

**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY
USING CASSIA FISTULA (SARAKONDRAI) BASED BIOMEMBRANE AS
SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

D. ANEE JOSEPHA

(REG.NO: 2022MSCP01)

External Guide

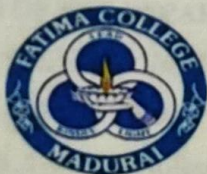
Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. R. JOTHI MANI, M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

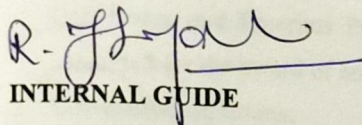
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING CASSIA FISTULA (SARAKONDRAI) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. D. ANEE JOSEPHA, 2022MSCP01, II-M.Sc. Physics at Materials Research Center, Madurai** under the guidance of **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. R. JOTHI MANI

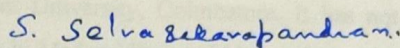
M.Ed., M.Phil., Ph.D., SET., PGDCA.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,

M.Sc., Ph.D.,

Director,

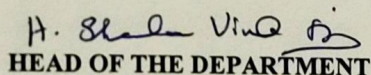
Materials Research Center,

Coimbatore – 641 045 &

Emeritus Professor,

Bharathiar University,

Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled "**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING *CASSIA FISTULA* (SARAKONDRAI) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" submitted to Fatima College in partial fulfilment of the requirements for the award of the degree "**Master of Science In Physics**", is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

D. Anee Josepha

D. ANEE JOSEPHA

Date: 27/3/2024

(Reg. NO: 2022MSCP01)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. A. AROCKIA MARY**, for her motivation and support during this project. I thank my beloved Father **Mr. I. DHANAPAL**, for giving me strength to chase my dreams. I thank my Husband **Mr. C. PATRICK PRINCE** for his constant support. I thank my beloved daughter **MS. P. KEIZY TRINITA** for her inspiration and motivation.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges DST/CURIE-PG/2022/11.

D. Anee Josepha
(D. ANEE JOSEPHA)

MEASUREMENT OF EXTERNAL AND INTERNAL GAMMA DOSE ASSESSMENT IN CONCRETE HOLLOW BLOCKS

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

K.APARNA

(REG.NO: 2022MSCP02)

External Guide

Dr. A.CHANDRASEKARAN, M.Sc.,M.Phil., Ph.D.,PGDCA.

(Assistant Professor,Department of Physics,Sri Sivasubramaniya Nadar College of
Engineering(Autonomous),Kalavakkam-603110.)

Internal Guide

Dr. M.RAGAM, M.Sc., M.Phil., Ph.D.,PGDCA.,SET,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

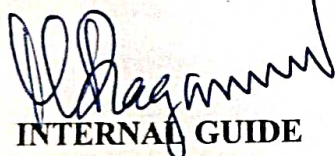
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled “**MESUREMENT OF EXTERNAL AND INTERNAL GAMMA DOSE ASSESSMENT IN CONCRETE HOLLOW BLOCKS**” is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. K. APARNA, 2022MSCP02, II-M.Sc. Physics** at **Sri Sivasubramaniya Nadar College of Engineering, Chennai** under the guidance of **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai and **Dr. M.RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. M.RAGAM

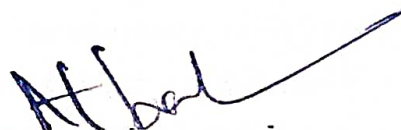
M.Sc., M.Phil., Ph.D., PGDCA., SET

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. A. CHANDRASEKARAN,

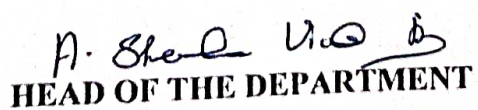
M.Sc., M.Phil., Ph.D. PGDCA.,

Assistant Professor,

Department of Physics,

Sri Sivasubramaniya Nadar College,

Chennai-603110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“MEASUREMENT OF EXTERNAL AND INTERNAL GAMMA DOSE ASSESSMENT IN CONCRETE HOLLOW BLOCKS”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. M. Ragam, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. A. Chandrasekaran, Assistant Professor, Department of Physics, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.03.24



K. APARNA

(Reg. NO: 2022MSCP02)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Mr. V. SATHISH**, **Ms. A. TAMILARASI**, **Ms. S.KARTHIKAYINI**, Research Scholars, Sri Sivasubramaniya Nadar College, Chennai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. K. KALAISELVI**, for her motivation and support during this project. I thank my beloved Father **Mr. S. KARTHIKEYAN**, for giving me strength to chase my dreams. I thank my dear brother **Mr. K. SURAJ**, for his constant support and encouragement.

**FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY
USING *CASSIA AURICULATA* (AAVARAMPOO) BASED
BIOMEMBRANE AS SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

D. AVILA FRANCINA

(REG.NO: 2022MSCP03)

External Guide

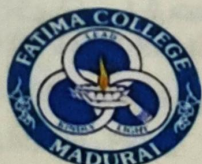
Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. M.V. LEENA CHANDRA, M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

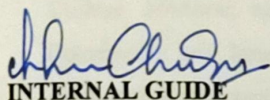
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY USING CASSIA FISTULA (SARAKONDRAI) FLOWER BASED BIOMEMBRANE ASSOLID ELECTROLYTE" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by **Ms. D. AVILA FRANCINA, 2022MSCP03**, II-M.Sc. Physics at **Materials Research Center, Madurai** under the guidance of **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and **Dr. M.V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



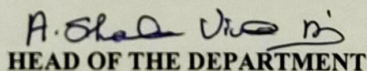
INTERNAL GUIDE

Dr. M.V. LEENA CHANDRA
M.Sc., M.Phil., NET., Ph.D.,
Assistant Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.

S. Selvakarapandian

EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,
M.Sc., Ph.D.,
Director,
Materials Research Center,
Coimbatore – 641 045 &
Emeritus Professor,
Bharathiar University,
Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,
M.Sc., M.Phil., Ph.D.,
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **"FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY USING CASSIA FISTULA (SARAKONDRAI) BASED BIOMEMBRANE AS SOLID ELECTROLYTE"** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **"Master Of Science In Physics"**, is the record of the original project work done by me under the guidance of Dr. M.V. Leena Chandra, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.03.24

D. Avila Francina

D. AVILA FRANCINA

(Reg. NO: 2022MSCP03)

ACKNOWLEDGEMENT

"GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY"

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. G. JOSEPHINE CECILY**, for her motivation and support during this project. I thank my beloved Father **Mr. A. DEVASAHAYARAJA**, for giving me strength to chase my dreams. I thank my dear sister **Ms. D. AGNES SILVIYA**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.


