit luminescent properties are known as "luminescent materials" or "phosphors," which originates from the Greek word meaning "light bearer." The term "phosphor" was coined in the 17^{th} century by an Italian alchemist named Vincentinus Casciarolo of Bologna. Luminescence can be further classified into various categories based on the mode of excitation, where the prefix preceding the term "luminescence" indicates the specific mode of excitation in most cases.

CHARACTERIZATION OF RARE EARTH DOPED MAGNESIUM FERRITE NANOPARTICLES AND ITS CATALYTIC ACTIVITY

Submitted in partial fulfilment of the requirements

of the degree of

(Master of Science Physics)

Department of Pure and Applied Physics

By

Muskan Singh

Roll No. 21110135

Supervisor

Prof H. S. Tewari

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya

(2023)

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.).

Certificate

This is to certify that Muskan Singh has carried out project on the topic "CHARACTERIZATION OF RARE EARTH DOPED MAGNESIUM FERRITE NANOPARTICLES AND ITS CATALYTIC ACTIVITY" in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G. under my supervision.

She has worked diligently, meticulously and methodically and collected the literatures very sincerely and carefully.

I recommend the project report to be forwarded for the Evaluation. I wish her all the success in her carrier and life.

Supervisor,
Prof. H. S. Tewari.
Department of Pure and Applied Physics
Guru Ghasidas Vishwavidyalaya
Bilaspur, C.G.

Chapter- 1

INTRODUCTION

Ferrite, a ceramic-like material with magnetic properties that are useful in many types of electronic devices. Ferrites are hard, brittle, iron-containing, and generally gray or black and are polycrystalline—i.e., made up of a large number of small crystals. They are composed of iron oxide and one or more other metals in chemical combination.Ferrites are usually ferrimagnetic ceramic compounds derived from iron oxides.[4] Magnetite (Fe_3O_4) is a famous example. Like most of the other ceramics, ferrites are hard, brittle, and poor conductors of electricity.

Many ferrites adopt the spinel structure with the formula AB_2O_4, where A and B represent various metal cations, usually including iron (Fe). Spinel ferrites usually adopt a crystal motif consisting of cubic close-packed (fcc) oxides (O^{2-}) with A cations occupying one eighth of the tetrahedral holes and B cations occupying half of the octahedral holes.

Characteristics of Magnetic Ferrite:

1. Ferrite magnets have the characteristics of high coercivity and low remanence in performance.

2. Ferrite magnets have a large coercive force and strong anti-demagnetization ability and are suitable for working in dynamic magnetic circuit environments with large temperature changes.

3. Ferrite magnets are hard and brittle and can be cut with emery tools.

4. Its main raw material is oxide, so it is not easy to corrode and generally does not require plating.

5. Its operating temperature is -40°C to +300°C.

Synthesis and Structural Characterization of $SnBi_4Te_7$ Topological Insulator

A Project dissertation submitted in partial fulfilment of requirements

for the degree of

Master of Science (Physics)

By:

Neeraj Kumar Sahu

M.Sc.(Physics) 4th semester

ROLL No-21110136

Enroll No-GGV/18/7106

Guided by:

Dr. Pradip Das

Assistant Professor,

Department of Pure & Applied Physics, GGV

Department of Pure and Applied Physics

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR(C.G.)

(A Central University Established by the Central Universities Act 2009 No 25 of 2009)

Session 2022-23

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

FORWARDING CERTIFICATE

This is to certify that NEERAJ KUMAR SAHU has carried out the project in Department of Pure and Applied Physics, GURU GHASI DAS UNIVERSITY, BILASPUR(C.G.). On the topic: "Synthesis and structural characterization of $SnBi_4Te_7$ Topological Insulator " The project is submitted for the partial fulfilment of requirement of the degree of Master of Science in Physics is forwarded to examiner for evaluation. I wish him every success in life.

Date: 17/08/2023

Prof. M. N. Tripathi

Head of Department

Department of Pure and Applied Physics,

Guru Ghasidas Vishwavidyalaya, Bilaspur(C. G.)

