

**“SYNTHESIS OF SILVERNANOPARTICLES, ITS  
CHARACTERISATION AND METAL ION SENSING  
EXPERIMENTS”**

The project is submitted to University of Calicut for the partial fulfilment of the requirement for the degree of master of science in chemistry.

**AMRITHA SURESH  
CRAWMCH001**

Under the supervision of  
**Dr. YOOSAF KARUVATH**

**Professor**

**Department of Applied Chemistry  
Cochin University of Science and Technology**



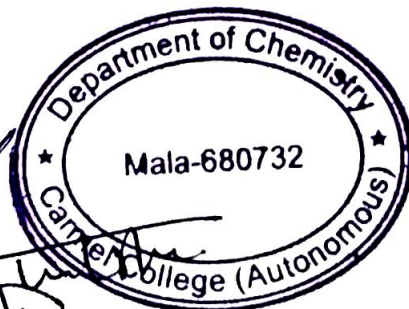
**DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA  
THRISSUR, KERALA**

**2022-2024**

**Supervisor**

**Examiners:**

1. Dr. Tom Chuan
2. Rosemal



**Head of the department**

**Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732**

3. Dr. Manoj Ar. K. K. K.

# COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY



## CERTIFICATE

This is to certify that the project entitled “SYNTHESIS OF SILVER NANOPARTICLES, ITS CHARACTERISATION AND METAL ION SENSING EXPERIMENTS” is an authentic record of the study carried out by **AMRITHA SURESH**, Reg No: **CRAWMCH001** under the guidance of **Dr. YOOSAF KARUVATH** Professor, Department of applied chemistry, Cochin university of science and technology, in partial fulfilment of the requirement for the award of the Degree, Master of Science in Chemistry in Calicut University at Carmel College (Autonomous) Mala during the academic year 2022-2024.

Place: *Kochi*

Date: *29/4/24*



**Dr. YOOSAF KARUVATH**

*Professor & Head*

*Professor*

**Dept. of Applied Chemistry**

**Department of Applied chemistry**

**Cochin university of science and technology**

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

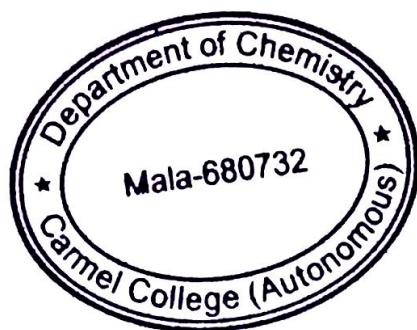


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Place: Mala

Date: 14/05/2024



**Dr. PRINCY K G**

Professor

Head of the Department

Department of chemistry

Carmel college (Autonomous) mala

**Dr. Princy K.G.**  
Professor & Head  
Department of Chemistry  
Carmel College (Autonomous)  
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Place: Mala

Date: 14/05/2024



**Dr, PRINCY K G**

Head of department

Department of chemistry

Carmel college (Autonomous) Mala

Head

Department of Chemistry

Carmel College (Autonomous)

Mala-680732

# HETEROGENEOUS PALLADIUM CATALYST FOR REDUCTION OF NITROARENES

Project report submitted to the University of Calicut for partial fulfillment of  
the award of the degree of

**M.Sc. Program in Chemistry**

By

**AMRUTHA S. NAIR N.**

**CRAWMCH002**

Under the guidance of

**Dr. Sindhu Mathai**

Assistant Professor

DEPARTMENT OF APPLIED CHEMISTRY

COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY

COCHIN-682022, KERALA



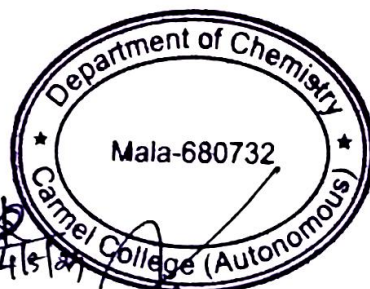
DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS)

MALA THRISSUR, KERALA

2022-2024

  
Supervisor

Examiners: Rosemol



  
Head of department

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

Dr. Tom Chuan

Dr. Manoj A.L. Oommen

DEPARTMENT OF APPLIED CHEMISTRY  
COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY  
COCHIN-682022, KERALA



**CERTIFICATE**

This is to certify that the project work entitled, “**HETEROGENEOUS PALLADIUM CATALYST FOR REDUCTION OF NITROARENES**” is an authentic record of the study carried out by **Ms. AMRUTHA S. NAIR N.** (Reg.No. CRAWMCH002) under the guidance of **Dr. SINDHU MATHAI**, Assistant Professor, Department of Applied Chemistry, Cochin University of Science and Technology Cochin-22 Kerala. In partial fulfillment of the requirement for the award of the degree, Master of Science in Chemistry during the academic year 2022-2024

Place: *Cochin*

Date: *30-04-2024*

**Dr. SINDHU MATHAI**

Dept. of Applied Chemistry

Cochin University of Science and Technology

**Dr. SINDHU MATHAI**

**Assistant Professor**

**Dept. of Applied Chemistry**

**Cochin University of Science & Technology**

**Cochin - 22, Kerala**

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with A grade)

Affiliated to University of Calicut

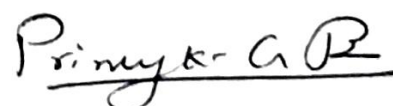


## CERTIFICATE

This is to certify that the project work entitled “**HETEROGENEOUS PALLADIUM CATALYST FOR REDUCTION OF NITROARENES**” is an authentic record of the work carried out by **AMRUTHA S. NAIR N. (CRAWMCH002)** under the co-guidance of **Dr.PRINCY K.G.**, Head of the Department of Chemistry, Carmel College (Autonomous) Mala during the academic year 2022-2024, from the University of Calicut, Malappuram.

Place:Mala

Date: 14/05/2024



**Dr. Princy K. G.**

Professor

Head of the Department

Department of Chemistry

Carmel College (Autonomous),Mala



**Dr. Princy K. G.**  
Professor & Head  
Department of Chemistry  
Carmel College (Autonomous), Mala  
Mala-680732

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala - 680732



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Place: mala

Date: 14/05/2024



**Dr. PRINCY K. G.**  
Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732  
Department of Chemistry

Carmel College (Autonomous) Mala



# “SYNTHESIS OF CARBON NANOPARTICLES FROM ORTHO PHENYLENE DIAMINE AND ORTHO CRESOL AND IT'S APPLICATION”

The project work submitted to University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry

**ANNA ANTO**

**CRAWMCH003**

Under the supervision of

**Dr. Paulson Mathew**

Professor and Head of the Department of Chemistry

St. Thomas College (Autonomous), Thrissur

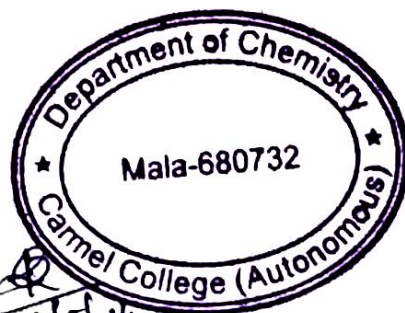


**POST GRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR**

**2022 – 2024**

**Supervisor**

**Examiners :** Rosemal



*Prinny K A P*  
**Head of the Department**

**Head**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala-680732**

**DEPARTMENT OF CHEMISTRY**  
**ST. THOMAS COLLEGE (AUTONOMOUS), THRISSUR**

Affiliated to the university of Calicut

NAAC (4<sup>th</sup> cycle):A++(3.70/4) Grade & College with potential For Excellence



**CERTIFICATE**

This is to certify that the work entitled “**SYNTHESIS OF CARBON NANOPARTICLES FROM ORTHO PHENYLENE DIAMINE AND ORTHO CRESOL AND IT’S APPLICATION**” submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research Department of Chemistry, St. Thomas College (Autonomous), Thrissur by **ANNA ANTO**, (Reg No: **CRAWMCH003**) M.Sc. Chemistry student, P.G Department of Chemistry, Carmel College (Autonomous), Mala (Affiliated to University of Calicut, Kerala) and was supervised and guided by me.

Place: Thrissur

Date: 04/05/2024

**Dr. PAULSON MATHEW**  
(Supervising guide)  
Professor & Head  
Department of Chemistry  
St. Thomas' College, Thrissur - 1  
St. Thomas college Autonomous, Thrissur

# CARMEL COLLEGE (AUTONOMOUS), MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala- 680732

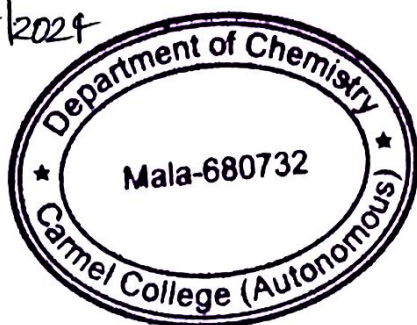


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Place : Mala

Date : 14/05/2024



**Dr. PRINCY K G**

Professor and Head of the Department  
Department of Chemistry

Carmel College (Autonomous), Mala

**Dr. Princy K.G.**  
Professor & Head  
Department of Chemistry  
Carmel College (Autonomous)  
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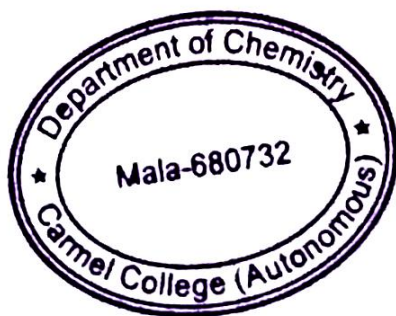


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Place : Mala

Date : 14/05/2024



**Dr. PRINCY K G**

Professor and Head of the Department  
Department of Chemistry  
Carmel College (Autonomous), Mala

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

# "COLORIMETRIC DETECTION OF GLUCOSE USING GOLD NANOPARTICLES"

The project is submitted to University of Calicut for the partial of  
fulfilment of the requirement for the degree of master of science in chemistry.

FARSANA THAJUDEEN

CRAWMCH004

Under the supervision of

Dr. YOOSAF KARUVATH

Professor

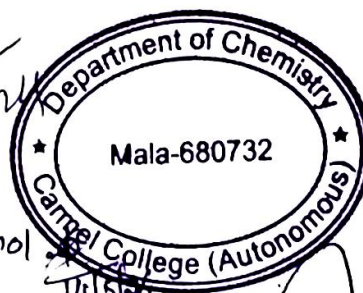
Department of Applied Chemistry  
Cochin University of Science and Technology



DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA  
THRISSUR, KERALA 2022-2024

Supervisor

*Handwritten signature*  
3/5/24



Head of the department

*Handwritten signature*

Examiners: Rosemol

*Handwritten signature*

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

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*Handwritten signature*  
Dr. Manoj A. L. N

# COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY



## CERTIFICATE

This is to certify that the project entitled “**COLORIMETRIC DETECTION OF GLUCOSE USING GOLD NANOPARTICLES**” is an authentic record of the study carried out by **FARSANA THAJUDEEN**, Reg No: **CRAWMCH004** under the guidance of **Dr. Yoosaf Karuvath**, Professor, Department of applied chemistry, Cochin university of science and technology, in partial fulfilment of the requirement for the award of the Degree, Master of Science in Chemistry in Calicut University at Carmel College (Autonomous) Mala during the academic year 2022-2024.

Place: ~~Mala~~ Kochi

Date: 03/05/24

*Yoosaf Karuvath*  
03/05/24  
Professor & Head  
Dept. of Applied Chemistry  
**DR. YOOSAF KARUVATH**  
Department of Applied chemistry  
Cochin University of science and technology

**CARMEL COLLEGE (AUTONOMOUS) MALA**  
**(Nationally Re-accredited with A grade)**

**Affiliated to University of Calicut**



**CERTIFICATE**

This is to certify that the project work entitled “**COLORIMETRIC DETECTION OF GLUCOSE USING GOLD NANOPARTICLES**” is an authentic record of the work carried out by **FARSANA THAJUDEEN (CRAWMCH004)** under the co-guidance of **Dr. ROSHNI K.THUMPAKARA**, Carmel College (Autonomous) Mala during the academic year 2022-2024, from the University of Calicut, Malappuram.

Place: Mala

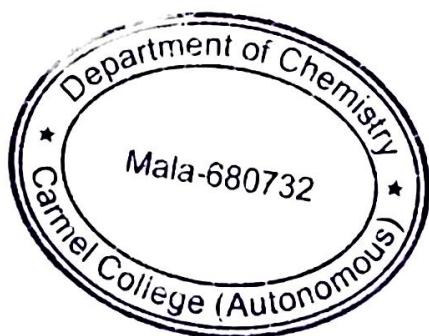
Date: 4-05-2024

**Dr. ROSHNI K. THUMPAKARA**

ASSOCIATE PROFESSOR

Department of chemistry

Carmel college (Autonomous) Mala



**Dr. Roshini.K.Thumpakara**  
**Associate Professor**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala - 680732**

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Natioanally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala – 680732


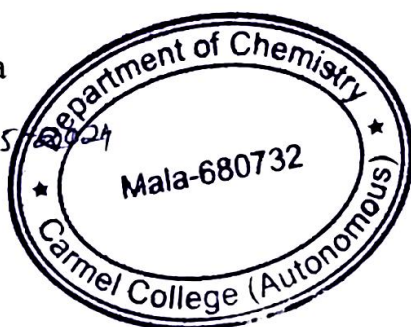


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Place:Mala

Date: 14-05-2024



**Dr. PRINCY K. G**

Head of the Department

Department of chemistry

Carmel college (Autonomous), Mala

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732



**“SYNTHESIS, CHARACTERIZATION AND CATALYTIC  
STUDIES OF NICKEL NANOPARTICLES SUPPORTED ON  
BONE ASH”**

The project work submitted to University of Calicut in partial fulfillment of the requirement for  
the degree of Master of Science in Chemistry