(D.AVILA FRANCINA)

**FABRICATION OF PRIMARY MAGNESIUM ION CONDUCTING
BATTERY USING *CASSIA AURICULATA* (AAVARAMPOO) BASED
BIOMEMBRANE AS SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

S. BALAMEENA

(REG.NO: 2022MSCP04)

External Guide

Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. M.V. LEENA CHANDRA, M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

Re-Accredited With A++ by NACC

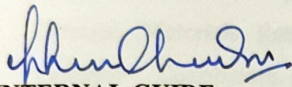
Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "**FABRICATION OF PRIMARY MAGNESIUM ION CONDUCTING BATTERY USING *CASSIA AURICULATA* (AAVARAMPOO) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by

Ms. S. BALAMEENA, 2022MSCP04, II-M.Sc. Physics at Materials Research Center, Madurai under the guidance of **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and **Dr. M. V. LEENA CHANDRA** Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. M.V. LEENA CHANDRA

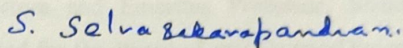
M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,

M.Sc., Ph.D.,

Director,

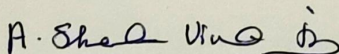
Materials Research Center,

Coimbatore – 641 045 &

Emeritus Professor,

Bharathiar University,

Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled "**FABRICATION OF PRIMARY MAGNESIUM ION CONDUCTING BATTERY USING CASSIA AURICULATA (AAVARAMPOO) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" submitted to Fatima College in partial fulfilment of the requirements for the award of the degree "**Master Of Science In Physics**", is the record of the original project work done by me under the guidance of Dr. M.V. Leena Chandra, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

S. Balameena

Place: Madurai

S. BALAMEENA

Date: 27/3/24

(Reg. NO: 2022MSCP04)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

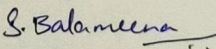
I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. P. ARUNA**, for her motivation and support during this project. I thank my beloved Father **Mr. B. SANKARAMOORTHY**, for giving me strength to chase my dreams. I thank my dear sister **Mrs. S. KALA SAMBATH**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.


(S. BALAMEENA)

HEAVY AND LIGHT MINERALS ANALYSIS OF INDUSTRIALLY POLLUTED LAKE SEDIMENTS

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

J.DHARSHINI

(REG.NO: 2022MSCP05)

External Guide

Dr. A.CHANDRASEKARAN, M.Sc., M.Phil., Ph.D., PGDCA.,
(Assistant Professor, Department of Physics, Sri Sivasubramaniya Nadar College of
Engineering(Autonomous), Kalavakkam-603110.)

Internal Guide

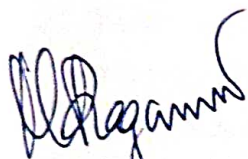
Dr. M.RAGAM, M.Sc., M.Phil., Ph.D., PGDCA., SET,
Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "HEAVY AND LIGHT MINERALS ANALYSIS OF INDUSTRIALLY POLLUTED LAKE SEDIMENTS" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by Ms. J. DHARSHINI, 2022MSCP05, II-M.Sc. Physics at Sri Sivasubramaniya Nadar College of Engineering, Chennai under the guidance of Dr. A. CHANDRASEKARAN, Assistant Professor, Department of Physics, Chennai and Dr. M.RAGAM, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. M.RAGAM

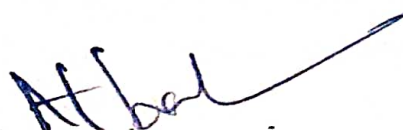
M.Sc., M.Phil., Ph.D., PGDCA., SET

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. A. CHANDRASEKARAN,

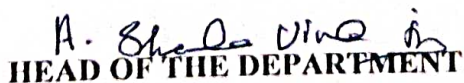
M.Sc., M.Phil., Ph.D., PGDCA.,

Assistant Professor,

Department of Physics,

Sri Sivasubramaniya Nadar College,

Chennai-603110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“HEAVY AND LIGHT MINERALS ANALYSIS OF INDUSTRIALLY POLLUTED LAKE SEDIMENTS”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. M. Ragam, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. A. Chandrasekaran, Assistant Professor, Department of Physics, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai



J. DHARSHINI

Date: 27-3-2024

(Reg. NO: 2022MSCP05)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Mr. V. SATHISH**, **Ms. A. TAMILARASI**, **Ms. S.KARTHIKAYINI**, Research Scholars, Sri Sivasubramaniya Nadar College, Chennai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. S. SUDHA**, for her motivation and support during this project. I thank my beloved Father **Mr. V. JEYARAMAN**, for giving me strength to chase my dreams. I thank my dear sister **Ms. J. SHARMILA**, for his constant support and encouragement.

SYNTHESIS AND CHARACTERISATION OF PVP- CAPPED SILVER NANOPARTICLES AND ITS BIOLOGICAL APPLICATIONS

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to MADURAI KAMARAJ UNIVERSITY, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

DHIYA SHREE M

(REG.NO: 2022MSCP06)

External Guide

Dr. M. JEYANTHINATH, M.Sc., M.Sc., Ph.D.,

**(Assistant Professor, Department of Materials Science, School of chemistry, Madurai
Kamaraj University, Madurai – 625021, Tamil Nadu)**

Internal Guide

Dr. ANCEMMA JOSEPH, M.Sc., Ph.D., SET., GATE.,

(Assistant Professor, Research Centre of Physics, Fatima College, Madurai – 625 018.)



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CERTIFICATE

This is to certify that the project report entitled **“SYNTHESIS AND CHARACTERISATION OF PVP-CAPPED SILVER NANOPARTICLES AND ITS BIOLOGICAL APPLICATIONS”** submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. M. DHIYA SHREE, 2022MSCP06**, II M.Sc Physics at, Madurai Kamaraj University under the guidance of **Dr. M. JEYANTHINATH**, Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai and **Dr. ANCEMMA JOSEPH**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai and submitted to Research Centre of Physics, Fatima College, Madurai.