ABSTRACT

We present the **"Synthesis and Structural Characterization of $SnBi_4Te_7$ Topological Insulator "**. Topological insulators (TIs) are the novel class of matter having conducting edge/surface state with insulating bulk and protected by time reversal symmetry. $SnBi_4Te_7$ has attracted great research interests due to its existence of large spin polarized surface states in Sn and Bi based alloys. In this project work, We have synthesized the $SnBi_4Te_7$ Topological Insulator by modified Bridgeman technique. And For structural characterization, We have done the Rietveld refinement of the obtained XRD data to determined the lattice parameter and crystal structure. And We found that the $SnBi_4Te_7$ has trigonal crystal structure with P-3m1(164) space group. And We have also recorded the Raman spectra and analyze the different vibrational modes. In future, the electrical transport measurement will be studied to understand its topological phase.

A project report on

Secondary Ion Mass Spectrometry of Terahertz Quantum Cascade Laser

SESSION: 2021-23

SUBMITTED BY
Niroj Sahu
Roll No-2110138
M.Sc. Physics 4th Semester

Under the supervision of
Dr. Rajesh Sharma
(Associate Professor)

Report submitted

in partial fulfilment for the degree of

Master Of Science (Physics)

DEPARTMENT OF PURE AND APPLIED PHYSICS,

GURU GHASIDAS VISHWAVIDYALAYA,

BILASPUR-495009 (C.G)

DECLARATION

I hereby declare that the work presented in this project dissertation entitled **"Secondary Ion Mass Spectrometry of Terahertz Quantum Cascade Laser"** submitted for the partial fulfilment of the requirement for the degree of Master of Science in Physics has been done in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) under the supervision of Dr. Rajesh Sharma, is my own conducted.

Date: 17/10/23

Niroj Sahu

Niroj Sahu
M.Sc Physics 4th Semester
Roll No-21110138
Enrolment No-GGV/21/07840
Department Of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya , Bilaspur (C.G)

Department of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

CERTIFICATE FROM THE SUPERVISOR

This is to certify that the project dissertation **"Secondary Ion Mass Spectrometry of Terahertz Quantum Cascade Laser"** submitted by Mr. Niroj Sahu Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for the partial fulfilment of the requirement for the degree of Master of Science in Physics is an original work carried out by him under my supervision and guidance.

To the best of my knowledge, the matter embodied in the project dissertation has not been submitted to any other University/ Institute for the award of any Degree or Diploma.

Date-

Dr Rajesh Sharma
Associate Professor
Department Of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

Department of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

APPROVAL CERTIFICATE

This is to certify that the project dissertation entitled as **"Secondary Ion Mass Spectrometry of Terahertz Quantum Cascade Laser"** submitted by Mr. Niroj Sahu for the partial fulfilment of the requirement for the degree of Master of Science in Physics is approved.

Date- 11/5/2023

Prof. M. N. Tripathi

Head Of the Department

Department Of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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ACKNOLEDGEMENT

I wish to express my deep sense of gratitude and indebtedness to my guide **Dr. Rajesh Sharma** for introducing the present topic and for his inspiring guidance, constructive criticism and valuable suggestion throughout this project work.

I would like Express my gratitude to **Prof. M.N. Tripathi** (Head, Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya Bilaspur) for his constant support and encouragement.

I would also like to thank all the faculty members of my department for their great contribution to enriching my knowledge. Also special thanks to all my classmates, especially group members for sharing the literature and valuable assistance.

Finally, I must express my gratitude to my parents for providing me with unfailing support and continuous encouragement throughout M.Sc. Physics course. The accomplishment would have not been possible without them.

Thank you!

Niroj Sahu

ABSTRACT

The secondary ion mass spectrometry (SIMS) is a technique to analyse the composition of solid surface by sputtering the surface of the specimen. We are provided with the data of secondary ion count vs depth. The aluminium content in the barriers of AlGaAs/GaAs THz QCLs developed by molecular beam epitaxy (MBE) was measured using the given data of secondary ion mass spectrometry (SIMS). Here we have also discussed the working principle of THz Quantum Cascade Lasers (QCLs) and the instrumentation of secondary ion mass spectrometry. The difference between conventional semiconductor laser and quantum cascade laser is thoroughly discussed.

