Department : Chemistry		
Academic Year : 2024-25		
Sr. No.	**Programme Code**	**Name of the Programme**
01.	1764	M. Sc. Chemistry

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अध्यक्ष/Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya,
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

Signature and Seal of the Head

Synthesis of copper Oxide Nanoparticles and its Applications

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

In partial fulfillment of the requirement for the degree of

Master of Science
in
Chemistry

Submitted by

Aakash

M.Sc. 4th Sem

Enrollment No. GGV/23/07201

Roll No. 23104101

Supervisor

Dr. Bhaskar Sharma

Assistant Professor

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

May 2025

Nishy
16.05.25

FORWARDING CERTIFICATE

This is to certify that ***Mr.Aakash*** has carried out the project in the Department of Certificate Chemistry, Guru Ghasidas Vishwavidyalaya (A Central university), Bilaspur (C.G.) on the topic *"Synthesis of Copper Nanoparticles and its Applications"*.

This project is submitted to partially fulfil the requirements for the degree of M.Sc. in Chemistry and forwarded to the examiner for evaluation.

I wish him every success in her life.

Signature of the HOD

Prof. Khemchand Dewangan, professor

Department of Chemistry, G.G.V.

Bilaspur(C.G.)

अध्यक्ष / Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

TABLE OF CONTENTS

Sequestration of organic dyes using mixed MOF and pomegranate leaf ash

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

In partial fulfillment of the requirement for the degree of

Master of Science
in
Chemistry

Submitted by

Khogeshwari Sahu

M.Sc.4th Sem (Physical Chemistry)

Enrollment No.- GGV/23/07219

Roll No.- 23104133

Supervisor

Prof. Charu Arora

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

May 2025

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. Charu Arora

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

Bilaspur-495009, C.G.

CERTIFICATE

This is to certify that ***M s. Khogeshwari Sahu*** has completed the project dissertation entitled **"Sequestration of organic dyes using mixed MOF and pomegranate leaf ash"** under my supervision for the partial fulfillment of required degree of ***"Master of Science in Chemistry"***. She has worked diligently, methodically and also collected the literature very sincerely. During this project work she has learnt about various aspects ofchemical science to the entitled topic.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfills the requirement of the Ordinance relating to the M.Sc. degree of the university.

I wish her every success in the future life.

Date: 15.5.25

Place: Bilaspur,C.G.

Signature of the Supervisor Charu Arora

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. K. Dewangan
Head of the Department

Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur-495009, C.G.

FORWARDING CERTIFICATE

This is to certify that ***M s. Khogeshwari Sahu*** has completed the project work entitled as **" Sequestration of organic dyes using mixed MOF and pomegranate leaf ash"** under the supervision of ***Prof. Charu Arora*** for the partial fulfillment of required degree of ***"Master of Science in Chemistry"***.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfills the requirement of the Ordinance relating to the M.Sc. degree of the university.

I recommend the project report be forwarded to the respective examiners for evaluation.

Date: 15.05.2025

Place: Bilaspur, C.G.

Signature of the HoD

अध्यक्ष / Head
रसायन शास्त्र विभाग
Dept. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

" Removal of Methylene Blue (MB) dye from wastewater by the using of Fe-Cr-BDC metal organic framework (MOF) "

TABLE OF CONTENTS

"Effective removal of fuchsin basic (FB) dye and malachite green (MG) dye from pomegranate leaf (*Punica granatum*) ash"

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Ancient Methods on Corrosion control: A scientific review on metallurgical marvel

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

In partial fulfillment of the requirement for the degree of

Master of Science
in
Chemistry

Submitted by

Ayush Shukla

M.Sc. 4th Sem

Enrollment No. GGV/20/07017

Roll No.2310411

Supervisor

Dr. Bhaskar Sharma

Assistant Professor

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

15-05-2025

May 2025

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. K. Dewangan
Head of the Department

Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur - 495009, C.G.

FORWARDING CERTIFICATE

This is to certify that *Mr. Ayush Shukla* has completed the project work entitled as *"Ancient methods of corrosion control: A scientific review on metallurgical marvels"* under the supervision of *Dr. Bhaskar Sharma*, for the partial fulfillment of required degree of *"Master of Science in Chemistry"*.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfills the requirement of the Ordinance relating to the M.Sc. degree of the university.

I recommend the project report be forwarded to the respective examiners for evaluation.

Date: 15/05/25

Place: Bilaspur, C.G.

15.05.2025

Signature of the HoD

अध्यक्ष / Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

TABLE OF CONTENTS

Department of Chemistry

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

(A Central University)

CERTIFICATE

This is Certified that, ARTI RAVINDRA has carried out this literature survey-based project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G) on the topic: "Exploring the Multifaceted World of Nanocarbon: Structure, Properties, and Emerging Applications". She has worked diligently; methodically and collected the literature very sincerely and carefully. During this project works has learnt about various synthesis and application related to entitled topic.

I wish every success in her carrier and life.

SUBMITTED BY

ARTI RAVINDRA

MSc. Chemistry (IV Sem.)

Roll no: 23104110

SUPERVISED BY

PROF. MANORAMA

Department of Chemistry

(GGV Bilaspur)

Department of Chemistry

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

(A Central University)

FORWARDING CERTIFICATE

This is to certify that, ARTI RAVINDRA has carried out this literature survey Based on project in the department of Chemistry, Guru Ghasidas Vishwavidyalaya (A central Universities), Bilaspur (C.G) on the topic: "Exploring the Multifaceted World of Nanocarbon: Structure, Properties, and Emerging Applications". This project submitted for the partial fulfillment of required degree of MSc. n Chemistry and Forwarded to examiner for evaluation.

I Wish every success in her life.

15.05.2025

Date: 15.05.25

Prof. K.D. Dewangan

(Head, department Chemistry)

Guru Ghasidas Vishwavidyalaya

Bilaspur (C.G)

Department of chemistry

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, ARPITA GUPTA has carried out this literature survey based on project in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya (A Central University), Bilaspur(C.G.) on the topic "Modified Electrodes As Electrochemical Sensors " This project submitted for the partial fulfilment of required degree of M.Sc. in Chemistry and forwarded to examiner for evaluation.

I wish every success in her life.

15-05-2025

PROF. KHEMCHAND DEWANGAN.