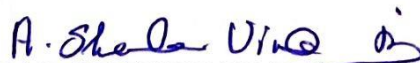
INTERNAL GUIDE

Dr. ANCEMMA JOSEPH
M.Sc., Ph.D., SET., GATE.,
Assistant Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.



EXTERNAL GUIDE

Dr. M. JEYANTHINATH,
M.Sc., M.Sc., Ph.D.,
Assistant Professor,
Department of Materials Science,
Madurai Kamaraj University
Madurai-625021,



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,
M.Sc., M.Phil., Ph.D.,
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.

DECLARATION

I do hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERISATION OF PVP-CAPPED SILVER NANOPARTICLES AND ITS BIOLOGICAL APPLICATIONS”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. Ancemma Joseph, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Jeyanthinath, Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/3/24

Dhiya Shree M.

DHIYA SHREE M

(Reg. NO: 2022MSCP06)

ACKNOWLEDGEMENT

"First and foremost I would like to bow down my head in front of Almighty"

Further, I express my deepest gratitude to **Dr. Sr. G. CELINE SAHAYA MARY** Principal, Fatima College, Madurai for permitting us to carry out our project at Madurai Kamaraj University and also, I extend my sincere gratitude to **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai whose unwavering support and encouragement have been instrumental throughout this endeavour.

No words can express my profound sense of gratitude to **Dr. M. JEYANTHINATH**, (Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai) who has been a pillar of support, offering expert advice, and encouragement at every step of the way. His wealth of knowledge and expertise in the field has been instrumental in shaping the direction and execution of this project.

I express my heart-felt gratitude to **Dr. ANCEMMA JOSEPH** Assistant Professor, Research Centre of Physics, Fatima College, Madurai, who have been very kind enough to extend her help at various phases of this research. Without her coherent and illuminating instruction, this dissertation would not have reached its present form.

I am deeply indebted to research scholars, for their invaluable guidance, expertise, and continuous support throughout the research process.

I am grateful to my family and friends for their unwavering encouragement and support during this challenging yet rewarding journey. Their belief in my abilities has been a constant source of inspiration.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

(DHIYA SHREE)

**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY
USING *CASSIA FISTULA* (SARAKONDRAI) BASED BIOMEMBRANE AS
SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

N.S. ISHWARIYA RANI

(REG.NO: 2022MSCP08)

External Guide

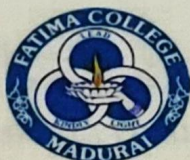
Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. R. JOTHI MANI, M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

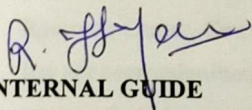
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING CASSIA FISTULA (SARAKONDRAI) BASED BIOMEMBRANE AS SOLID ELECTROLYTE" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by Ms. N.S. ISHWARIYA RANI, 2022MSCP08, II-M.Sc. Physics at Materials Research Center, Madurai under the guidance of Dr. S. SELVASEKARAPANDIAN, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and Dr. R. JOTHI MANI, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. R. JOTHI MANI

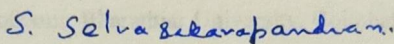
M.Ed., M.Phil., Ph.D., SET., PGDCA.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,

M.Sc., Ph.D.,

Director,

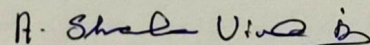
Materials Research Center,

Coimbatore – 641 045 &

Emeritus Professor,

Bharathiar University,

Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING CASSIA FISTULA (SARAKONDRAI) BASED BIOMEMBRANE AS SOLID ELECTROLYTE”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/3/2024

N.S. Ishwariya Rani
N.S. ISHWARIYA RANI

(Reg. NO: 2022MSCP08)

ACKNOWLEDGEMENT

"GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY"

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. N. SANTHANALAKSHMI**, for her motivation and support during this project. I thank my beloved Father late **Mr. V.M. NAGARETHINAM**, for giving me strength to chase my dreams. I thank my Beloved Husband I thank my husband **Mr. B. THIRUMAL CHANDRAN** for his constant support.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

N.S. Ishwariya Rani
(N.S. ISHWARIYA RANI)

**STUDY OF ANNEALING TEMPERATURE ON PREPARED IRON
OXIDE NANOPARTICLES BY SOL-GEL METHOD AT ARGON AND
OXYGEN AMBIENT**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to MADURAI KAMARAJ UNIVERSITY, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

JENO S

(REG.NO: 2022MSCP10)

External Guide

Dr. M. JEYANTHINATH, M.Sc., M.Sc., Ph.D.,

**(Assistant Professor, Department of Materials Science, School of chemistry, Madurai
Kamaraj University, Madurai – 625021, Tamil Nadu)**

Internal Guide

Dr. ANCEMMA JOSEPH, M.Sc., Ph.D., SET., GATE.,

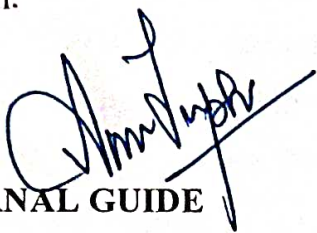
(Assistant Professor, Research Centre of Physics, Fatima College, Madurai – 625 018.)



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CERTIFICATE

This is to certify that the project report entitled "STUDY OF ANNEALING TEMPERATURE ON PREPARED ION OXIDE NANOPARTICLES BY SOL-GEL METHOD AT ARGON AND OXYGEN AMBIENT" submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. S. JENO** at, Madurai Kamaraj University under the guidance of **Dr. M. JEYANTHINATH**, Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai and **Dr. ANCEMMA JOSEPH**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai and submitted to Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. ANCEMMA JOSEPH
M.Sc., Ph.D., SET., GATE.,
Assistant Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.
Tamil Nadu,



EXTERNAL GUIDE

Dr.M. JEYANTHINATH,
M.Sc., M.Sc., Ph.D.,
Assistant Professor,
Department of Materials Science,
Madurai Kamaraj University
Madurai-625021,
Tamil Nadu.

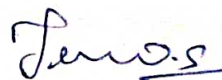


HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,
M.Sc., M.Phil., Ph.D.,
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.