CONTENT

1. INTRODUCTION

The THz Quantum cascade laser (QCL) comes under the direct generation of Terahertz radiation. first of all, let us discuss what terahertz radiation is.

Terahertz radiation falls in between infrared radiation and microwave radiation in the *electromagnetic spectrum. Terahertz frequency ranges from 0.1-10 THz which corelate to a* wavelength range of 30μm to 3mm.THz radiation is no visible rays. Terahertz radiation can penetrate a wide variety of non-conducting materials, clothing, paper, cardboard, wood, plastic and ceramics. The penetration depth is typically less than that of microwave radiation. Terahertz radiation has limited penetration through fog and clouds and cannot penetrate liquid water or metal. Terahertz radiation can penetrate some distance through body tissue like x-rays, but unlike them is non-ionizing, so it is of interest as a replacement for medical X-rays. Due to its longer wavelength, images made using terahertz waves have lower resolution than X-rays and need to be enhanced. The earth's atmosphere is a strong absorber of terahertz radiation, so the range of terahertz radiation in air is limited to tens of meters, making it unsuitable for long-distance communications.

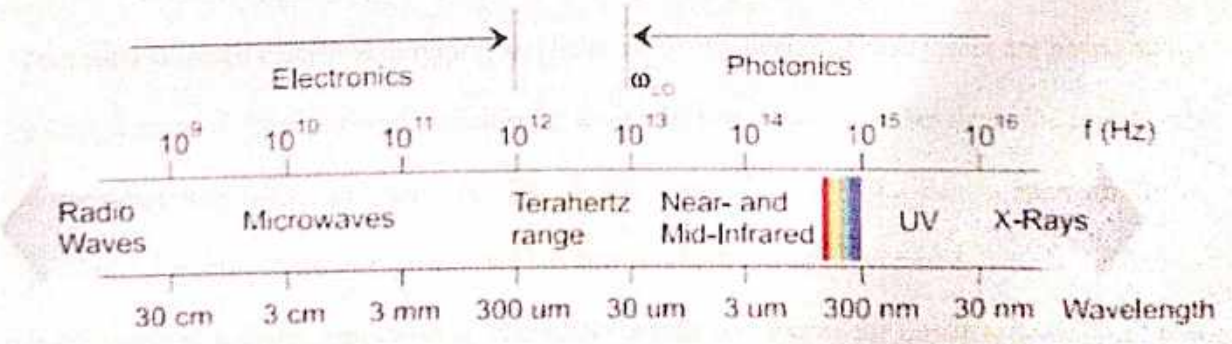

Fig 1: Electromagnetic spectrum showing the THz range (10^{12} THz) within electronic and photonic range.

Deposition and Characterization of Ni:ZnO Thin Films Using Sol-Gel Spin Coating Method for Solar Cell Applications

A project dissertation Submitted

In partial fulfillment for the Degree Of

Master of Science in Physics

By

Ms. Pratibha Xalxo

Roll No: 21110141

Enrollment No: GGV/21/07835

Session: 2022-2023

Under the guidance of

Dr. Rakesh Kumar Pandey

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Department of pure and Applied Physics
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Bilaspur-495 009 (C.G.)

CERTIFICATE

This is to certify that Miss. Pratibha Xalxo has carried out the project under my supervision in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G, on the topic "**Deposition and Characterization of Ni:ZnO Thin Films Using Sol-Gel Spin Coating Method for Solar Cell Applications**". To the best of our knowledge the work presented in the project is original and has not been submitted anywhere.

17-8-23

Supervised by
Dr. R. K. Pandey

Head of the Department
Professor M. N. Tripathi

विभागाध्यक्ष / H.O.D
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Department of pure and Applied Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur-495 009 (C.G.)