(Head, Department of Chemistry)

GURU GHASIDAS VISHWAVIDYALAYA

BILASPUR, CG.

Department of Chemistry

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

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

CERTIFICATE

This is to certify that, ARPITA GUPTA has carried out this literature survey-based project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwa vidyalaya, Bilaspur (C.G.) on the topic "MODIFIED ELECTRODES AS ELECTROCHEMICAL SENSORS" she has worked diligently; methodically and collected the literature very sincerely and carefully. During this project works she has learnt about various organic synthesis related to entitled topic.

SUBMITTED BY

ARPITA GUPTA

M.Sc. Chemistry (IV Sem.)

Roll No. 23104109

SUPERVISED BY

PROF. MANORAMA

(Professor)

Department of chemistry

गुरु घासीदास विश्वविद्यालय, बिलासपुर

Guru Ghasidas Vishwavidyalaya, Bilaspur

A Central University established by the Central Universities Act 2009 No. 25 of 2009

FORWARDING CERTIFICATE

This is to certify that the project work entitled **"Bio-inspired Novel Synthesis of Reduced Graphene Oxide by Using *Cicer arietinum* (chana bhaji) Leaf Extract and its Characterization"** submitted by **Varsha Rani Gupta (M.sc. IV semester)** Department of Chemistry, Guru Ghasidas Vishwavidyalaya Bilaspur (C.G.) under the supervision of **Prof. Manorama** for the partial fulfillment of requirements for the degree of M.Sc. in Chemistry and forwarded to the examiner for evaluation. I wish her every success in her life.

15.05.2025

(Signature of H.O.D.)

Head

Department Of Chemistry

(Signature of Student)

Varsha Rani Gupta

Green Synthesis of Iron Oxide (Fe_3O_4) Nanoparticles

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Science
in

Chemistry

by

Bindiya Rani Patel

Under the Guidance of

Dr. Bhaskar Sharma

Research center

Department of Chemistry,

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

May 2025

FORWARDING CERTIFICATE

This is to certify that *Miss. **Bindiya Rani Patel*** has carried out the project in the Department of CertificateChemistry, Guru Ghasidas Vishwavidyalaya (A Central university), Bilaspur (C.G.) on the topic "*Green Synthesis of Iron Oxide (Fe_3O_4) Nanoparticles*".

This project is submitted for the partial fulfilment of requirements for the degree of **M.Sc. in Chemistry** and forwarded to examiner for evolution.

I wish her every success in her life.

Signature of the HOD
Prof. Khemchand Dewangan,
HOD
Department of Chemistry, G.G.V.
Bilaspur (C.G)

अध्यक्ष / Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

TABLE OF CONTENTS

DESIGN AND SYNTHESIS OF A 2,4- DINITROPHENYLHYDRAZONE BASED SELECTIVE AND SENSITIVE FLUOROSCENT COLORIMETRIC CHEMOSENSOR FOR UNAMBIGUOUS DETECTION OF S-2 IONS

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Sciencein

Chemistry

by

Subhashchand

Roll No. - 23104157

Under the Guidance of

Dr. Gautam Kumar Patra

Research Center Department of Chemistry,

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

May 2025

FORWARDING CERTIFICATE

This is to certify that *Mr. Subhashchand* has carried out the project in the Department of Certificate Chemistry, Guru Ghasidas Vishwavidyalaya (A Central university), Bilaspur (C.G.) on the topic "Design and synthesis of a 2,4- dinitrophenylhydrazone based selective and sensitive fluorescent chemosensor for unambiguous detection of S^{-2} ions" This project is submitted for the partial fulfilment of requirements for the degree of M.Sc. inChemistry and forwarded to examiner for evolution.

I wish her every success in her life.

15-05-2025

Signature of the HOD

Prof. Khemchand
Dewangan, Professor
Department of Chemistry, G.G.V.
Bilaspur (C.G)

अध्यक्ष/Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

15-05-2025

CONTENT

A

Project Report

ON

Design of a TREN-based chemosensor for selective colorimetric detection of Ni^{2+} ion and turn-on fluorometric detection of Zn^{2+} ion.

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT
FOR THE DEGREE OF

Master of Science
In Chemistry

Submitted by;
Dillip Bhoi
Roll No-23104120
Enrollment No-GGV/23/07209
Supervisor
Dr. G.K. PATRA

Department of Chemistry

GURU GHASIDAS VISHWAVIDYALAYA
(A Central University)

2023- 2025

रसायन विज्ञान
Department of Chemistry
गुरु घासीदास विश्वविद्यालय, बिलासपुर-495009, छत्तीसगढ़
Guru Ghasidas Vishwavidyalaya, Bilaspur-495009, Chhattisgarh
(A Central University established by the Central University Act 2009 No. 25 of 2009)
https://www.new.ggu.ac.in/

Prof. Khemchand Dewangan
Professor
Head of Department

Department of Chemistry
Guru Ghasidas University
E-mail ID:dewanganke@gmail.com
Contact: 9691012090, 9935269379

Ref. No.

FORWARDING CERTIFICATE

This is to certify that **Dillip Bhoi** has completed the project work entitled "***Design of a TREN based chemosensor for selective colorimetric detection of Ni^{2+} ion and turn on fluorometric detection of Zn^{2+} ion***" under the supervision of **Prof. Goutam Kumar Patra**, for the partial fulfillment of the required degree of "**Master of Science in Chemistry**".

I wish him every success in his future life.

Date: 15/05/2025

Place: **Bilaspur**

Signature of the HOD
Prof. Khemchand Dewangan
GURUGHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY)
BILASPUR, CG

अध्यक्ष / Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya,
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

Table of Content

A

PROJECT REPORT

ON

DESIGN AND SYNTHESIS OF A 5-HYDROXY 2-METHOXYBENZALDEHYDE-BASED SCHIFF BASE AS A FLUORESCENT TURN-OFF CHEMOSENSOR FOR SELECTIVE DETECTION OF Cu^{2+} IONS.

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF M.Sc CHEMISTRY

Department of Chemistry

GURU GHASIDAS VISHWAVIDYALAYA

(A Central University A^{++} Grade Accredited By NAAC)

2023-2025

Supervisor:
Prof. G. K. PATRA
GURU GHASIDAS VISHWAVIDYALAYA
(A CENTRAL UNIVERSITY A** GRADE
ACCREDITED BY NAAC) BILASPUR, C.G.