DECLARATION

I do hereby declare that the project work in this thesis entitled “ **STUDY OF ANNEALING TEMPERATURE ON PREPARED ION OXIDE NANOPARTICLES BY SOL-GEL METHOD AT ARGON AND OXYGEN AMBIENT** ” submitted to Fatima College in partial fulfilment of the requirements for the award of the degree “**Master Of Science In Physics**”, is the record of the original project work done by me under the guidance of Dr. Ancemma Joseph, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Jeyanthinath, Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.



Place: Madurai

JENO S

Date: 27/03/2024

(Reg. NO: 2022MSCP10)

ACKNOWLEDGEMENT

"I can do all things through Jesus who strengthens me" –Philippians 4:13

Further, I express my deepest gratitude to **Dr. Sr. G. CELINE SAHAYA MARY** Principal, Fatima College, Madurai for permitting us to carry out our project at Madurai Kamaraj University and also, I extend my sincere gratitude to **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai whose unwavering support and encouragement have been instrumental throughout this endeavour.

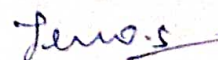
No words can express my profound sense of gratitude to **Dr.M. JEYANTHINATH**, (Assistant Professor, Department of Materials Science, School of chemistry, Madurai Kamaraj University, Madurai)who has been a pillar of support, offering expert advice, and encouragement at every step of the way. His wealth of knowledge and expertise in the field has been instrumental in shaping the direction and execution of this project.

I express my heart-felt gratitude to **Dr. ANCEMMA JOSEPH**Assistant Professor, Research Centre of Physics, Fatima College, Madurai, who have been very kind enough to extend her help at various phases of this research. Without her coherent and illuminating instruction, this dissertation would not have reached its present form.

I am deeply indebted to research scholars, for their invaluable guidance, expertise, and continuous support throughout the research process.

I am grateful to my family and friends for their unwavering encouragement and support during this challenging yet rewarding journey. Their belief in my abilities has been a constant source of inspiration.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.



(JENO)

**SYNTHESIS AND CHARACTERIZATION OF COBALT
TUNGSTATE (CoWO_4) FOR SUPERCAPACITOR
APPLICATION.**

**A dissertation submitted to
FATIMA COLLEGE (AUTONOMOUS)
(Affiliated to MADURAI KAMARAJ UNIVERSITY, Madurai)
To Partial fulfillment of the requirements for the degree of
MASTER OF SCIENCE IN PHYSICS**

Submitted by

Ms. S. JESWIL

(Register No: 2022MSCP11)

External Guide

Dr. SUJIN P JOSE, M.Sc., Ph.D.,

**(Assistant Professor and Head, Department of Computational Physics, School of
Physics, Madurai Kamaraj University, Madurai-625021.)**

Internal Guide

Dr. M. RAGAM, M.Sc., M.Phil., Ph.D., PGDCA., SET.


**(Assistant Professor, Research Centre of Physics, Fatima College, Madurai-
625018.)**



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**

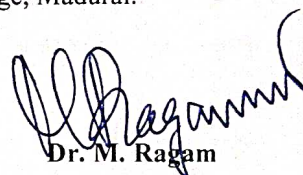
BONAFIDE CERTIFICATE

This is to certify that the project report entitled "SYNTHESIS AND CHARACTERIZATION OF COBALT TUNGSTATE FOR SUPERCAPACITOR APPLICATION" has been submitted to Fatima College, Madurai in partial fulfillment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by S.JESWIL, 2022MSCP11, II-M.Sc., at Advanced Materials Laboratory, School of Physics, Madurai Kamaraj University, Madurai under the guidance of Dr. SUJIN P JOSE, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University and Dr. M. Ragam , Assistant Professor , Research Centre of Physics, Fatima College, Madurai and submitted to Research Centre of Physics, Fatima College, Madurai.



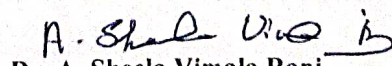
Dr. Sujin P. Jose 25.3.24

Assistant Professor and Head,
Department of Computational Physics,
School of Physics,
Madurai Kamaraj University,
Madurai-625021.



Dr. M. Ragam

Assistant Professor,
Research Center of Physics,
Fatima College,
Madurai -625018.



Dr. A. Sheela Vimala Rani

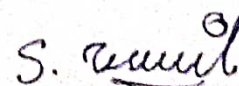
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai-625018.

DECLARATION

I do hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF COBALT TUNGSTATE FOR SUPERCAPACITOR APPLICATION”** submitted to Fatima College in partial fulfillment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of **Dr. M. RAGAM** ,Assistant Professor, Research Centre of Physics, Madurai, and **Dr. SUJIN P JOSE**, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.03.2024



S.JESWIL

(Reg.NO: 2022MSCP11)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY “

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Material Research Centre, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

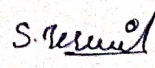
I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Center of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. SUJIN P JOSE**, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University, for her constant support and supervisions throughout the project work and for initiating my interest in research. I owe a lot to her and express my deep sense of gratitude to her. I consider myself extremely fortunate to get an opportunity to work under her.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima college, Madurai, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank, **Ms. P. SASTIPRIYAA**, Research Scholar, Advanced Materials Laboratory for her constant support throughout this project.

I thank my beloved mother **Mrs. V. MARY JAQUILINE**, for her motivation and support during the project. I thank my beloved father **Mr. M. SELVARAJ**, for his guidance and support during the internship. I would like to thank my friends for their valuable support.


(S.JESWIL)

STUDY ABOUT THE EFFECT OF CHROMATE INDUSTRIES ON NATURAL RADIOACTIVITY IN SOIL SAMPLES

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

P. JEYAMEENA

(REG.NO: 2022MSCP12)

External Guide

Dr. A.CHANDRASEKARAN, M.Sc., M.Phil., Ph.D., PGDCA.,
Assistant Professor, Department of Physics, Sri Sivasubramaniya Nadar College of
Engineering (Autonomous), Kalavakkam-603110.