Abstract

The zinc oxide (ZnO) is an important II-VI group semiconductor material. It is having direct band gap (3.4 eV) and large free-exciton binding energy (60 meV). it also possesses high mechanical and thermal stabilities, its hexagonal wurtzite crystalline form (o 5.21 A and a= 3.25 A) similar to GaN. It is widely used in high-performance optoelectronic devices like LED, Laser, optical waveguide, optical amplifier, optical switch, photonic crystals etc. In addition, the abundance of Zn makes it one of the most promising materials among the other transparent conductive oxides (TCOs) for large scale applications like front window electrode for solar cell and display based devices. It also presents high photoconductivity and considerable piezoelectric and pyroelectric properties. Transparent thin films of ZnO have recently become one of the most promising materials for the advancement of newer technologies in the field of fabrication of optoelectronics devices like photonic crystals. optical waveguide, UV-Lasers etc. thin film solar cells, development of gas sensors, design and fabrication of optical displays and light emitting diodes. The wide band-gap oxide semiconductors like ZnO, when doped with transition metal ions (Ni, Mn, Fe and Co) have attracted much attention for their versatile applications. The sol-gel process is one of the most attractive techniques for the thin film deposition because of non vacuum requirement, low temperature processing, easy to dope and also offers the possibility of preparing large area coating. Also, the thin films by sol gel technique have good homogeneity, excellent compositional control with good electrical and optical properties. Ni:ZnO thin films have been deposited on ITO glass substrate by using sol gel spin coating method. Zinc acetate dehydrate, Methanol, Ethanolamine and Nickleacetate were used as main precursor, solvent, sol stabilizer and dopant respectively. The deposited films were characterized by Raman spectroscopy and UV-Vis spectroscopy.

A

Literature Based Project on

"Band Structure of Graphene by Using Tight Binding Approximation (TBA) Method "

A Project Thesis Submitted for
Partial Fulfilment of the Requirement for the Degree of
M.Sc. in Physics

Session:- 2021-2023

UNDER THE GUIDANCE OF

Dr.R Vijaya Kumar
(Assistant Professor)
Department of Pure and
Applied Physics.

SUBMITTED BY

Ram Kumar Mukherjee
M.Sc. (Physics)
IV Semester
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Department of Physics
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

FORWORDING CERTIFICATE

This is to certify that, Ram Kumar Mukherjee has carried out this literature survey based on project in the Department of Physics, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur (C.G.) on the topic "Band Structure of Graphene by Using Tight Binding Approximation (TBA) Method" This project submitted for the partial fulfilment of required degree of M.Sc. in Physics and forwarded to examiner for evaluation.

I wish every success in his life.

Prof. M. N Tripathi
(Head, Department of Physics)
Guru Ghasidas Vishwavidyalaya
Bilaspur (C. G.)

विभागाध्यक्ष/H.O.D.
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(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

CERIFICATE

This is to certify that, Ram Kumar Mukherjee has carried out this literature survey-based project under my supervision in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "Band Structure of Graphene by Using Tight Binding Approximation (TBA) Method".

He has worked diligently; methodically and also collected the literature very sincerely and carefully. During this project work she has learnt about various methods related to entitled topic.
I wish every success in her career and life.

Ram Kumar Mukherjee.

SUBMITTED BY
Ram Kumar Mukherjee
M.Sc. Physics (IV Sem.)
Roll No. 21110145
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SUPERVISED BY
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(Assistant Professor)
Department of Physics
GGV, Bilaspur (C.G.)

ABSTRACT

The band structure of graphene, a paradigmatic two-dimensional material, is elegantly elucidated through the tight binding approximation method. This technique dissects the electronic behavior of carbon atoms within the lattice, accounting for their mutual interactions via atomic orbitals. Focusing on the pivotal orbitals, derived from the carbon's p-z orbitals, the method accurately depicts the -bonding and -antibonding bands,revealing their intricate interplay.

Central to the graphene band structure are the renowned Dirac points, located at the K and K' points in the Brillouin zone, where the -bonding and -antibonding bands cross. At these points, electrons behave akin to massless relativistic particles, exemplifying a linear dispersion relationship, reminiscent of Dirac cones. The tight binding approximation captures this unique behavior near the Dirac points, enabling the characterization of graphene's exceptional electronic attributes, such as its high electron mobility and distinctive quantum Hall effect.