Submitted by:
KAMALESH PRADHAN
M. Sc. Inorganic Chemistry,
IVth Semester
Roll No. 23104131

Prof. KHEMCHAND DEWANGAN (HOD)
Department of Chemistry
Guru Ghasidas Vishwavidyalaya, Bilaspur
[A Central University A** Grade Accredited By NAAC
BILASPUR, C.G.]

FORWARDING CERTIFICATE

This is to certify that KAMALESH PRADHAN (M.Sc. Inorganic Chemistry) has been completed a project on "DESIGN AND SYNTHESIS OF A 5-HYDROXY-2-METHOXYBENZALDEHYDE-BASED SCHIFF BASE AS A FLUORESCENT TURN-OFF CHEMOSENSOR FOR SELECTIVE DETECTION OF Cu^{2+} IONS" under the supervision of Prof. G. K. PATRA. This project work is submitted for the partial fulfillment of the required degree in chemistry and forwarded to the Examiner for evaluation.

I wish his every success in the future life.

Signature
Prof. KHEMCHAND DEWANGAN
HEAD OF DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYAL
(A Central University A** Grade Accredited By NAAC)
BILASPUR, C.G.

अध्यक्ष/Head
रसायन शास्त्र विभाग
Deptt. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya,
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

CONTENTS

Multifunctional Schiff base capped Silver nanoparticle for selective and sensitive colorimetric detection for Zr^{4+} and fluorometric detection of Cd^{2+} ion

A Dissertation Submitted

To

Department of Chemistry

School of Study of Physical Sciences

(Guru Ghasidas Vishwavidyalaya)

In partial fulfillment of the requirement for the Degree of Master of Science in Chemistry

By

PARMANAND YADAV

Roll No – 23104142

Enrollment No – GGV/23/07225

Under the Supervision of

Prof G.K. Patra

Professor

(Department of Chemistry)

(April- May 2025)

गुरु घासीदास विश्वविद्यालय, बिलासपुर

Guru Ghasidas Vishwavidyalaya, Bilaspur

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

FORWARDING CERTIFICATE

This is to certify that **Parmanand Yadav (M.Sc. Chemistry 4th Sem)** has been completed a project on **"Multifuctional Schiff base capped silver nanoparticle for selective and sensitive colorimetric detection for Zr^{4+} and fluorometric detection of Cd^{2+} ion "** under the supervision of **Prof. G.K. Patra** This project work is submitted for the partial fulfillment of degree of **Master of Science in Chemistry** and forwarded to Examiner for evaluation.

I wish his every success in the future.

Date १८/०४/२५

(Signature)

Prof. Khemchand Dewangan

Head of Department

(Department of Chemistry)

(GGV, Bilaspur, C.G.)

Dept. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya,
बिलासपुर 495009 (छ.ग.)

Tables of Content

A Project Report

On

Synthesis and Characterization of $LaNiO_3$ and $LaFeO_3$ Perovskite Materials Using Sol-gel Method

Submitted for

Partial Fulfilment of the Requirement for the Degree of

Master of Science in Chemistry

Session 2023-2025

GUIDED BY

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

SUBMITTED BY

Ms. Divya Rani Kurrey
(Analytical Chemistry)
M.Sc. IV Semester
Roll No. 23104121
Enroll. No. GGV/20/07023

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, Bilaspur (C.G.) 495009, India
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

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

CERTIFICATE

This is to certify that **Ms. Divya Rani Kurrey** has carried out this project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "**Synthesis and Characterization of $LaNiO_3$ and $LaFeO_3$ Perovskite materials using Sol-gel Method".** She has worked diligently, methodically and collected the literature very sincerely and carefully. During this project work, she has learnt about various synthesis and characterization techniques related to the entitled topics.

To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend that the project report be forwarded to the respective examiners for evaluation. I wish her all the success in her career and life.

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495009, India

DEPARTMENT OF CHEMISTRY
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 **Ms. Divya Rani Kurrey** has carried out this project in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya,Bilaspur (C.G.) on the topic **Synthesis and Characterization of $LaNiO_3$ and $LaFeO_3$ perovskite materials using Sol-gel Method.** This project is submitted for the partial fulfilment of requirements for the degree of M.Sc. Analytical Chemistry and forwarded to the examiner for evaluation.

I wish her every success in her life.

15.05.2025

Prof. Khemchand Dewangan
Head,
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.), India, 495009,

Head
Dept. of Chemistry
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.)

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

DECLARATION

I hereby declare that the project work presented in the project entitled **"Synthesis and Characterization of $LaNiO_3$ and $LaFeO_3$ perovskite material using Sol-gel Method"** submitted as partial fulfilment of M.Sc. in Analytical Chemistry has been performed by me in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur, under the guidance of **Dr. Ashish Kumar Singh.** The work presented in the project dissertation is original and will remain the intellectual property of the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.).

Date: 15-05-25
Place: Bilaspur

Divya Rani Kurrey
M.Sc. IV Semester
(Analytical Chemistry)
Roll No. 23104121
Enroll. No. GGV/20/07023

TABLE OF CONTENTS

Synthesis of Zinc Oxide Nanoparticles and its Applications

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

In partial fulfillment of the requirement for the degree of

Master of Science
in
Chemistry

Submitted by

Ganpat janghel

M.Sc. 4th Sem

Enrollment No. GGV/23/07212

Roll No. 23104124

Supervisor

Dr. Bhaskar Sharma

Assistant Professor

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

May 2025

FORWARDING CERTIFICATE

This is to certify that *Mr.Ganpat Janghel* has carried out the project in the Department of Certificate Chemistry, Guru Ghasidas Vishwavidyalaya (A Central university), Bilaspur (C.G.) on the topic "*Synthesis of Zinc Oxide Nanoparticles and Its Applications*".

This project is submitted to partially fulfil the requirements for the degree of M.Sc. in Chemistry and forwarded to the examiner for evaluation.

I wish him every success in her life.

Signature of the HoD

Prof. Khemchand Dewangan, professor
Department of Chemistry, G.G.V.
Bilaspur(C.G.)

Head / Head
रसायन शास्त्र विभाग
Dept. of Chemistry
गुरु घासीदास विश्वविद्यालय,
Guru Ghasidas Vishwavidyalaya
बिलासपुर 495009 (छ.ग.)
Bilaspur 495009 (C.G.)