Internal Guide

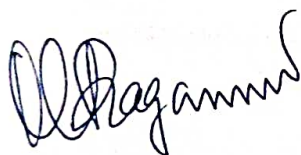
Dr. M.RAGAM, M.Sc., M.Phil., Ph.D., PGDCA., SET.,
Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled “**STUDY ABOUT THE EFFECT OF CHROMATE INDUSTRIES ON NATURAL RADIOACTIVITY IN SOIL SAMPLES** ” is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by **Ms. P. JEYAMEENA, 2022MSCP12, II-M.Sc. Physics** at **Sri Sivasubramaniya Nadar College of Engineering, Chennai** under the guidance of **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai and **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. M. RAGAM

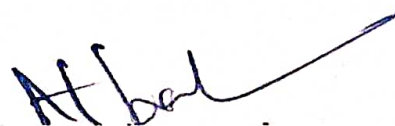
M.Sc., M.Phil., Ph.D., PGDCA., SET.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. A. CHANDRASEKARAN,

M.Sc., M.Phil., Ph.D., PGDCA.,

Assistant Professor,

Department of Physics,

Sri Sivasubramaniya Nadar College,

Chennai - 603110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled “**STUDY ABOUT THE EFFECT OF CHROMATE INDUSTRIES ON NATURAL RADIOACTIVITY IN SOIL SAMPLES**” submitted to Fatima College in partial fulfilment of the requirements for the award of the degree “**Master Of Science In Physics**”, is the record of the original project work done by me under the guidance of Dr. M. Ragam, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. A. Chandrasekaran, Assistant Professor, Department of Physics, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 24.03.2024

P. Jeyameena

P.JEYAMEENA

(Reg. NO: 2022MSCP12)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Mr. V. SATHISH**, **Ms. A. TAMILARASI**, **Ms. S. KARTHIKAYINI**, Research Scholars, Sri Sivasubramaniya Nadar College, Chennai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. P. MUTHUSELVI**, for her motivation and support during this project. I thank my beloved Father **Mr. C. POTHURAJA**, for giving me strength to chase my dreams. I thank my dear sister **Mr. P. KARTHIKA**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

P. Jeyameena
(P.JEYAMEENA)

**SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM
DOPED NICKEL OXIDE BY COPRECIPITATION METHOD**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

H. JOSHINI

(REG.NO: 2022MSCP13)

External Guide

Dr. M. GULAM MOHAMED, M.Sc., M.Phil., Ph.D., M.B.A (Edn.Mgt).,

Dean of Research & i/c Head of the department, Department of Physics,
The New College(Autonomous), Royapettah, Chennai-600014.

Internal Guide

Dr. R. JOTHI MANI, M.Sc., M.Ed., M.Phil., Ph.D., SET, PGDCA

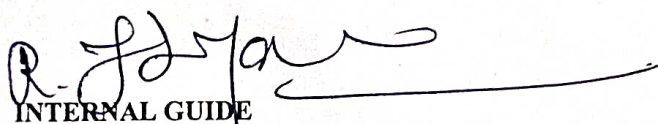
Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC
Mary Land,
Madurai – 625 018.
March 2024**

BONA FIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED NICKEL OXIDE BY COPRECIPITATION METHOD" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by **Ms. H. JOSHINI, 2022MSCP13, II-M.Sc. Physics** at **The New College, Chennai** under the guidance of **Dr. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College (Autonomous), Royapettah, Chennai and **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. R. JOTHI MANI


M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



Dr. M. GULAM MOHAMED
M.Sc., M.Phil., M.B.A., Ph.D.
EXTERNAL GUIDE Associate Professor & Research Supervisor
P.G. & Research Department of Physics
Dr. M. GULAM MOHAMED, The New College (Autonomous)
Chennai-600 014.

M.Sc., M.Phil., Ph.D., M.B.A (Edn.Mgt).,

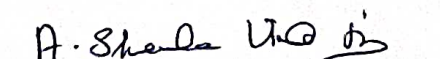
Dean of Research &

i/c Head of the department,

Department of Physics,

The New College (Autonomous),

Chennai-600014.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED NICKEL OXIDE BY COPRECIPITATION METHOD”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Gulam , Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.03.2024 .

H. JOSHINI

H. JOSHINI

(Reg. NO: 2022MSCP13)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **DR. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work

I thank Research Scholars, The New College, Chennai for their constant support throughout this project work.

With a deep sense of reverence I record my gratitude towards my parents and friends who helped me in finalising this project.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

H. Joshini
(H. JOSHINI)

**SYNTHESIS AND CHARACTERIZATION OF $\text{Ca}_2\text{KZn}_2\text{V}_3\text{O}_{12}$
DOPED Sm^{3+} PHOSPHORS FOR LIGHT APPLICATIONS**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to MADURAI KAMARAJ UNIVERSITY, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

S.R.LARA KUMARI

(REG.NO: 2022MSCP14)

External Guide

Dr. S. MASILLA MOSES KENNEDY, M.Sc., M.PHIL., Ph.D.,

Professor and Head, Department of physics , Sri Sivasubramaniya Nadar College Of
Engineering (Autonomous), Kalavakkam-603110

Internal Guide

Mrs .R. ALPHONSA FERNANDO, M.SC., M.PHIL., PGDCA.,

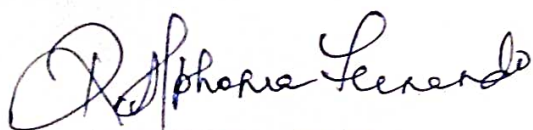
(Associate Professor, Research Centre of Physics, Fatima College, Madurai – 625 018.)