**JISMI V.B**

**CRAWMCH005**

Under the supervision of

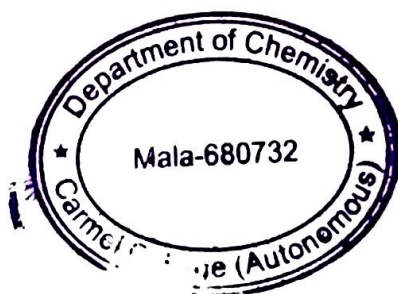
**Dr. Paulson Mathew**

Professor and Head of the Department of Chemistry  
St. Thomas College (Autonomous), Thrissur



**POST GRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR  
2022 – 2024**

**Supervisor**



**Examiners :**

**Head of the Department**

Head  
Department of Chemistry  
Carmel College (Autonomous)  
**Mala-680732**

**DEPARTMENT OF CHEMISTRY**  
**ST. THOMAS COLLEGE ( AUTONOMOUS), THRISSUR**

Affiliated to the university of Calicut

NAAC (4<sup>th</sup> cycle):A++(3.70/4) Grade & College with potential For Excellence



**CERTIFICATE**

This is to certify that the work entitled **“SYNTHESIS, CHARACTERIZATION AND CATALYTIC STUDIES OF NICKEL NANOPARTICLES SUPPORTED ON BONE ASH”** submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research Department of Chemistry, St. Thomas College ( Autonomous), Thirissur by **JISMI V B** , (Reg No: **CRAWMCH005**) M.Sc. Chemistry student, P.G Department of Chemistry, Carmel College (Autonomous), Mala (Affiliated to University of Calicut, Kerala) and was supervised and guided by me.

Place: Thirissur

Date: 04-05-2024

**Dr. PAULSON MATHEW**

(Supervising guide)

Professor & Head of the Department of Chemistry  
St. Thomas College Autonomous, Thirissur

*Dr. Paulson Mathew PhD, MEd  
Professor & Head  
Department of Chemistry  
St. Thomas' College, Thirissur - 1*

# CARMEL COLLEGE (AUTONOMOUS), MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala- 680732

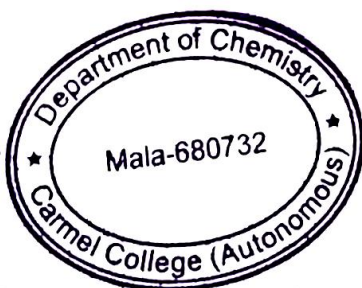


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Place : Mala

Date : 14-05-24



**Dr. PRINCY K G**

Professor and Head of the Department  
Department of Chemistry  
Carmel College (Autonomous), Mala

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

**CARMEL COLLEGE (AUTONOMOUS), MALA**  
**(Nationally Re-accredited with 'A' grade)**  
**Affiliated to University of Calicut**  
**Mala- 680732**



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Place : Mala

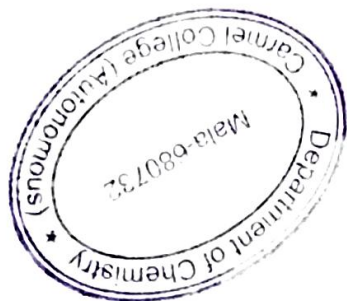
Date : 14<sup>th</sup> 05 - 2024

**Dr. ROSHNI K THUMBAKARA**

Associate professor

Department of Chemistry

Carmel College (Autonomous), Mala



**Dr. Roshini.K.Thumpakara**  
**Associate Professor**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala - 680732**

**“SYNTHESES OF A SERIES OF meso-ARYL SUBSTITUTED trans-A<sub>2</sub>B<sub>2</sub>-PORPHYRINS UTILIZING GREEN CHEMISTRY PROTOCOL”**

Project report submitted to the University of Calicut for partial fulfillment of the award of the degree of

**M. Sc. Program in Chemistry**

By

**KRISHNAPRIYA K G**

**CRAWMCH006**

Under the guidance of

**Dr. Simi Pushpan K**

Assistant Professor

DEPARTMENT OF CHEMISTRY

UNION CHRISTIAN COLLEGE, ALUVA



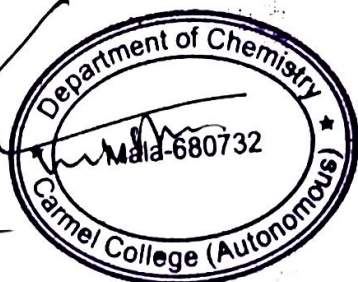
DEPARTMENT OF CHEMISTRY

CARMEL COLLEGE (AUTONOMOUS) MALA

THRISSUR, KERALA

2022-2024

Supervisor



Head of the Department

Examiners:

Rosemol

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

Dr. Manoj A. L.

**UNION CHRISTIAN COLLEGE, ALUVA**  
(Affiliated to Mahatma Gandhi University, Kottayam)



**CERTIFICATE**

This is to certify that the project work entitled, “**SYNTHESES OF A SERIES OF meso-ARYL SUBSTITUTED trans-A2B2-PORPHYRINS UTILIZING GREEN CHEMISTRY PROTOCOL**” is an authentic record of the study carried out by **Ms. KRISHNAPRIYA K G**, Reg No. **CRAWMCH006** under the guidance of **Dr. SIMI PUSHPAN K**, Assistant Professor, Department of Chemistry, Union Christian College, Aluva, Ernakulam, Kerala. In partial fulfillment of the requirement for the award of the Degree, Master of Science in Chemistry during the academic year 2022-2024

Place: Aluva

Date: 08/05/2024

DEPARTMENT OF CHEMISTRY  
UNION CHRISTIAN COLLEGE  
ALUVA

**Dr. SIMI PUSHPAN K**

Assistant Professor

Department of Chemistry

Union Christian College

Dr. SIMI PUSHPAN.K  
Assistant Professor  
Department of Chemistry  
Union Christian College  
Aluva - 683 102, Kerala

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with A grade)

Affiliated to University of Calicut



## CERTIFICATE

This is to certify that the project work entitled “**SYNTHESES OF A SERIES OF meso-ARYL SUBSTITUTED trans-A2B2-PORPHYRINS UTILIZING GREEN CHEMISTRY PROTOCOL**” is an authentic record of the work carried out by **KRISHNAPRIYA K G (CRAWMCH006)** under the co-guidance of **Dr. ROSHNI K THUMPAKARA**, Associate Professor, Carmel College (Autonomous) Mala during the academic year 2022-2024, from the University of Calicut, Malappuram.