15.5.2025

TABLE OF CONTENTS

A Project Report

On

Synthesis and Characterization of $LaMO_3$ (M = Mn, Co) by Sol-Gel Method

Submitted for

Partial Fulfilment of the Requirement for the Degree of Master of Science in Chemistry

Session 2023-2025

GUIDED BY

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

SUBMITTED BY

Ms. Sagarika Priyadarsini Sahoo
M.Sc. IV Semester
Roll No. 23104150
Enroll. No. GGV/23/07232

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, Bilaspur (C.G.) 495009, India

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

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

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

CERTIFICATE

This is to certify that **Ms. Sagarika Priyadarsini Sahoo** has carried out this project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "**Synthesis and Characterization of $LaMO_3$ (M = Mn, Co) by Sol-Gel Method"**.

She has worked diligently, methodically and collected the literature very sincerely and carefully. During this project work, she has learnt about various synthesis and characterization techniques related to the entitled topics.

To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend that the project report be forwarded to the respective examiners for evaluation. I wish her all the success in her career and life.

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495009, India

DEPARTMENT OF CHEMISTRY

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 **Ms. Sagarika Priyadarsini Sahoo** has carried out this project in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "**Synthesis and Characterization of $LaMO_3$ (M = Mn, Co) by Sol-Gel Method".** This project is submitted for the partial fulfilment of requirements for the degree of M.Sc. in Physical Chemistry and forwarded to the examiner for evaluation.

I wish her every success in her life.

Prof. Khemchand Dewangan
Head
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.), India, 495009,

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

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

DECLARATION

I hereby declare that the project work presented in the project entitled topic "**Synthesis and Characterization of $LaMO_3$ (M = Mn, Co) by Sol-Gel Method"** submitted as partial fulfilment of M.Sc. in Physical Chemistry has been performed by me in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur, under the guidance of **Dr. Ashish Kumar Singh.**

The work presented in the project dissertation is original and will remain intellectual property of the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.).

Date:
Place: Bilaspur

Sagarika Priyadarsini Sahoo
M.Sc. IV Semester
(Physical Chemistry)
Roll No. 23104150
Enroll. No. GGV/23/07232

ACKNOWLEDGEMENT

I would like to express my profound gratitude and grateful regards to my supervisor, **Dr. Ashish Kumar Singh**, Professor, Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), who has given their benevolent co-operation at every stage of project work and without their guidance, this work would hardly have been completed.

I am grateful to **Prof. Khemchand Dewangan**, Head, Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), who has been helping and facilitating during my project work.

I express my thanks to **Prof. H. S. Tewari**, Dean, School of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), for his cooperation and encouragement.

I extend my earnest thanks to **Prof. G. K. Patra, Prof. C. Arora, Prof. S. K. Singh**, **Prof. Manorama, Dr. U. P. Azad, Dr. S. B. Singh, Dr. B. Sharma, Dr. A. Shrivastava, Dr. S. Banerjee, Dr. N. Kumari, Dr. B. L. Sahu,** Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for helping me in conducting laboratory work as well as in data completion.

I would also like to thank research scholar Pappu Shriwas for his continuous guidance throughout the period.

I am also thankful to my classmates and my relatives who always encouraged and inspired me. Words can never convey my deep gratitude and grateful regards to my parents and family for their affection, faith and patience during the whole of the project.

Sagarika Priyadarsini Sahoo
M.Sc. IV Semester
Physical chemistry

CONTENTS

[pmIm]OH as Base and Solvent for MW–Assisted Pd–Catalyzed Cyanation Reactions Aryl Halides

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Science
in

Chemistry

by

Antara Chowdhury

Under the Guidance of

Dr. Subhash Banerjee

Research center
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

MAY 2025

CERTIFICATE OF THE SUPERVISOR

This is to certify that the work incorporated in the major project "***[pmIm]OH as Base and solvent for MW-Assisted Pd-Catalyzed Cyanation Reactions Aryl Halides***", is a record of research work carried out by ***Antara Chowdhury*** bearing Roll No. 23104106, Enrollment No. GGV/20/07009 under my guidance and supervision for the award of Degree of the *Master of Science* in Chemistry at the Guru Ghasidas Vishwavidyalaya, Bilaspur, (CG) India.

To the best of my knowledge and belief the major dissertation synopsis i) Embodies the work of the candidate herself, ii) Has duly been completed, iii) Fulfils the requirement of the Ordinance relating to the Master of Science in chemistry degree of the University is up to the desired standard both in respect of contents and language for being referred to the examiners.

(Signature of the Supervisor)

Dr. Subhash Banerjee
Associate Professor
Department of Chemistry, G.G.V. Bilaspur (C.G)

TABLE OF CONTENTS

Pd Doped $NiCo_2O_4$ for C-H Activation Reactions

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Science
in

Chemistry

by

Savita Devi

Under the Guidance of

Dr. Subhash Banerjee

Research center
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

May 2025

CERTIFICATE OF THE SUPERVISOR

This is to certify that the work incorporated in the major project ***"Pd Doped $NiCo_2O_4$ for C-H Activation Reactions"***, is a record of research work carried out by ***Savita Devi*** bearing Roll No. 23104152, Enrollment No. GGV/20/07060 under my guidance and supervision for the award of Degree of the *Master of Science* in Chemistry at the Guru GhasidasVishwavidyalaya, Bilaspur, (CG) India.

To the best of my knowledge and belief the major dissertation synopsis i) Embodies the work of the candidate herself, ii) Has duly been completed, iii) Fulfils the requirement of the Ordinance relating to theMaster of Science in chemistry degree of the University is up to the desired standard both in respect of contents and language for being referred to the examiners.

15/05/25

(Signature of the Supervisor)

Dr. Subhash Banerjee
Associate Professor
Department of Chemistry, G.G.V. Bilaspur (C.G)

TABLE OF CONTENTS

Task-Specific Acidic Ionic Liquid for One-Pot Synthesis of Pyrano Chromenes

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

of

Master of Science
in

Chemistry

By

Swetlana Prerna Ram

Under the Guidance of

Dr. Subhash Banerjee

Research center
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

May 2025

CERTIFICATE OF THE SUPERVISOR

This is to certify that the work incorporated in the major project "***Task-Specific Acidic Ionic Liquid for One-Pot Synthesis of Pyrano Chromenes***", is a record of research work carried out by ***Swetlana Prerna Ram*** bearing RollNo.23104159, Enrollment No.GGV/20/07065 under my guidance and supervision for the award of Degree of the *Master of Science* in Chemistry in the Guru Ghasidas Vishwavidyalaya, Bilaspur, (CG) India.