In summation, the tight binding approximation method serves as a powerful lens through which the enigmatic band structure of graphene is deciphered. The resulting insights into its electronic bands, particularly the emergent Dirac cones originating from orbitals, lay the groundwork for comprehending the exceptional electronic properties of graphene. This foundational understanding not only enriches the field of condensed matter physics but also augments graphene's potential for transformative applications spanning electronics, optoelectronics, and more.

Green Synthesis of Calcium Oxide Nanoparticle (CaO NPs) Using Leaves Extract Of Murraya Koenigii & Evaluation Of Their Antibacterial Activity

A Project dissertation Submitted In partial fulfilment of the requirements for the Degree of

MASTER OF SCIENCE (M.Sc.)

In PHYSICS

By

Rama Chandra Sahoo
Roll No-2110146
M.Sc Physics 4th Semester

SUPERVISED BY

Dr. Dinesh Uthra
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(A Central University Established Under Central University Act 2009, No. 25 of 2009)

APPROVAL CERTIFICATE

This is to certify that the project dissertation entitled as **"Green synthesis of Calcium oxide Nanoparticle (CaO NPs) Using Leaves Extract of Murraya koenigii and Evaluation of Their Antibacterial Activities"** submitted by Mr. Rama Chandra Sahoo for the partial fulfilment of the requirement for the degree of Master of Science in Physics is approved.

Prof. M. N. Tripathi
Head Of The Department
Department Of Pure & Applied Physics
Guru Ghasidas Vishwavidyalaya , Bilaspur (C.G)

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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CHAPTER-01

1.Abstract

In this study Calcium Oxide can be synthesized via thermal treatment of $Ca(OH)_2$ as precursors which was synthesized by adding NaOH solution to $CaCl_2 \cdot 2H_2O$ solution without using any surfactant, organic medium and complicated tools which was later act as a precursor for the synthesis of green calcium oxide nanoparticle using simplest and ecofriendly biological method called **Green synthesis** method .Aqueous extract from ***Murraya keongii* (Curry) plants leaves** are used as capping agent for the synthesis of CaO NPs .

This method is cheap and the biological agent is completely ecofriendly and also locally available. The synthesis method does not produce any harmful byproduct and toxic gases. So, It is totally green synthesis of Calcium Oxide from Murraya keongii leaf

Antibacterial study can be done by **Agar well diffusion method**. Escherichia coli and Staphylococcus aureus were used as microorganisms in this study. Also, green synthesized CaO NPs shows a positive results.

The synthesized CaO NPs has been characterized by using **Raman spectroscopy, UV-Vis Absorption Spectroscopy Analysis**, and **X-ray powder diffraction analysis.**

GURU GHASIDAS UNIVERSITY

"DESIGN AND CONSTRUCTION OF ANTENNA BOOSTER"

A project dissertation submitted in a partial fulfilment of the requirements for the degree of

Master of Science (M.Sc.) In Physics

By

SOMANATH MEHER

(M.Sc. Physics 4th Sem.)

ROLL NO. -21110150

Under the guidance of

Dr. ALKA SINGH

Assistant Professor

Department of Pure and Applied Physics

Guru Ghasidas University, Bilaspur (C.G)-495009, India

AUGUST 2023

" CERTIFICATE"

This is to certify that **SOMANATH MEHER** (Enrollment No. GGV/21/07844 Roll no. 21110150) has completed his project work "**DESIGN AND CONSTRUCTION OF ANTENNA BOOSTER**" for the partial fulfillment of Degree of Master of Science in Physics under my supervision.