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "SYNTHESIS AND CHARACTERIZATION of $\text{Ca}_2\text{KZn}_2\text{V}_3\text{O}_{12}$ DOPED Sm^{3+} PHOSPHORS OF LIGHT APPLICATIONS" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by Ms. S.R.LARA KUMARI ,(Reg.No:2022MSCP14)., II-M.Sc. Physics under the guidance of Dr.S. Masilla Moses Kennedy, Professor and Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering(Autonomous, Affiliated to Anna University, Chennai), Kalavakkam and Mrs.R. Alphonsa Fernando, Associate Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Mrs .R. ALPHONSA FERNANDO,

M.SC.,M.PHIL.,PGDCA.,

Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr.S. MASILLA MOSES KENNEDY

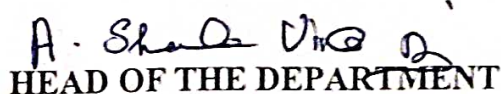
M.Sc., M.PHIL., Ph.D

Professor and Head,

Department of Physics,

SSN College of Engineering,

Kalavakkam-603110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of physics,

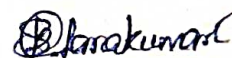
Fatima College

DECLARATION

I hereby declare that the project work in this thesis entitled“ **SYNTHESIS AND CHARACTERIZATION of $\text{Ca}_2\text{KZn}_2\text{V}_3\text{O}_{12}$ DOPED Sm^{3+} PHOSPHORS OF LIGHT APPLICATIONS**” submitted to Fatima College in partial fulfilment of the requirements for the award of the degree “**Master Of Science In Physics**” ,is the record of the original project work done by me under the guidance of S.Masilla Moses Kennedy, Professor and Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering(Autonomous, Affiliated to Anna University, Chennai), Kalavakkam and Mrs.R. Alphonsa Fernando ,Associate Professor, Research Centre of Physics, Fatima College, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.3.24



S.R.LARA KUMARI

(Reg. NO: 2022MSCP14)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this project work.

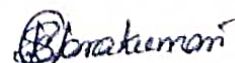
I would like to express my special thanks of gratitude to the principal **Prof.V.E.ANNAMALAI** as well as our vice principal. **Prof.S.RADHA** who gave me the golden opportunity to do this wonderful project in Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Chennai- 603110.

I am greatly indebted to **DR. S. Masilla Moses Kennedy** Head, Department of physics ,Sri Sivasubramaniya Nadar College Of Engineering (Autonomous),Kalavakkam-603110 for his constant support and supervision throughout the project work and for initiating my interest in research.

My indebted thanks to **Mrs. R. Alphonsa Fernando**, Associate Professor, Research Centre of physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank, **MS. A.PRINCY**, Research Scholars, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), for their constant support throughout this project work.

I thank my beloved parents **Mr. S.RAJKUMAR** and **Mrs. R. POORNALATHA** for their motivation during this project and friends for their valuable support.



(S. R. LARA KUMARI)

**SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM
DOPED CADMIUM OXIDE BY HYDROTHERMAL METHOD**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

R.MANJUPARKAVI

(REG.NO:2022MSCP15)

External Guide

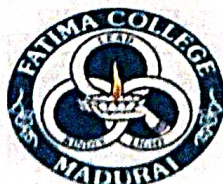
Dr. M.GULAM MOHAMED, M.Sc., M.Phil., Ph.D., M.B.A (Edn.Mgt).,

Dean of Research & i/c Head of the department, Department of Physics,
The New College (Autonomous), Royapettah, Chennai-600014.

Internal Guide

Dr.R. JOTHIMANI, M.Sc., M.Ed., M.Phil., Ph.D., SET, PGDCA.

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

Re-Accredited With A++ by NACC

Mary Land,
Madurai-625 018.

March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "**SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED CADMIUM OXIDE BY HYDROTHERMAL METHOD**" is submitted to Fatima College, Madurai in partial fulfillment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. R. MANJUPARKAVI, 2022MSCP15**, II-M.Sc. Physics at **The New College, Chennai** under the guidance of **Dr. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College (Autonomous), Royapettah, Chennai and **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. R. JOTHI MANI

M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



Dr. M. GULAM MOHAMED

M.Sc., M.Phil., M.B.A., Ph.D.

EXTERNAL GUIDE Associate Professor & Research Supervisor

P.G. & Research Department of Physics

Dr. M. GULAM MOHAMED, **The New College (Autonomous)**
Chennai-600 014.

M.Sc., M.Phil., Ph.D., M.B.A., (Edn. Mgt),

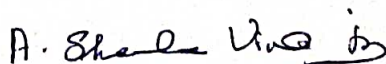
Dean of Research &

i/c Head of the department,

Department of Physics,

The New College (Autonomous),

Chennai-600014.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai-625018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED CADMIUM OXIDE BY HYDROTHERMAL METHOD”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Gulam , Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/03/24

R. Manjuparkavi

R. MANJUPARKAVI

(Reg. NO: 2022MSCP15)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at The New College, Chennai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **DR. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work

I thank Research Scholars, The New College, Chennai for their constant support throughout this project work.

With a deep sense of reverence I record my gratitude towards my parents and friends who helped me in finalising this project.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

P. Manjuparkavi
(R. MANJUPARKAVI)

**SYNTHESIS AND CHARACTERIZATION OF
Ca₂KZn₂V₃O₁₂ DOPED Dy³⁺ PHOSPHATE PHOSPHORS
FOR LIGHT APPLICATIONS**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY, Madurai**)

To Partial fulfilment of requirements for the award of the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

PADMHA PRIYA. K. S

(Reg. No: 2022MSCP16)

External Guide

Dr. S. Masilla Moses Kennedy, M.Sc., M.Phil., PhD

Professor and Head, Department of Physics, SSN College of
Engineering, Kalavakkam -603 110

Internal Guide

Mrs. R. Alphonsa Fernando, M.Sc., M.Phil., PGDCA

Associate Professor, Research Centre of Physics,
Fatima College, Madurai - 625 018



RESEARCH CENTRE OF PHYSICS

FATIMA COLLEGE (AUTONOMOUS)

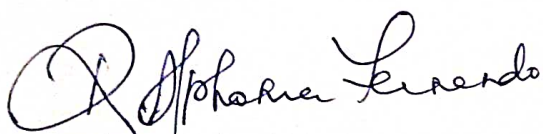
Re-Accredited with A++ Grade by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled “SYNTHESIS AND CHARACTERIZATION OF $\text{Ca}_2\text{KZn}_2\text{V}_3\text{O}_{12}$ DOPED Dy^{3+} PHOSPHATE PHOSPHOR FOR LIGHT APPLICATIONS” is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. K.S. PADMHA PRIYA, 2022MSCP16**, II-M.Sc. Physics under the guidance of **Dr. S. MASILLA MOSES KENNEDY**, Professor and Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous, Affiliated to Anna University, Chennai), Kalavakkam and **Mrs. R. ALPHONSA FERNANDO**, Associate Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Mrs. R. ALPHONSA FERNANDO