To the best of my knowledge and belief the major dissertation synopsis i) Embodies the work of the candidate herself, ii) Has duly been completed, iii) Fulfils the requirement of the Ordinance relating to the Master of Science in Chemistry degree of the University is up to the desired standard both in respect of contents and language for being referred to the examiners.

(Signature of the Supervisor)

Dr. Subhash Banerjee
Associate Professor
Department of Chemistry,
G.G.V. Bilaspur (C.G)

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Microwave Assisted Ionic Liquid Mediated Rapid Synthesis of Covalent Organic Polymer

A Project submitted to

Guru Ghasidas Vishwavidyalaya; Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Science
in

Chemistry

by

Tanuja Patel

Under the Guidance of

Dr. Subhash Banerjee

Research center
Department of
Chemistry;
Guru Ghasidas Vishwavidyalaya; Bilaspur (C.G)

May 2025

CERTIFICATE OF THE SUPERVISOR

This is to certify that the work incorporated in the major project "***Microwave Assisted Ionic Liquid Mediated Rapid Synthesis of Covalent Organic Polymer***"; is a record of research work carried out by ***Tanuja Patel*** bearing Roll No. 23104160; Enrollment No. GGV/20/07067 under my guidance and supervision for the award of Degree of the *Master of Science* in microbiology degree at the Guru Ghasidas Vishwavidyalaya; Bilaspur; (CG) India.

To the best of my knowledge and belief the major dissertation synopsis i) Embodies the work of the candidate herself; ii) Has duly been completed; iii) Fulfils the requirement of the Ordinance relating to the Master of Science in chemistry degree of the University is up to the desired standard both in respect of contents and language for being referred to the examiners.

15/05/25

(Signature of the Supervisor)

Dr. Subhash Banerjee
Associate Professor
Department of Chemistry; G.G.V. Bilaspur (C.G)

TABLE OF CONTENTS

Pd Doped $NiCo_2O_4$ for C-H Activation Reactions

A Project submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

In partial fulfillment

For the award of the degree

Of

Master of Science
in

Chemistry

by

Savita Devi

Under the Guidance of

Dr. Subhash Banerjee

Research center
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G)

May 2025

CERTIFICATE OF THE SUPERVISOR

This is to certify that the work incorporated in the major project ***"Pd Doped $NiCo_2O_4$ for C-H Activation Reactions"***, is a record of research work carried out by ***Savita Devi*** bearing Roll No. 23104152, Enrollment No. GGV/20/07060 under my guidance and supervision for the award of Degree of the *Master of Science* in Chemistry at the Guru Ghasidas Vishwavidyalaya, Bilaspur, (CG) India.

To the best of my knowledge and belief the major dissertation synopsis i) Embodies the work of the candidate herself, ii) Has duly been completed, iii) Fulfils the requirement of the Ordinance relating to the Master of Science in chemistry degree of the University is up to the desired standard both in respect of contents and language for being referred to the examiners.

15/05/24

(Signature of the Supervisor)

Dr. Subhash Banerjee
Associate Professor
Department of Chemistry, G.G.V. Bilaspur (C.G)

TABLE OF CONTENTS

Topic: - Synthesis and characterization, application and properties of the Schiff base for the amino acid.

A Dissertation submitted

To

Guru Ghasidas Vishwavidyalaya

A Dissertation Submitted in Partial Fulfilment for Degree of

M.Sc. chemistry

By

Isha Baghmar

Enrollment No. GGV/23/07214 & Roll No. 23104127

Under the Supervision of

Dr. Suryabhan Singh

(Assistant Professor, Dept. Of chemistry)

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

May ,2025

Department of chemistry

Guru Ghasidas Vishwavidyalaya

(A Central University Established Under the Central Universities Act, 25 of 2009) Bilaspur, Chhattisgarh, India

Date..... Bilaspur

CERTIFICATE FROM THE SUPERVISOR

This is to certify that Isha Baghmar worked on a postgraduate dissertation project entitled " Synthesis and characterization, application and properties of the Schiff base for the amino acid" under my supervision for 4 months and this work has not been formed the basis for the award of any other similar title. It represents entirely independent work on the part of the candidate.

Dr. Suryabhan Singh

Assistant professor

Department of chemistry

Guru Ghasidas Vishwavidyalaya, Bilaspur

Guru Ghasidas Vishwavidyalaya
(A Central University)
Bilaspur (C.G.) 495001, India

A Literature based Project Report on

"Cation and Anion Sensing based on 'Turn ON' fluorescence"

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

Session:-2024-2025

UNDER THE GUIDANCEOF
Dr. Suryabhan Singh
(Assistant Professor)
Department of Chemistry
Guru GhasidasVishwavidyalaya

SUBMITTED BY
Mayank Gautam
M.Sc.(Chemistry)
IV Semester
RollNo.23104138

Department of Chemistry

Guru Ghasidas Vishwavidyalaya ,Bilaspur (C.G.)

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

CERTIFICATE

This is to certify that, MAYANK GAUTAM has carried out this literature survey-based project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "Cation and Anion Sensing based on Turn 'ON' Fluorescence "

He has worked diligently; methodically and collected the literature very sincerely and carefully. During this project works he has learnt about various organic synthesis related to entitled topic.

I wish every success in his career and life.

SUBMITTED BY

Mayank Gautam

M.Sc.Chemistry (IVSem.)

Roll No. 23104138

SUPERVISED BY

Dr.Suryabhan Singh

(Assistant Professor)

Department of Chemistry

GGV Bilaspur (C.G.)