Head of Department

(prof. M.N. Tripathi)

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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Supervisor

(Dr. Alka Singh)

Department of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya (A Central University)

Bilaspur (C.G.),495009

(BLUETOOTH CONTROL HOME AUTOMATION SYSTEM)

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT OF THE

DEGREE

OF

MASTER OF SCIENCE

IN

Submitted by:

Suchitra

Roll no: 21107111

Under the supervision of:

Dr M. N. TRIPATHI

Department of pure and applied physics

GURU GHASIDAS VISHWAVIDYALAYA

(A CENTRAL UNIVERSITY)

(2022-23)

CERTIFICATE

This is to certify that SUCHITRA has carried out the project on the topic "BLUETOOTH CONTROL HOME AUTOMATION SYSTEM" in the Department of Pure & Applied Physics, Guru Ghasi das Vishwavidyalaya, under my supervision. He has worked diligently, meticulously and methodically and collected the literature very sincerely and carefully. During this project work he has learnt few of analytical technique of communication and modulation. to the best of Our knowledge the work presented in this project is original and has not been submitted anywhere. I recommended the project to be forwarded to the respective examiners for evaluation. I wish his all success in his life & career.

DATE

Prof. M.N. TRIPATHI
Professor
Department of Pure & Applied Physics GGV
Bilaspur ((C.G.)
(A CENTRAL UNIVERSITY)

ABSTRACT

This paper presents the design and implementation of a low cost but yet flexible and secure cell phone -based home automation system. The design is based on a stand- alone Arduino BT board and the home appliances are connected to the input / output ports of this board via relays. The communication between the cell phone and the Arduino BT board is wireless. This system is designed to be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core. Passport protection is being used to only allow authorised users from accessing the appliances at home.

A Project Report

On

Spatial Laser beam profiles and Super Resolution Microscopy

Submitted For

Partial Fulfilment of The Requirement for The Degree Of Master of Science in Physics

Supervised By

Dr. Rajesh Sharma

Associate Professor

Department Of Physics

Guru Ghasidas Vishwavidyalaya

Bilaspur - 495009 (C.G.)

Submitted By

Ms. Sudha Rani Behera

M.Sc. IV Semester

Roll No. 21110154

Enroll. No. GGV/21/07847

Department of Physics

Guru Ghasidas Vishwavidyalaya,

Bilaspur (C.G.)Session 2022--2023

Department of Pure and Applied Physics

Guru Ghasidas Vishwavidyalaya,Bilaspur (C.G), India

(A Central University established by the Central University Act 2009)

CERTIFICATE FROM THE SUPERVISOR

This is to certify that the project dissertation entitled as "Spatial laser beam profiles and Super Resolution Microscopy" submitted by Sudha Rani Behera Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for the partial fulfilment of the requirement for the degree of Master of Science in Physics is an original work carried out by her under my supervision and guidance.

To the best of my knowledge, the matter embodied in the project dissertation has not been submitted to any other University/ Institute for the award of any Degree or Diploma.

Date-

Dr Rajesh Sharma

Associate Professor

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Department of Pure and Applied Physics
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(A Central University established by the Central University Act 2009)

APPROVAL CERTIFICATE

This is to certify that the project dissertation entitled as "Spatial laser beam profiles and Super Resolution Microscopy" submitted by Sudha Rani Behera for the partial fulfilment of the requirement for the degree of "Master of Science in Physics" is approved.

Date-

Prof. M. N. Tripathi

Head Of The Department

Department Of Pure & Applied Physics

Guru Ghasidas Vishwavidyalaya , Bilaspur (CG)

विभागाध्यक्ष/H.O.D.
शुद्ध एवं अनुप्रयुक्त भौतिकी विभाग
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बिलासपुर (छ.ग.)/Bilaspur (C.G.)

1.Abstract: -

Super-resolution microscopy has emerged as a creative tool in the field of cellular and molecular imaging techniques with the capability to resolve objects below the classical diffraction limit of optical resolution. This project report includes the principle, techniques, experimental setup and working of super-resolution microscopy through various methods such as STED (Stimulated Emission Depletion) and RESOLFT (Reversible Saturable/Switchable Fluorescent Transitions). This project also discusses the measurement of laser beam profiles using Knife-edge experiment with the help of Origin Software. There are various laser beam profiles such as Beam width (Beam Radius), Beam Divergence, Beam Intensity profile, Beam waist location, Optical Aberrations etc. As laser beam radius plays a crucial role in super-resolution microscopy, here we only go through the measurement of Laser beam width (beam radius). In technique like STED, a tightly focused laser beam is used to excite fluorophores in a sample. The size of laser beam directly influences the resolution enhancement. A small laser beam radius allows for more precise excitation of fluorophores and a higher spatial resolution.