M.Sc., M.Phil., PGDCA.,

Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

S. MASILLA MOSES KENNEDY

M.Sc., M.Phil., Ph.D.,

Professor and Head,

Department of Physics,

SSN College of Engineering,

Kalavakkam-603 110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled “**SYNTHESIS AND CHARACTERIZATION OF $\text{Ca}_2\text{KZn}_2\text{V}_3\text{O}_{12}$ DOPED Dy^{3+} PHOSPHATE PHOSPHOR FOR LIGHT APPLICATIONS**” submitted to Fatima College in partial fulfillment of the requirements for the award of the degree “**Master of Science in Physics**”, is the record of original Project work done by **PADMHA PRIYA.K.S** (Reg.No:2022MSCP16) under the guidance of **Dr. S. Masilla Moses Kennedy**, Professor and Head, Department of Physics,SSN College of Engineering, Kalavakkam, Chennai and **Mrs. R. Alphonsa Fernando**, Associate Professor, Research Centre of Physics, Fatima College, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place : Madurai

Date : 27/3/24

K. S. Padmha Priya
K. S. PADMHA PRIYA

(2022MSCP16)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this internship work.

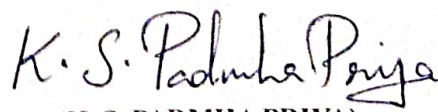
I am greatly indebted to **Prof. Dr. S. MASILLA MOSES KENNEDY**, Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 for his constant support and supervision throughout the internship work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to, **Mrs. R. ALPHONSA FERNANDO**, Associate Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **A. PRINCY**, Research Scholars, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), for their constant support throughout this internship work.

I thank my beloved Mother **Mrs. S. PAPPATHI**, for her motivation and support during this project. I thank my beloved Father **Mr. K. SENTHIL KUMAR**, for giving me strength to chase my dreams.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.


(K. S. PADMHA PRIYA)

**SYNTHESIS AND CHARACTERIZATION OF Tb^{3+}
AND Sm^{3+} DOPED $Sr_3Bi(PO_4)_3$ PHOSPHATE
PHOSPHORS FOR LIGHT APPLICATIONS**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

M. PRIYADHARSHINI

(REG.NO: 2022MSCP17)

External Guide

Dr. S. MASILLA MOSES KENNEDY, M.Sc.,M.Phil.,Ph.D.,

Professor and Head, Department of Physics, SSN College of Engineering,
Kalavakkam - 603 110

Internal Guide

Mrs. R. ALPHONSA FERNANDO, M.Sc.,M.Phil.,PGDCA.,

Associate Professor, Research Centre of Physics, Fatima College,
Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "SYNTHESIS AND CHARACTERIZATION OF Tb^{3+} and Sm^{3+} DOPED $Sr_3Bi(PO_4)_3$ PHOSPHATE PHOSPHOR FOR LIGHT APPLICATIONS" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by **Ms. M. PRIYADHARSHINI**, 2022MSCP17, II-M.Sc. Physics under the guidance of **Dr. S. MASILLA MOSES KENNEDY**, Professor and Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous, Affiliated to Anna University, Chennai), Kalavakkam and **Mrs. R. ALPHONSA FERNANDO**, Associate Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Mrs. R. ALPHONSA FERNANDO

M.Sc., M.Phil., PGDCA.;

Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

S. MASILLA MOSES KENNEDY

M.Sc., M.Phil., Ph.D.,

Professor and Head,

Department of Physics,

SSN College of Engineering,

Kalavakkam-603 110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

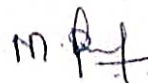
Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled "**SYNTHESIS AND CHARACTERIZATION OF Tb^{3+} and Sm^{3+} DOPED $Sr_3Bi(PO_4)_3$ PHOSPHATE PHOSPHOR FOR LIGHT APPLICATIONS** " submitted to Fatima College in partial fulfillment of the requirements for the award of the degree "**Master of Science in Physics**", is the record of original Project work done by **PRIYADHARSHINI . M** (Reg.No:2022MSCP17) under the guidance of **Dr. S. Masilla Moses Kennedy**, Professor and Head, Department of Physics,SSN College of Engineering, Kalavakkam, Chennai and **Mrs. R. Alphonsa Fernando** , Associate Professor, Research Centre of Physics, Fatima College, Madurai and It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.



Place : Madurai

M . PRIYADHARSHINI

Date : 27/03/24

(Reg. No: 2022MSCP17)

ACKNOWLEDGEMENT
“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this internship work.

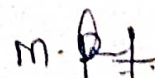
I am greatly indebted to **Prof. Dr. S. MASILLA MOSES KENNEDY**, Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 for his constant support and supervision throughout the internship work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to , **Mrs. R. ALPHONSA FERNANDO**, Associate Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. V. RATHINA MALA**, Research Scholars, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), for their constant support throughout this internship work.

I thank my beloved Mother **Mrs. P. PETCHI** , for her motivation and support during this project. I thank my beloved Father **Mr. P. MAHESWARAN**, for giving me strength to chase my dreams. I thank my dear sister **Mrs. M. JEYASHIVANI**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.



(M. PRIYADHARSHINI)

**ANALYSIS OF RECENTLY EXCAVATED ARCHEOLOGICAL
TERRACOTTA POTTERY SAMPLES OF TAMIL NADU BY
SPECTROSCOPIC TECHNIQUES**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

C. SABARNIKKA

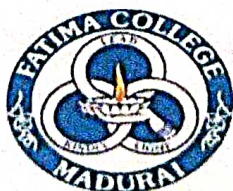
(REG.NO: 2022MSCP19)

External Guide

Dr. A.CHANDRASEKARAN, M.Sc., M.Phil., Ph.D., PGDCA.,
Assistant Professor, Department of Physics, Sri Sivasubramaniya Nadar College of
Engineering (Autonomous), Kalavakkam-603110.

Internal Guide

Dr. M.RAGAM, M.Sc., M.Phil., Ph.D., PGDCA., SET.,
Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.