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DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

[A Central University Established by the central universities act, 2009 No. 25 of 2009]

A PROJECT REPORT

ON

"HETEROBIMETALLIC COMPLEX AND THEIR APPLICATION IN CATALYSIS"

Master of Science IV Semester

Session: 2024 – 2025

SUPERVISOR

Dr. SURYABHAN SINGH

ASSISTANT PROFESSOR

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS CENTRAL UNIVERSITY

BILASPUR C.G

SUBMITTED BY

KALYANI BHARTI

M.Sc IV SEMESTER

ROLL NO. 23104130

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR

[A Central University Established by the Central Universities Act, 2009 No. 25 of 2009]

CERTIFICATE

This is to certify that KALYANI BHARTI has carried out this literature survey-based project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "HETEROBIMETALLIC COMPLEXES AND THEIR APPLICATION IN CATALYSIS" He has worked diligently, methodically and collected the literature very sincerely and carefully. During this project work, she has learnt about various syntheses and applications related to the topic.

I wish every success in her career and life.

SUPERVISOR

Dr. SURYABHAN SINGH

ASSISTANT PROFESSOR

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS CENTRAL UNIVERSITY

BILASPUR C.G

SUBMITTED BY

KALYANI BHARTI

M.Sc IV SEMESTER

ROLL NO. 23104130

15525

CONTENT

Topic: - **"Synthesis and characterization of bimetallic complexes using cationic and anionic complexes:"**

A Dissertation submitted

To

Guru Ghasidas Vishwavidyalaya

A Dissertation Submitted in Partial Fulfilment for Degree of

M.Sc. chemistry

By

Mudavath Hanumanthu

Enrollment No. GGV/23/07222 & Roll No. 23104139

Under the Supervision of

Dr. Suryabhan Singh

(Assistant Professor, Dept.of chemistry)

Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)

May ,2025

Department of chemistry

Guru Ghasidas Vishwavidyalaya

(A Central University Established Under the Central Universities Act, 25 of 2009) Bilaspur, Chhattisgarh, India

Date:.....

Bilaspur

CERTIFICATE FROM THE SUPERVISOR

This is to certify that Mudavath Hanumanthu worked on a postgraduate dissertation project entitled "To synthesis and characterization of bimetallic complexes using by cation and anion complexes:" under my supervision for 4 months and this work has not been formed the basis for the award of any other similar title. It represents entirely independent work on the part of the candidate. .

Dr. Suryabhan Singh

Assistant professor

Department of chemistry

Guru Ghasidas Vishwavidyalaya, Bilaspur

AN

EXPERIMENTAL BASED PROJECT REPORT

On

SYNTHESIS AND CHARACTERIZATION OF LANTHANUM BASED DOUBLE PEROVSKITE

Submitted for

Partial Fulfilment of the Requirement for the Degree ofMaster of Science in Chemistry

Session 2023-2025

GUIDED BY

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.)

SUBMITTED BY

Ms. Rakshi Pradhan
M.Sc. IV Semester
Roll No. 23104146
Enroll No. GGV/23/07228

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, Bilaspur (C.G.) 495009, India
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

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

CERTIFICATE

This is to certify that **Ms. Rakshi Pradhan** has carried out this experimental based project work under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "**SYNTHESIS AND CHARACTERIZATION OF LANTHANUM BASED DOUBLE PEROVSKITE**".

She has worked diligently, methodically and also collected the literature very sincerely and carefully. During this project work she has learnt about various organic transformation and new synthetic technique related to the entitled topics.

To the best of our knowledge the work presented in this project is original and has not been submitted anywhere. I recommended the project report to be forwarded to the respective examiners for evaluation. I wish her all the success in her career and life.

Date:

Place: Bilaspur (C.G.)

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.) 495009, India

DEPARTMENT OF CHEMISTRY

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 **Ms. Rakshi Pradhan** has carried out this experimental based project work in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic "SYNTHESIS AND CHARACTERIZATION OF LANTHANUM BASED DOUBLE PEROVSKITE". This project is submitted for the partial fulfilment of requirements for the degree of M.Sc. in Physical Chemistry and forwarded to examiner for evaluation.

I wish her every success in his life.

Date: 15/05/2025

Place: Bilaspur (C.G.)

Prof. Khemchand Dewangan

Head, Department of Chemistry,
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.) 495009, India

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

DECLARATION

I hereby declare that the experimental-based project work presented in the project entitled "SYNTHESIS AND CHARACTERIZATION OF LANTHANUM BASED DOUBLE PEROVSKITE" submitted as partial fulfilment of M.Sc. in Physical Chemistry has been performed by me in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur under the guidance of **Prof. Ashish Kumar Singh.**

The work presented in the project dissertation is original and will remain intellectual property of Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.).

Date:
Place: Bilaspur (C.G.)

Ms. Rakshi Pradhan
M.Sc. IV Semester
(Physical Chemistry)
Roll No. 23104146
Enroll. No. GGV/23/07228

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to my supervisor **Dr. Ashish Kumar Singh**, Professor, Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) under whose guidance, the present project work has been brought to completion my leaps up in thankfulness for the benevolent, time, constant help and valuable throughout the project.

I wish to acknowledge **Prof. Khemchand Dewangan** (Head, Department of Chemistry, Guru Ghasidas Vishwavidyalaya) who gave me opportunity to undergo project work and his valuable suggestion during my M.Sc. in Chemistry course.

I express my thanks to **Prof. H. S. Tiwari**, Dean, School of Physical Sciences, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.), for his cooperation and encouragement.

I extend my earnest thanks to Prof. G. K. Patra, Prof. S. K. Singh, Prof. C. Arora, Dr. S. K. Thakur, Prof. Manorama, Dr. B. Sharma, Dr. A. Shrivastava, Dr. S. Banerjee, Dr. B. Mondal, Dr. U. P. Azad, Dr. S. B. Singh, Dr. N. Kumari, Dr. B. L Sahu, Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) for helping me in conducting laboratory work as well as in completion.

I would also like to thank research scholar Pappu Shriwas for his continuous guidance throughout the period.

I would also express my deep sense of gratitude to my classmates, parents and family members for their encouragement and support throughout, which always inspired me.

Date:
Place: Bilaspur (C.G.)