Place: Mala

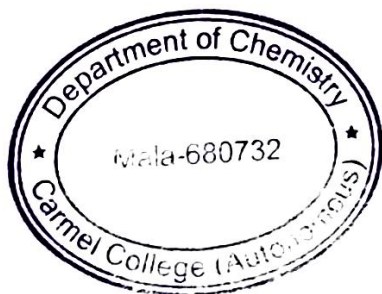
Date: 08/05/2024

**Dr. ROSHNI K THUMPAKARA**

Associate Professor

Department of Chemistry

Carmel College (Autonomous) Mala



**Dr. Roshini K. Thumpakara**  
Associate Professor  
Department of Chemistry  
Carmel College (Autonomous)  
Mala - 680732

# CARMEL COLLEGE (AUTONOMOUS) MALA

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Affiliated to University of Calicut

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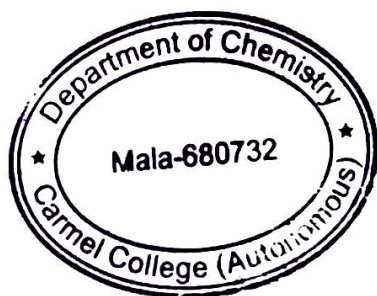


## CERTIFICATE

This is to certify that the project work entitled "SYNTHESES OF A SERIES OF meso-ARYL SUBSTITUTED trans-A<sub>2</sub>B<sub>2</sub>-PORPHYRINS UTILIZING GREEN CHEMISTRY PROTOCOL" is an authentic record of the work carried out by KRISHNAPRIYA K G (CRAWMCH006) under the supervision and guidance of Dr. SIMI PUSHPAN K, Assistant Professor, Department of Chemistry, Union Christian College, Aluva and Dr. ROSHNI K THUMPAKARA, Associate Professor Chemistry, Carmel College (Autonomous) Mala of the partial fulfillment for the award of the degree of Master of Science in Chemistry during the academic year 2022-2024, from the University of Calicut, Malappuram.

Place: Mala

Date: 08/05/2024



*Princy K G*

Dr. PRINCY K G

Head of the Department

Department of Chemistry

Carmel College (Autonomous) Mala

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732



**“SYNTHESIS OF meso-ARYL SUBSTITUTED  
DIPYRROMETHANE AND ITS USE IN THE SYNTHESIS OF  
meso-ARYL SUBSTITUTED trans-A<sub>2</sub>B<sub>2</sub> PORPHYRIN USING  
GREEN CHEMISTRY PROTOCOL”**

The project is submitted to the University of Calicut for the partial fulfillment of the requirements for the degree of Master of Science in Chemistry.

**LAKSHMI E S  
CRAWMCH007**

Under the guidance of  
**Dr. SIMI PUSHPAN K**

Assistant Professor, Department of Chemistry  
Union Christian College, Aluva



**DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA  
THRISSUR, KERALA 2022-224**

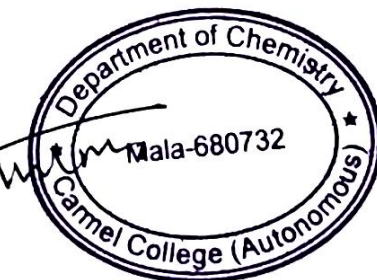
Supervisor

**Dr. T. V. C.**

Examiners:

**Dr. Maniy K. L.**

Rosemol



Head of the department

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

4/15/24

**UNION CHRISTIAN COLLEGE, ALUVA**  
**DEPARTMENT OF CHEMISTRY**  
(Affiliated to Mahatma Gandhi University, Kottayam)




**CERTIFICATE**

This is to certify that the project work entitled, “**SYNTHESIS OF meso-ARYL SUBSTITUTED DIPYRROMETHANE AND ITS USE IN THE SYNTHESIS OF meso-ARYL SUBSTITUTED trans-A<sub>2</sub>B<sub>2</sub> PORPHYRIN USING GREEN CHEMISTRY PROTOCOL**” is an authentic record of the study carried out by **Ms. LAKSHMI E S**, Reg No. **CRAWMCH007** under the guidance of **Dr. SIMI PUSHPAN K**, Assistant Professor, Department of Chemistry, Union Christian College, Aluva, Ernakulam, Kerala. In partial fulfillment of the requirement for the award of the Degree, Master of Science in Chemistry during the academic year 2022-2024

Place: Aluva

Date: 10/05/2024

DEPARTMENT OF CHEMISTRY  
UNION CHRISTIAN COLLEGE  
ALUVA

  
**Dr. SIMI PUSHPAN K**  
Assistant Professor  
Department of Chemistry  
Union Christian College

Dr. SIMI PUSHPAN.K  
Assistant Professor  
Department of Chemistry  
Union Christian College  
Aluva - 683 102, Kerala

# CARMEL COLLEGE (AUTONOMOUS) MALA

Affiliated to University of Calicut

Nationally Re-accredited with A grade

Mala(P.O),Thrissur,Kerala,India-680732

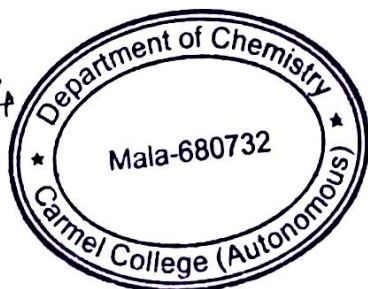


## CERTIFICATE

This is to certify that the project work entitled “SYNTHESIS OF meso-ARYL SUBSTITUTED DIPYRROMETHANE AND ITS USE IN THE SYNTHESIS OF meso-ARYL SUBSTITUTED trans-A<sub>2</sub>B<sub>2</sub> PORPHYRIN USING GREEN CHEMISTRY PROTOCOL” is an authentic record of the work carried out by LAKSHMI E S (CRAWMCH007) under the co-guidance of Dr. VIDYA FRANCIS, Assistant professor, Department of chemistry, Carmel College (Autonomous), Mala during the academic year 2022-2024, from the University of Calicut, Malappuram.

Place: Mala

Date: 13/05/2024



  
Dr. VIDYA FRANCIS

Assistant professor

Department of chemistry

Carmel college (Autonomous),Mala

Dr. Vidya Francis  
Assistant Professor  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

# CARMEL COLLEGE (AUTONOMOUS) MALA

Affiliated to University of Calicut  
Nationally Re-accredited with A grade  
Mala(P.O),Thrissur,Kerala,India-680732

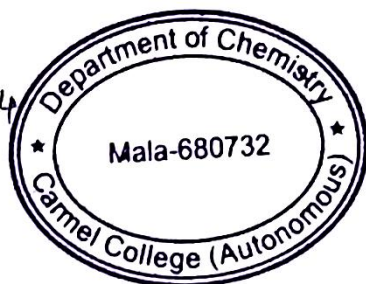


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Place: Mala

Date: 10/05/2024



*Princy K G*

**Dr. Princy K G**

Head of the Department  
Department of Chemistry  
Carmel college (Autonomous) Mala

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

**"STUDIES ON THE GREEN SYNTHESIS,  
CHARACTERIZATION AND APPLICATIONS OF NICKEL  
NANOPARTICLES"**

The project work submitted to University of Calicut in partial fulfillment of the requirement  
for the degree of Master of Science in Chemistry

**MARIYA JAISON P  
CRAWMCH008**

Under the supervision of

**Dr. Paulson Mathew**

Professor and Head of the department of Chemistry  
St. Thomas College (Autonomous), Thrissur




**POST GRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR  
2022 – 2024**

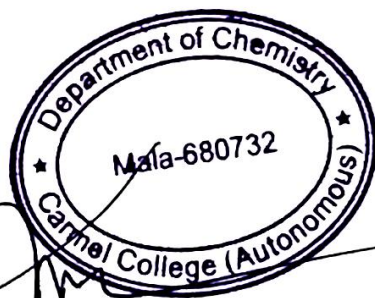
  
Supervisor

Examiners:

  
Dr. Tom C

Rosemol   
14/12/24

Dr. Manoj A L. 