2.Introduction to Super-resolution microscopy: -

High-resolution microscopy is a powerful technique that allows scientists to observe and analyse objects at the nanoscale level. It has revolutionized various fields of research, including biology, materials science, nanotechnology, and medicine. High-resolution microscopes enable scientists to visualize and understand the intricate details of biological structures, cellular processes, and the physical properties of materials with exceptional clarity and precision. Super-resolution microscopy is a revolutionary imaging technique that goes beyond the diffraction limit of conventional light microscopy, allowing scientists to capture images with unprecedented detail at the nanoscale level. This report explores the principles and methods underlying super-resolution microscopy and its implications in the field of physics. This work was recognized internationally with the award of the 2014 Nobel Prize.

Super-resolution microscopy is a groundbreaking technique in physics that surpasses the diffraction limit of traditional light microscopy. By utilizing various methods such as STED (stimulated emission depletion), PALM (photoactivated localization microscopy), and SIM (structured illumination microscopy), researchers can achieve higher spatial resolution, enabling them to visualize biological structures and physical phenomena at the nanoscale level. This advancement has revolutionized our understanding of cellular processes and materials science. The central aim of Super-Resolution microscopy (SRM) is to generate a higher

STUDY ON SYNTHESIS AND CHARACTERIZATION OF PEDOT:PSS HYDROGELS

SUBMITTED AS PARTIAL FULFILLMENT OF

Master of Science (Physics)
SESSION 2021-23

SUBMITTED BY:

SUNNY MAURIYA

M.Sc. PHYSICS 4TH SEMESTER

ROLL NO. – 21110155

ENROLLMENT NO.- GGV/21/07848

GUIDED BY:

Dr. ARUN KUMAR SINGH

ASSOCIATE PROFESSOR

DEPARTMENT OF PURE AND APPLIED PHYSICS

GURU GHASIDAS VISHWAVIDYALAYA

KONI BILASPUR (C.G.)

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(A Central University Established by the Central Universities Act No. 25 of 2009)

CERTIFICATE

This is to certify that the **Mr. SUNNY MAURIYA** has carried out the project under my supervision in the Department of Pure and Applied Physics, Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.), on the topic **"STUDY ON SYNTHESIS AND CHARACTERIZATION OF PEDOT:PSS HYDROGELS"** to the best of my knowledge the work presented in this project is original and has not been submitted anywhere.

Arun Kumar Singh
17/8/2023
Dr. ARUN KUMAR SINGH
Associate Professor

Abstract

PEDOT:PSS poly(3,4-ethylenedioxythiophene):poly (styrene sulfonate) is a promising material and useful in various fields like Biological tissue with sensing and stimulation, owing to their favorable electrical and mechanical properties. We have synthesized PEDOT:PSS hydrogel through simple techniques which has conductive nanofibre network that yields pure PEDOT:PSS hydrogel. This method involves controlled annealing using ethanol as the gelling solvent. Ethanol play on important role of removing excess PSS and indudcing sub-sequent gelling. The PEDOT:PSS hydrogel showed high water swelling ratio with interconnected network design. The electrochemical characterization of PEDOT:PSS hydrogel was studied in three electrode configuration in 1 M H_2SO_4 electrolyte. The cyclic voltammetry curve of PEDOT:PSS hydrogel showed highest areal capacitance is 58.02mf/cm2 at the scan rate 5 mV/s.

GURU GHASIDAS UNIVERSITY

STUDY OF THERMOELECTRIC PROPERTIES OF ZINTL PHASE COMPOUND NaSrSb USING FIRST PRINCIPLE CALCULATION

A project dissertation submitted in a partial fulfilment of the requirements for the degree of

Master of Science (M.Sc.) In Physics

By

SWAPNIL MISHRA

(M.Sc. Physics 4th Sem.)