Ms. Rakshi Pradhan
M. Sc. IV Semester
(Physical Chemistry)

CONTENTS

1.INTRODUCTION

Electrochemical water splitting represents a crucial method for generating green hydrogen. The advancement of energy production and the safe guarding of the environment are critical for achieving sustainable development. However, the reliance on fossil fuels, which contribute significantly to environmental degradation, presents substantial challenges in the conversion and storage of clean energy, as well as in the degradation of pollutants [1]. A particularly promising approach to address these issues involves the development of electrochemical processes capable of converting water, carbon dioxide, and nitrogen into valuable products such as hydrogen [2], hydrocarbons [3], oxygenates [4], and ammonia [5]. Electrocatalysis, which utilizes applied electricity to facilitate catalytic reactions, is recognized for its ability to convert electrical energy into chemical energy, while photocatalysis harnesses solar energy for similar transformations [6]. Both methodologies necessitate the use of efficient catalysts to enhance reaction efficiencies. Among the various catalysts, noble metals like gold, silver, palladium, and iridium are favoured for their superior performance in (electro)photocatalytic reactions [7-8]. However, the prohibitive cost of these catalysts poses a significant barrier to their widespread use, underscoring the urgent need for the design and development of cost-effective, earth-abundant alternatives for these applications. Perovskite oxides (ABO_3) have garnered significant attention as a versatile class of materials for electrochemical (EC) applications, owing to their distinctive structural and compositional flexibility, coupled with remarkable stability [9]. Notably, these materials are extensively utilized in electrocatalysis, offering two primary advantages:(1) they are cost-effective and can be synthesized easily, which facilitates excellent stoichiometric control, reproducibility, and homogeneity;[10] (2) they possess an exceptional ability to incorporate a diverse array of substituting and doping elements, thereby allowing for the modulation of their properties [11-15].

The electrochemical process of water splitting is a crucial method for generating green hydrogen from a sustainable resource like water [16]. To facilitate the production of oxygen and hydrogen gases via this process, both the oxygen evolution reaction (OER) and the hydrogen evolution reaction (HER) are necessary. These reaction can be regarded as environmentally benign from a sustainable resource like water. This process necessitates both the OER and HER to effectively produce oxygen and hydrogen gases. These reactions are recognized as clean and sustainable energy source [17]. Although the concept of water splitting

To Develop An Eco- Friendly Method For Synthesizing Magnetic nanoparticles (MNPs)

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

This dissertation is submitted in partial fulfillment of the requirements for the degree of

Master of Science

in

Chemistry

Submitted by

Rekha Tirkey

M.Sc. 4th Sem (Physical chemistry)

Enrolment No. GGV/23/07229

Roll No. 23104147

Supervisor

Prof. Khemchand Dewangan

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. Khemchand Dewangan

Professor of Dept. Chemistry

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

Bilaspur-495009, C.G.

CERTIFICATE

This is to certify that Miss Rekha Tirkey has completed the project dissertation entitled **"To development An eco- friendly method for synthesizing magnetic nanoparticles"** under my supervision for the partial fulfilment of required degree of "Master of Science in Chemistry". Throughout this project, he has demonstrated diligence, a methodical approach, and a sincere commitment to collecting and reviewing relevant literature. In the process, he has gained a comprehensive understanding of various aspects of chemical science related to the topic at hand.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfils the requirement of the Ordinance relating to the M.Sc. degree of the university.

I wish him every success in the future life.

Date:

Place: Bilaspur, (C.G)

15/05/2025

Signature of the Supervisor

TABLE CONTENTS

Localization of Coated Iron Oxide (Fe_3O_4) Nanoparticles on Tomato Seeds and Their Effects on Growth

A dissertation submitted in partial fulfillment of the requirement for the degree of Masters of Science (M.Sc.) in Chemistry

M.Sc. Project Report (May 2025)

Submited By

Satya Tamboli

(Enrollment No.: GGV/23/07233)

(Roll No.: 23104151)

Under Supervision of

Dr. Khemchand Dewangan

HOD & Professor

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

Koni Bilaspur 495009 (C.G), India

CERTIFICATE

This is to certify that the thesis entitled "Localization of Coated Iron Oxide (Fe_3O_4) Nanoparticles on Tomato Seeds and Their Effects on Growth" is the work carried by **Miss Satya Tamboli** (Enrollment no. GGV/23/07233, Roll no. 23104151) of Department of Chemistry, **Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)** is a verified record of the work completed under my direction and supervision. The thesis work has not been submitted to another university or organization for a degree or professional certification. She wrote this thesis alone, and it is free of plagiarism and clear enough in its grammar to be read. I certify that, unless otherwise mentioned in this thesis, the work contained within it is entirely my own original research.

Date: 15/May/2025

Place: GGV, Bilaspur

15/5/2025

Dr. Khemchand Dewangan

Head of Department & Project Supervisor

Department of Chemistry

Guru Ghasidas Vishwavidyalaya,

Koni Bilaspur-495009, C.G, India

CONTENT

GREEN SYNTHESIS OF SILVER NANOPARTICLE BY ALOE VERA PLANT EXTRACTION

A dissertation submitted in partial fulfilment of the requirement for the degree of Master of Science (M.Sc.) in chemistry

M.Sc. Project Report By

Shruti Rai

(Enrollment No.: GGV/23/07235)

Department of Chemistry

Guru Ghasidas University, Koni (Bilaspur),

495009 (C.G.), India

1.2 Certificate

It is to certify that the work in the project report titled **"green synthesis of silver nanoparticle by aloe vera plant extraction and In Situ generation of bimetallic nanoparticle and its applications"** by Shruti Rai has been approved under my supervision that this work has not been submitted elsewhere.

15/05/2025

Dr. Khemchand Dewangan
Project supervisor
Department of Chemistry
Guru Ghasidas University
Bilaspur-495009 (C.G.)

GGU BILASPUR
15/05/2025

15/05/2025

Dr. Khemchand Dewangan
Head of Department
Department of Chemistry
Guru Ghasidas University
Bilaspur-495009 (C.G.)

1.4 Table of Contents

A Project Report

On

Synthesis and Characterisation of Lanthanum-based double perovskite oxides of LSFZ and LSFC by Sol gel method

Submitted for

Partial Fulfilment of the Requirement for the Degree of

Master of Science in Chemistry

Session 2023-2025

GUIDED BY

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

SUBMITTED BY

Ms. Shyama rani Kar
M.Sc. 4th Semester
Roll No. 23104156
Enroll. No. GGV/23/07236

DEPARTMENT OF CHEMISTRY
GURU GHASIDAS VISHWAVIDYALAYA, Bilaspur (C.G.) 495009, India
(A Central University Established by Central Universities Act 2009 No. 25 of 2009)

DEPARTMENT OF CHEMISTRY

GURU GHASIDAS VISHWAVIDYALAYA, BILASPUR (C.G.)