  
Head of the Department

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732

**DEPARTMENT OF CHEMISTRY**  
**ST. THOMAS COLLEGE ( AUTONOMOUS), THRISSUR**

Affiliated to the university of Calicut

NAAC (4th cycle):A++(3.70/4) Grade & College with potential For Excellence



**CERTIFICATE**

This is to certify that the work entitled “**STUDIES ON THE GREEN SYNTHESIS, CHARACTERIZATION AND APPLICATIONS OF NICKEL NANOPARTICLES**” submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research department of Chemistry, St. Thomas college ( Autonomous), Thirissur by **MARIYA JAISON P** , (Reg No: **CRAWMCH008**) M.Sc. Chemistry student P.G department of Chemistry, Carmel college (Autonomous), mala (Affiliated to University of Calicut, Kerala) and was supervised and guided

Place : Thirissur

Date: 4/05/2024

**Dr. PAULSON MATHEW**

(supervising guide)

*Dr. Paulson Mathew PhD, MBA*  
*Professor & Head*  
*Department of Chemistry*  
*St. Thomas' College, Thirissur - 1*

St. Thomas College autonomous, Thirissur

**CARMEL COLLEGE (AUTONOMOUS), MALA**  
**(Nationally Re-accredited with 'A' grade)**  
**Affiliated to University of Calicut**  
**Mala- 680732**

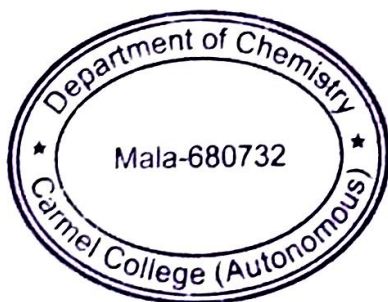



**CERTIFICATE**

This is to certify that the dissertation entitled “**STUDIES ON THE GREEN SYNTHESIS, CHARACTERIZATION AND APPLICATIONS OF NICKEL NANOPARTICLES**” is an authentic record of the work carried out by **MARIYA JAISON P**, Reg No: **CRAWMCH008** under the co – guidance of **Dr. VIDYA FRANCIS**, Assistant professor, Department of Chemistry, Carmel college (Autonomous) ,Mala of the partial fulfillment for the award of the degree of Master of Science in Chemistry during the academic year 2022 – 2024.

Place:Mala.

Date: 14/5/2024



  
**Dr.VIDYA FRANCIS**  
Assistant professor  
Department of chemistry  
Carmel College (autonomous)

**Dr.Vidya Francis**  
**Assistant Professor**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala-680732**

**CARMEL COLLEGE (AUTONOMOUS), MALA**  
**(Nationally Re-accredited with 'A' grade)**  
**Affiliated to University of Calicut**  
**Mala- 680732**

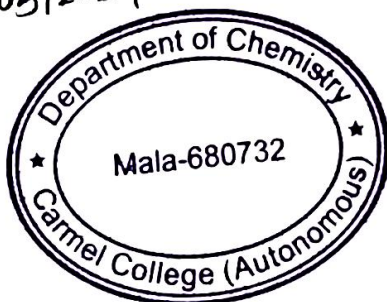


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Place : Mala

Date : 14/05/2024



A handwritten signature in black ink, appearing to read "Princy K G".

**Dr. PRINCY K G**

Professor and Head of the department  
Department of Chemistry  
Carmel College (Autonomous), Mala

**Head**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala-680732**



**“GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES  
ANTIBACTERIAL EFFICACY AND PHOTOCATALYTIC  
POTENTIAL”**

**The dissertation submitted to University of Calicut  
for the partial fulfilment of the award of the degree of**

**MASTER OF SCIENCE**

**in**

**CHEMISTRY**

**By**

**NAVYA P**

**CRAWMCH009**

**Under the supervision of**

**Dr.VIDYA FRANCIS**

**Assistant Professor**

**Department of Chemistry**

**Carmel College (Autonomous), Mala**

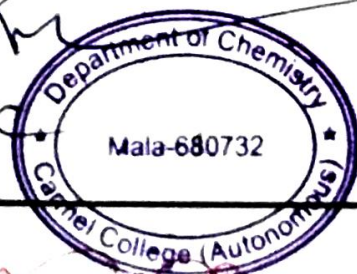


**DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE(AUTONOMOUS), MALA  
THRISSUR, KERALA**

**2022-2024**

**Supervisor**

**Head of the Department**



**Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732**

Rosemol

Dr. Memo, A.L.



# **CARMEL COLLEGE (AUTONOMOUS), MALA**

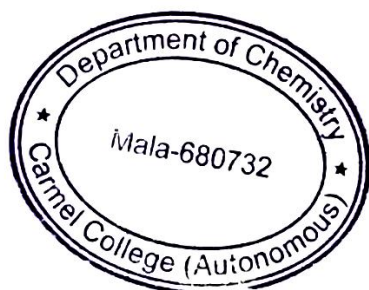
(Nationally Re-accredited with "A" grade)  
Affiliated to University of Calicut

## **CERTIFICATE**

**This is to certify that the project entitled "Green Synthesis of Zinc Oxide Nanoparticles, Antibacterial Efficacy and Photocatalytic Potential" is an authentic record of the study carried out by Navya P (CRAWMCH009) in partial fulfilment of the award of the Degree of Master of Science in Chemistry of Calicut University at Carmel College (Autonomous), Mala under the guidance of Dr. Vidya Francis, Assistant Professor, Department of Chemistry, Carmel College (Autonomous) Mala.**

**Place: Mala**

**Date: 14-05-24**



  
**Dr Vidya Francis**

**Assistant Professor**

**Department of Chemistry**

**Carmel College (Autonomous), Mala**

**Dr. Vidya Francis**  
**Assistant Professor**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala-680732**



## CARMEL COLLEGE (AUTONOMOUS) MALA

Affiliated to University of Calicut

Nationally Re-accredited with A grade

Mala (P.O), Thrissur, Kerala, India-680732

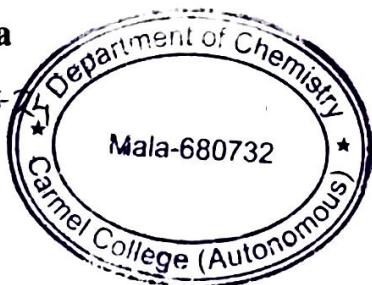
Email:mail@carmelcollegemala.ac.in

### CERTIFICATE

This is to certify that the dissertation entitled "Green Synthesis of Zinc Oxide Nanoparticles, Antibacterial Efficacy and Photocatalytic Potential is an authentic record of the work carried out by NAVYA P (CRAWMCH009) under the supervision and guidance of Dr.VIDYA FRANCIS, Assistant Professor Carmel College (Autonomous), Mala during the academic year 2023-2024, from the University of Calicut, Malappuram. The work presented in this project has not been submitted for any other degree or diploma earlier.