Under the guidance of

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AUGUST 2023

Certificate from Supervisor

This is to be certify that the report entitled " **Study of Thermoelectric Properties of Zintl Phase Compound NaSrSb using first Principle calculation** " carried out by **Swapnil mishra** of **Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur,** for the partial fulfilment of requirements for the degree, **Master of Science in Physics (Specialization in Material Science)** at **Guru Ghasidas University Bilaspur** is absolutely carried out by him under my supervision and guidance.

To best of our knowledge, these results have not been submitted by him for the award of any other degree or diploma.

17/05/23

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Approval Certificate

This is to certify that the report entitled " **Study Of Thermoelectric Properties of Zintl Phase Compound NaSrSb using first principles calculation**" carried out by **Swapnil mishra** is approved for the degree of M.Sc. in Physics (Specialization in Material Science).

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ABSTRACT

The study focuses on the electronic structure, transport properties, and thermoelectric performance of NaSrSb compound in the Zintl phase. The results show that NaSrSb has a high Seebeck coefficient and low thermal conductivity, which are desirable properties for thermoelectric applications. The study also investigates the effect of doping on the thermoelectric properties of NaSrSb and suggests potential strategies for enhancing its performance. Overall, this work contributes to the understanding of the thermoelectric properties of NaSrSb compound and provides insights for the development of efficient thermoelectric materials.

The study also investigates the effect of doping on the thermoelectric properties of NaSrSb. The results show that doping with certain elements can enhance the thermoelectric performance of NaSrSb by increasing the Seebeck coefficient and reducing the thermal conductivity. The study suggests potential strategies for enhancing the thermoelectric performance of NaSrSb, such as optimizing the doping concentration and controlling the carrier concentration.

STRUCTURAL, CHAARACTERIZATION AND OPTICAL PROPERTIES OF $AlSrSiO_4$: Nd^{+3} SYNTHESIED BY COMBUTION METHOD

SUBMITTED AS PARTIAL FULFILMENT

OF

MASTER OF SCIENCE (PHYSICS)

SESSION 2021-22

SUBMITTED BY

Name: Varsha KURREY

MSC 4TH SEMESTER PHYSICS

ROLL NUMBER-20408043

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GURU GHASIDAS UNIVERSITY BILASPUR (C.G.)

DEPARTMENT OF PURE & APPLIED PHYSICS

Under the guidance of

Dr. Rajendra Prasad Patel

THESIS CERTIFICATE

This is to certify that the thesis entitled **"synthesis, characterisation and optical properties Of $AlSrSiO_4$: Nd^{+3} by combustion method"** submitted by **Varsha Kurrey** to Guru Ghasidas university, Bilaspur Chhattisgarh for the award of the degree of Master of Science in physics is a bona fide record of research work carried out by him under my supervision. The contents of this thesis, in full or in parts, have not been submitted to any other Institute or University for the award of any degree or diploma.

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Place: Bilaspur

Date: 15 September 2022

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CHAPTER 1

INTRODUCTION

1.1. INTRODUCTION:

The luminescence behaviour in inorganic materials can be enhanced by doping rare-earth. Their luminescence behaviour is due to their various energy levels which allow 4f-4f or 5f-4f transitions. These transitions are responsible for characteristic emission from ultra-violet to infra-red region in electromagnetic spectrum due to relaxation of excited state electrons to their ground state after absorption of light. The rare-earth doped materials are used in various technological applications such as light emitting diodes, biomarkers etc[1].

In inorganic photoluminescence (PL) materials have intromitted remarkable research attention of scientific community owning to their application in fabrication light emitting diodes the fabrication of white light emitting diodes is based on the conversion of the blue illumination InGaN LED by phosphor materials. The require condition is that the emission of the LED chip should be converted to visible light to optimize the light Output of the device. This luminescent material widely known as Luminescent phosphors are capable of efficiency absorbing light of a particular wavelength and to convert it into visible light[1][2].

In this work, we present Nd doped $AlSrSiO_4$: Nd^{+3} Inorganic material due to its chemical and thermal stability. The work is focus around synthesis and characterization of $AlSrSiO_4$:Nd^{+3} Inorganic phosphors. Inorganic phosphors are synthesized using combustion method which was confirmed using XRD measurement later the samples were taken for photoluminescence [1].