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

CERTIFICATE

This is to certify that **Ms. Shyama rani Kar** has carried out this project under my supervision in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.) on the topic **"Synthesis and Characterisation of Lanthanum-based double perovskite oxides of LSFZ and LSFC by Sol gel method"**.

She has worked diligently, methodically and collected the literature very sincerely and carefully. During this project work, she has learnt about various synthesis and characterization techniques related to the entitled topics.

To the best of our knowledge, the work presented in this project is original and has not been submitted anywhere. I recommend that the project report be forwarded to the respective examiners for evaluation. I wish her all the success in her career and life.

Dr. Ashish Kumar Singh
Professor
Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur (C.G.)

DEPARTMENT OF CHEMISTRY

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 Ms. Shyama rani Kar has carried out this project in the Department of Chemistry, Guru Ghasidas Vishwavidyalaya,Bilaspur (C.G.) on the topic "Synthesis and Characterisation of Lanthanum-based double perovskite oxides of LSFZ and LSFC by Sol gel method". This project is submitted for the partial fulfilment of requirements for the degree of M.Sc. in Physical Chemistry and forwarded to the examiner for evaluation.

I wish her every success in her life.

Prof. Khemchand Dewangan
Head
Department of Chemistry,
Guru Ghasidas Vishwavidyalaya,
Bilaspur (C.G.), India, 495009,

CONTENT

1. INTRODUCTION

Increasing energy demands have stimulated intense research on alternative energy conversion and storage systems with high efficiency, low cost, and environmental benignity [1,2]. Catalysts for oxygen reduction and evolution reactions are at the heart of key renewable-energy technologies, including fuel cells [3,4] and water splitting. For more effective energy conversion or storage systems, a variety of creative concepts have been put forth, including fuel, alkaline water electrolysis, cells, as well as metal-air batteries. Electrocatalysis, which utilizes applied electricity to facilitate catalytic reactions, is recognized for its ability to convert electrical energy into chemical energy, while photocatalysis harnesses solar energy for similar transformations [5]. Both methodologies necessitate the use of efficient catalysts to enhance reaction efficiencies. Among the various catalysts, noble metals like gold, silver, palladium, and iridium are favoured for their superior performance in (electro) photocatalytic reactions [6]. However, the prohibitive cost of these catalysts poses a significant barrier to their widespread use, underscoring the urgent need for the design and development of cost-effective, earth-abundant alternatives for these applications.

Several catalysts have been developed to enhance electrode kinetics and stability under the electrocatalytic OER, which has been the subject of much research in recent decades. The OER activity of metal oxide catalysts comprising transition metals [7,8], and several metal oxide families, including perovskite, has been the subject of extensive investigation. It has been discovered that the layer structure type-family ($M(OH)_2$, MOOH, and $LiMO_2$; M = Mn, Fe, Co, and Ni)[9,10,11], spinel ($A'B'_2O_4$; A' = alkaline-earth and/or transition metals, B' = group 13 elements and/or transition metals), and (ABO_3; A = alkaline-and/or rare-earth metals, B = transition metals)[12,13]show notable activity toward OER. These transition metal-based oxides are inexpensive, simple to make, and safe for the environment. They also exhibit moderate conductivities and are stable in alkaline solutions, making them suitable candidates for electrocatalytic OER. Additionally, promising electrocatalytic materials for HER and/or OER have been reported for organometallics (metal coordination complexes) [14,15], which may be excellent candidates for the overall reaction with water splitting. However, compared to metal oxide catalysts for electrocatalytic OER, there are very few documented instances of non-oxide catalysts for OER. It is known that ORR can involve a two-step, two-electron reaction wherein an intermediate stable peroxide can be formed that further gets reduced to water at high potentials. Even in cases where the ORR involves two steps, a two-electron process, efforts have been directed towards improving the reaction conditions such that a direct

Comparative Study on Adsorption of Cationic Dye Mixtures Using Fe/Cr-BDC Metal-Organic Framework and Parthenium Leaf Ash

A Project Report Submitted to

Guru Ghasidas Vishwavidyalaya, Bilaspur, C.G.

In partial fulfillment of the requirement for the degree of

Master of Science
in
Chemistry

Submitted by

Tushar Ranjan Sarangi

M.Sc. 4th Sem

Enrollment No.
GGV/23/07240
Roll No. 23104163

Supervisor

Prof. Charu Arora

Department of Chemistry

Guru Ghasidas Vishwavidyalaya

May 2025

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. Charu Arora

Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur-495009, C.G.

CERTIFICATE

This is to certify that ***Mr. Tushar Ranjan Sarangi*** has completed the project dissertation entitled *"Comparative Study on Adsorption of Cationic Dye Mixtures Using Fe/Cr-BDC Metal-Organic Framework and Parthenium Leaf Ash"* under my supervision for the partial fulfillment of required degree of ***"Master of Science in Chemistry"***. She has worked diligently, methodically and also collected the literature very sincerely. During this project work she has learnt about various aspects of chemical science to the entitled topic.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfills the requirement of the Ordinance relating to the M.Sc. degree of the university.

I wish her every success in the future life.

Date: 15.5.25

Place: **Bilaspur, C.G.**

Signature of the Supervisor

Guru Ghasidas Vishwavidyalaya

(A Central University established under Central Universities Act 2009)

Prof. K. Dewangan
Head of the Department

Department of Chemistry
Guru Ghasidas Vishwavidyalaya
Bilaspur - 495009, C.G.

FORWARDING CERTIFICATE

This is to certify that ***Mr. Tushar Ranjan Sarangi*** has completed the project work entitled as ***"Comparative Study on Adsorption of Cationic Dye Mixtures Using Fe/Cr-BDC Metal-Organic Framework and Parthenium Leaf Ash"*** under the supervision of ***Prof. Charu Arora***, for the partial fulfillment of required degree of ***"Master of Science in Chemistry"***.

To the best of my knowledge and belief of the project

1) is original and has not been submitted anywhere for award of any degree.
2) Fulfills the requirement of the Ordinance relating to the M.Sc. degree of the university.

I recommend the project report be forwarded to the respective examiners for evaluation.

Date: 15.05.2025

Place: **Bilaspur, C.G.**

Signature of the HoD

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