Place:Mala

Date: 14-05-24



*Princy K.G*

Dr Princy K.G

Head  
Professor & Head, Department of Chemistry  
Department of Chemistry  
Carmel College (Autonomous)  
Carmel College (Autonomous) Mala  
Mala-680732

# “SYNTHESIS OF CARBON DOTS FROM BENZAMIDE AND ITS CHARACTERISATION”

The project work submitted to University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry

**PRAJITHA J**

**CRAWMCH010**

Under the supervision of

**Dr. Paulson Mathew**

Professor and Head of the Department of Chemistry

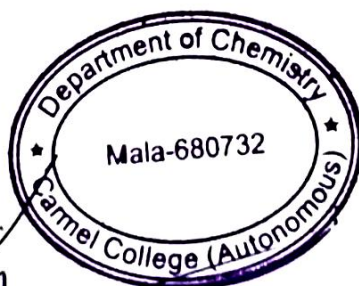
St. Thomas College (Autonomous), Thrissur



**POST GRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR**

**2022 – 2024**

**Supervisor**



**Head of the Department**

**Examiners :**

*Dr. Tom - C*

*Rosemol*

*Dr. Manoj A L. Ramraj*

**Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732**

## DEPARTMENT OF CHEMISTRY

### ST. THOMAS COLLEGE ( AUTONOMOUS), THRISSUR

Affiliated to the university of Calicut

NAAC (4<sup>th</sup> cycle):A++(3.70/4) Grade & College with potential For Excellence



### CERTIFICATE

This is to certify that the work entitled “SYNTHESIS OF CARBON DOTS FROM BENZAMIDE AND ITS CHARACTERISATION” submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research Department of Chemistry, St. Thomas College ( Autonomous), Thrissur by **PRAJITHA J** (Reg No: **CRAWMCH010**) M.Sc. Chemistry student, P.G Department of Chemistry, Carmel College (Autonomous), Mala (Affiliated to University of Calicut, Kerala) and was supervised and guided by me.

Place: Thrissur

Date: 04.05.2024

**Dr. PAULSON MATHEW**

(Supervising guide)

Professor & Head of the Department of Chemistry  
St. Thomas college Autonomous, Thrissur

*Dr. Paulson Mathew PhD, MBA  
Professor & Head  
Department of Chemistry  
St. Thomas' College, Thrissur - 1*

**CARMEL COLLEGE (AUTONOMOUS), MALA**  
**(Nationally Re-accredited with 'A' grade)**  
**Affiliated to University of Calicut**  
**Mala- 680732**

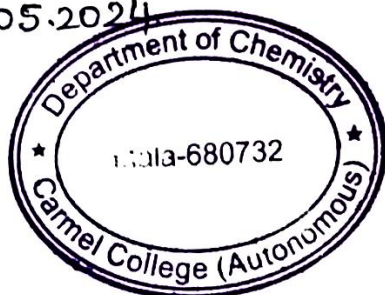


**CERTIFICATE**

This is to certify that the dissertation entitled **“SYNTHESIS OF CARBON DOTS FROM BENZAMIDE AND ITS CHARACTERISATION”** is an authentic record of the work carried out by **PRAJITHA J**, Reg No: **CRAWMCH010** under the co – guidance of **Ms. NEETHU SUNNY**, Assistant professor, Department of Chemistry, Carmel College (Autonomous), Mala of the partial fulfillment for the award of the degree of Master of Science in Chemistry during the academic year 2022 – 2024.

Place : Mala

Date : 14.05.2024



*Neethu*

**Ms. NEETHU SUNNY**

Assistant professor

Department of Chemistry

Carmel College (Autonomous), Mala

**CARMEL COLLEGE (AUTONOMOUS), MALA**

**(Nationally Re-accredited with 'A' grade)**

**Affiliated to University of Calicut**

**Mala- 680732**

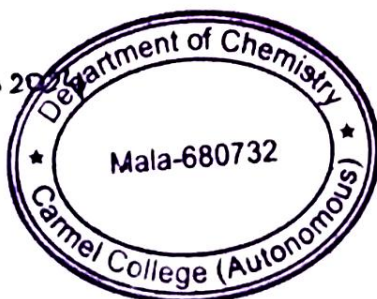


## **CERTIFICATE**

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Place : Mala

Date : 14.05.2024



*Princy K-G R*

**Dr. PRINCY K G**

Professor and Head of the Department  
Department of Chemistry  
Carmel College (Autonomous), Mala

**Head**  
**Department of Chemistry**  
**Carmel College (Autonomous)**  
**Mala-680732**

# “DESIGN AND SYNTHESIS OF SQUARAMIDE-NAPHTHALIMIDE BASED CHEMOSENSOR FOR ANION SENSING”

A project work submitted to Calicut University in partial fulfillment of the requirement for the Master of Science in Chemistry

**SANGEETHA M**

Reg no: CRAWMCH011

Under the supervision of

**Dr. SHANMUGARAJU SANKARASEKARAN**

Associate Professor, Department of Chemistry

Indian Institute of Technology Palakkad



**POSTGRADUATE DEPARTMENT OF CHEMISTRY**

**CARMEL COLLEGE (AUTONOU MOUS) MALA, THRISSUR**

2022-2024

*Dr. Tom C*  
Rosemal  
14/1/24

**Research Supervisor**  
Dr. Shanmugaraju Sankarasekaran

Associate Professor  
Department of Chemistry  
Indian Institute of Technology Palakkad,  
Kanjikode, Palakkad, Kerala - 678 623.

*Dr. Manoj A.L.*  
*Sangeetha*

*Prinny K G R*  
**Head of the Department**

Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732





IIT PALAKKAD

Indian Institute of Technology Palakkad

भारतीय प्रौद्योगिकी संस्थान पालक्काड

Nurturing Minds For a Better World

## CERTIFICATE

This is to certify that the project titled “**DESIGN AND SYNTHESIS OF SQUARAMIDE-NAPHTHALIMIDE BASED CHEMOSENSOR FOR ANION SENSING**” is a bonafide work done by **SANGEETHA M**, Reg no: **CRAWMCH011**, under my supervision and guidance in partial fulfillment of the requirements for the award of degree, Master of Science in Chemistry under the faculty of Science, Indian Institute of Technology, Palakkad.

Place : Palakkad

Date: 12/05/2024

Dr. Shanmugaraju Sankarasekaran  
Associate Professor  
Department of Chemistry  
Indian Institute of Technology Palakkad,  
Kanjikode, Palakkad, Kerala - 678 623.

**Dr. Shanmugaraju Sankarasekaran**

(Supervising Guide)

Associate Professor

Department of Chemistry

IIT Palakkad

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with an 'A' grade)

Affiliated to University of Calicut

Mala- 680732

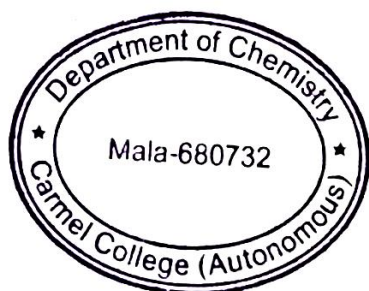


## CERTIFICATE

This is to certify that the dissertation entitled "**DESIGN AND SYNTHESIS OF SQUARAMIDE-NAPHTHALIMIDE BASED CHEMOSENSOR FOR ANION SENSING**" is an authentic record of the work carried out by **Sangeetha M** Reg no: **CRAWMCH011** under the co-guidance of **Ms. NEETHU SUNNY** Assistant professor, Department of Chemistry, Carmel College Mala of the partial fulfillment for the award of the degree of Master of Science in Chemistry during the academic year 2022-2024.

Place: Mala

Date:



*Neethu*

**Ms. NEETHU SUNNY**

Assistant Professor

Department of Chemistry

Carmel College (Autonomous)

Mala

# CARMEL COLLEGE (AUTONOMOUS) MALA

(Nationally Re-accredited with an 'A' grade)

Affiliated to University of Calicut

Mala- 680732

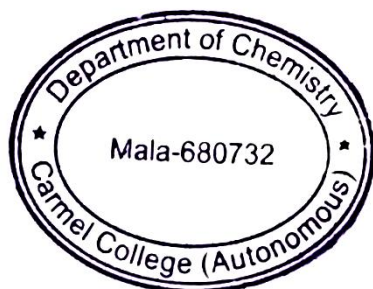


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Place: Mala

Date:



*Princy K G*

**Dr. PRINCY K G**

Head of the Department  
Department of Chemistry  
Carmel College (Autonomous)  
Mala

# "SYNTHESIS OF AZOCOMPOUNDS FROM AROMATIC AMINES AND ITS FLUORESCENCE STUDIES"

The project work submitted to University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry

**SREELA P.C**

**CRAWMCH012**

Under the supervision of

**Dr. Paulson Mathew**

Professor and Head of the Department of Chemistry

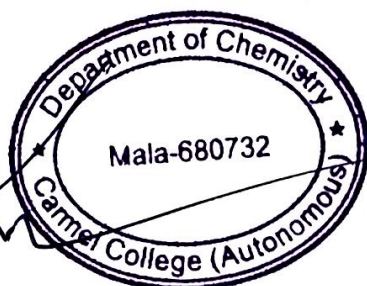
St. Thomas College (Autonomous), Thrissur



**POSTGRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR**

**2022 – 2024**

**Supervisor**



**Examiners :**

*T.M.C*

Rosemel

*14/5/24*

**Head of the Department**

**Head  
Department of Chemistry  
Carmel College (Autonomous)  
Mala-680732**

*Dr. Manoj A.*  
*N. Karanth*

**DEPARTMENT OF CHEMISTRY**  
**ST. THOMAS COLLEGE (AUTONOMOUS), THRISSUR**

Affiliated to the university of Calicut

NAAC (4<sup>th</sup> cycle):A++(3.70/4) Grade & College with potential For Excellence



**CERTIFICATE**

This is to certify that the work entitled "SYNTHESIS OF AZOCOMPOUNDS FROM AROMATIC AMINES AND ITS FLUORESCENCE STUDIES" submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research department of Chemistry, St. Thomas college (Autonomous), Thirissur by **SREELA P.C**, (Reg No: **CRAWMCH012**) M.Sc. Chemistry student P.G department of Chemistry, Carmel college (Autonomous), mala (Affiliated to University of Calicut, Kerala) and was supervised and guided by me.

*Dr. Paulson Mathew PhD, MBA*

**Dr. PAULSON MATHEW** *Professor & Head*  
*Department of Chemistry*  
(Supervising guide) *St. Thomas' College, Thirissur - I*  
Professor & Head of the Department of Chemistry  
St. Thomas College Autonomous, Thirissur

Place: Thirissur

Date: **A-5-24**

# CARMEL COLLEGE (AUTONOMOUS), MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala- 680732

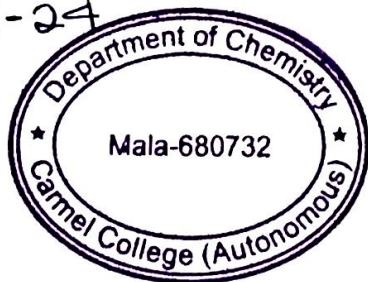


## CERTIFICATE

This is to certify that the dissertation entitled "SYNTHESIS OF AZOCOMPOUNDS FROM AROMATIC AMINES AND ITS FLUORESCENCE STUDIES" is an authentic record of the work carried out by **SREELA P.C**, Reg No: **CRAWMCH012** under the co – guidance of **Ms. NEETHU SUNNY**, Assistant professor, Department of Chemistry, Carmel college (Autonomous), Mala of the partial fulfillment for the award of the degree of Master of Science in Chemistry during the academic year 2022 – 2024.

Place : Mala

Date : 14-5-24



*Neethu*

**Ms. NEETHU SUNNY**

Assistant professor

Department of Chemistry

Carmel College (Autonomous), Mala

# CARMEL COLLEGE (AUTONOMOUS), MALA

(Nationally Re-accredited with 'A' grade)

Affiliated to University of Calicut

Mala- 680732

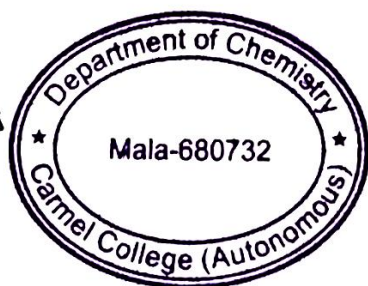


## CERTIFICATE

This is to certify that the dissertation entitled "SYNTHESIS OF AZOCOMPOUNDS FROM AROMATIC AMINES AND ITS FLUORESCENCE STUDIES" is an authentic record of the work carried out by SREELA P.C (Reg No: CRAWMCH012) under the supervision and guidance of Dr. PAULSON MATHEW Professor and Head of the department of Chemistry, St. Thomas College (Autonomous), Thrissur and Ms. NEETHU SUNNY, Assistant professor, Department of Chemistry, Carmel College (Autonomous), Mala of the partial fulfillment for the award of the degree of Master Of Science in Chemistry during the academic year 2022-2024.

Place: Mala

Date : 14-5-24



*Princy K G*

**Dr. PRINCY K G**

Professor and Head of the Department  
Department of Chemistry  
Carmel College (Autonomous), Mala

Head  
Department of Chemistry  
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# “Synthesis and Characterization of Phenothiazine-Based Dye for DSSC Application”

Project report submitted to the University of Calicut for partial fulfillment of the award of the degree of Master of Science in Chemistry

THASLEEMA N S

CRAWMCH013

Under the supervision of

Dr. SINDHU MATHAI

Assistant Professor

Department of Applied Chemistry

Cochin University of Science and Technology



DEPARTMENT OF CHEMISTRY

CARMEL COLLEGE (AUTONOMOUS), MALA,



THRISSUR, KERALA

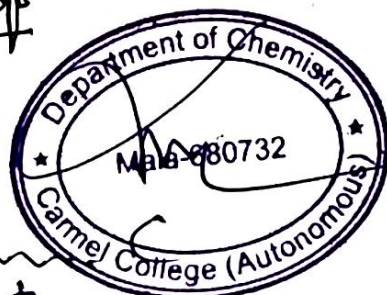
2022-2024

  
Supervisor

  
Head of the Department

Examiners:

  
Rosemol  14/5/24



Head  
Department of Chemistry  
Carmel College (Autonomous)  
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Dr. Manoj A-L 



**DEPARTMENT OF APPLIED CHEMISTRY**  
**COCHIN UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**COCHIN-682022, KERALA**



**CERTIFICATE**

This is to certify that the work entitled “**Synthesis and Characterization of Phenothiazine-Based Dye for DSSC Application**” is an authentic record of the study carried out by **THASLEEMA N S**, Reg No **CRAWMCH013** under the guidance of **Dr. SINDHU MATHAI** Assistant professor, Department of applied chemistry, Cochin University of Science and Technology, in partial fulfillment of the requirement for the award of the Degree, Master of Science in Chemistry in Calicut University at Carmel College (Autonomous)Mala during the academic year 2022-2024.

Place: Cochin

Date: **30-04-2024**

**Dr. SINDHU MATHAI**

(Supervising guide)

Assistant professor

Department of Applied Chemistry

Cochin University of

Science and Technology

**Dr. SINDHU MATHAI**  
**Assistant Professor**  
Dept. of Applied Chemistry  
Cochin University of Science & Technology  
Cochin - 22, Kerala

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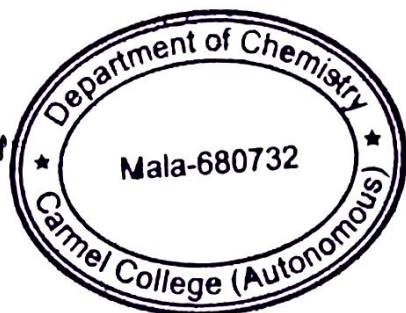


## CERTIFICATE

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Place: Mala

Date: 14.5.2024



Ms. ANCYLYN ANTU K

Assistant professor

Department of Chemistry

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Mala

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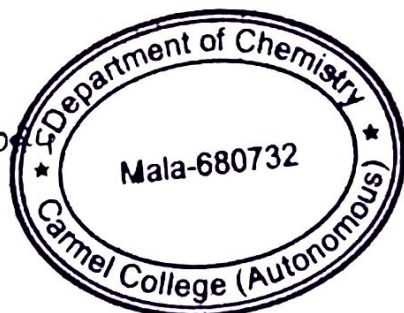


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Place: Mala

Date: 14.05.2024



*Princy K G*

Dr. PRINCY K G

Head of the Department

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Head

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Mala-680732

**“STUDIES ON THE SYNTHESIS OF RUTHENIUM  
SUPPORTED TITANIA NANOCATALYST AND ITS  
APPLICATION IN THE DEGRADATION OF CONGO RED  
DYE”**

The project work submitted to University of Calicut in partial fulfillment of the requirement for  
the degree of Master of Science in Chemistry

**THASNEEM.P.R**

**CRAWMCH014**

Under the supervision of

**Dr. Paulson Mathew**

Professor and Head of the Department of Chemistry

St. Thomas College (Autonomous), Thrissur



**POST GRADUATE DEPARTMENT OF CHEMISTRY  
CARMEL COLLEGE (AUTONOMOUS) MALA, THRISSUR**

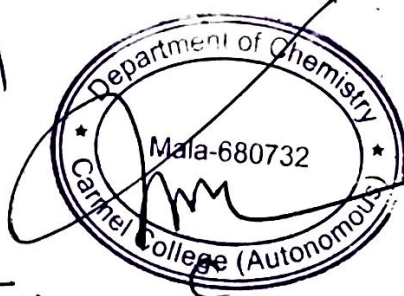
**2022 – 2024**

**Supervisor**

**Examiners :**

*Dr. Tom*  
*Rosemol* *14/5/24*

*Dr. Manj Al* *14/5/24*



*Princy K-A P*  
**Head of the Department**

**Head  
Department of Chemistry  
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Mala-680732**

**DEPARTMENT OF CHEMISTRY**  
**ST. THOMAS COLLEGE ( AUTONOMOUS), THRISSUR**

Affiliated to the university of Calicut

NAAC (4<sup>th</sup> cycle):A++(3.70/4) Grade & College with potential For Excellence



**CERTIFICATE**

This is to certify that the work entitled “**STUDIES ON THE SYNTHESIS OF RUTHENIUM SUPPORTED TITANIA NANOCATALYST AND ITS APPLICATION IN THE DEGRADATION OF CONGO RED DYE**” submitted to Faculty of Science, University of Calicut in partial fulfillment of the requirement for the degree of Master of Science in Chemistry is authentic record of the project work carried out at P.G & Research Department of Chemistry, St. Thomas College ( Autonomous), Thirissur by **THASNEEM.P.R.**, (Reg No: **CRAWMCH014**) M.Sc. Chemistry student, P.G Department of Chemistry, Carmel College (Autonomous), Mala (Affiliated to University of Calicut, Kerala) and was supervised and guided by me.

Place: Thrissur

Date: 04-05-2024

**Dr. PAULSON MATHEW** *Dr. Paulson Mathew PhD, MBA*  
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Professor & Head of the Department of Chemistry *St. Thomas' College, Thirissur - I*  
St. Thomas college Autonomous, Thrissur

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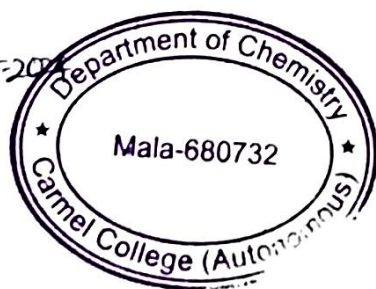


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Place : Mala

Date : 14-05-2024



A handwritten signature in black ink, appearing to read "Ancilyn Antu K".

**Ms. ANCILYN ANTU K**

Assistant professor

Department of Chemistry

Carmel College (Autonomous), Mala

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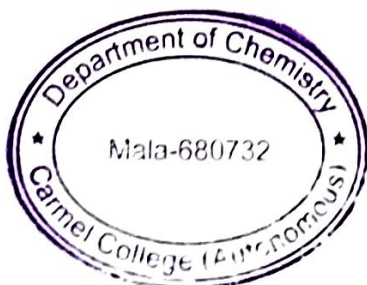


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Place : Mala

Date : 14-05-2024



*Princy K G*

**Dr. PRINCY K G**

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Department of Chemistry

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Head

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