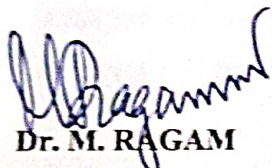


**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**
Re-Accredited With A++ by NACC
Mary Land, Madurai – 625 018.
March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "ANALYSIS OF RECENTLY EXCAVATED ARCHEOLOGICAL TERRACOTTA POTTERY SAMPLES OF TAMIL NADU BY SPECTROSCOPIC TECHNIQUES" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by Ms. C. SABARNIKKA, 2022MSCP19, II-M.Sc. Physics at Sri Sivasubramaniya Nadar College of Engineering, Chennai under the guidance of Dr. A. CHANDRASEKARAN, Assistant Professor, Department of Physics, Chennai and Dr. M. RAGAM, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.

INTERNAL GUIDE



Dr. M. RAGAM

M.Sc., M.Phil., Ph.D., PGDCA., SET.,

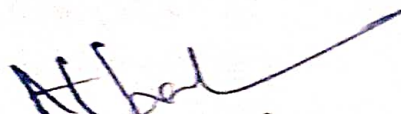
Assistant Professor,

Research Centre of Physics,

Fatima College,
College,

Madurai – 625 018.

EXTERNAL GUIDE



Dr. A. CHANDRASEKARAN,

M.Sc., M.Phil., Ph.D., PGDCA.,

Assistant Professor,

Department of Physics,

Sri Sivasubramaniya Nadar

Chennai - 603110.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled “**ANALYSIS OF RECENTLY EXCAVATED ARCHEOLOGICAL TERRACOTTA POTTERY SAMPLES OF TAMIL NADU BY SPECTROSCOPIC TECHNIQUES**” submitted to Fatima College in partial fulfilment of the requirements for the award of the degree “**Master Of Science In Physics**”, is the record of the original project work done by me under the guidance of Dr. M. Ragam, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. A. Chandrasekaran, Assistant Professor, Department of Physics, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.3.2024

C. Sabarnikka/

C.SABARNIKKA

(Reg. NO: 2022MSCP19)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. A. CHANDRASEKARAN**, Assistant Professor, Department of Physics, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Mr. V. SATHISH**, **Ms. A. TAMILARASI**, **Ms. S. KARTHIKAYINI**, Research Scholars, Sri Sivasubramaniya Nadar College, Chennai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. R. PARIMALAM**, for her motivation and support during this project. I thank my beloved Father **Mr. S. CHANDRAN**, for giving me strength to chase my dreams. I thank my dear Brother **Mr. C. RISHIVATHEN**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG
Colleges DST/CURIE-PG/2022/11.

C. Sabarika/.
(C.SABARIKKA)

SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED COPPER OXIDE BY GREEN SYNTHESIS METHOD

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

S. SALEITH EVANJALINE

(REG.NO: 2022MSCP20)

External Guide

Dr. M. GULAM MOHAMED, M.Sc., M.Phil., Ph.D., M.B.A (Edn.Mgt).,

Dean of Research & i/c Head of the department, Department of Physics,
The New College (Autonomous), Royapettah, Chennai-600014.

Internal Guide

Dr. R. JOTHI MANI, M.Sc., M.Ed., M.Phil., Ph.D., SET, PGDCA

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



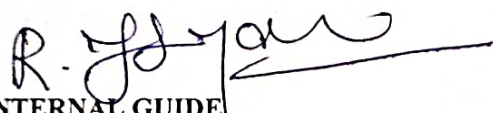
**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC**


Mary Land,
Madurai – 625 018.

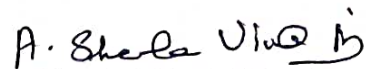
March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED COPPER OXIDE BY GREEN SYNTHESIS METHOD" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by **Ms. S. SALEITH EVANJALINE, 2022MSCP20, II-M.Sc. Physics at The New College, Chennai** under the guidance of **Dr. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College (Autonomous), Royapettah, Chennai and **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.


INTERNAL GUIDE
Dr. R. JOTHI MANI
M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.,
Assistant Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.


EXTERNAL GUIDE
Dr. M. GULAM MOHAMED
M.Sc., M.Phil., M.B.A., Ph.D.
Associate Professor & Research Supervisor
P.G. & Research Department of Physics
The New College (Autonomous)
Chennai-600 014.
Dr. M. GULAM MOHAMED
M.Sc., M.Phil., Ph.D., M.B.A., (Edn.Mgt).,
Dean of Research &
i/c Head of the department,
Department of Physics
The New College (Autonomous), Chennai-600 014.
Chennai-600014.


HEAD OF THE DEPARTMENT
Dr. A. SHEELA VIMALA RANI,
M.Sc., M.Phil., Ph.D.,
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED COPPER OXIDE BY GREEN SYNTHESIS METHOD”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Gulam , Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/03/2024

S. Saleith Evanjaline

S. SALEITH EVANJALINE

(Reg. NO: 2022MSCP20)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at The New College, Chennai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **DR. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work

I thank Research Scholars, The New College, Chennai for their constant support throughout this project work.

With a deep sense of reverence I record my gratitude towards my parents and friends who helped me in finalising this project.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges DST/CURIE-PG/2022/11.

S. Saleith Evanjaline
(S. SALEITH EVANJALINE)

**SYNTHESIS AND CHARACTERIZATION OF CeO_2/CuO
NANOCOMPOSITE FOR DYE DEGRADATION UNDER SUNLIGHT**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

S.SARUMATHI

(REG.NO: 2022MSCP21)

External Guide

Dr.M. JEYANTHINATH M.Sc.,M.Sc.,Ph.D

Assistant Professor , Department of Material Science, Madurai Kamaraj University
Madurai- 625021.

Internal Guide

Dr. ANCEMMA JOSEPH M.Sc.,Ph.D.,SET.,GATE

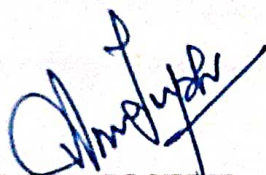
Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CERTIFICATE

This is to certify that the Project report entitled "SYNTHESIS AND CHARACTERIZATION OF CeO_2/CuO NANOCOMPOSITE FOR DYE DEGRADATION UNDER SUNLIGHT" is submitted to Fatima College, Madurai in partial fulfillment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms.S.SARUMATHI**, 2022MSCP21, at Madurai Kamaraj University, Madurai under the guidance of **DR.M. JEYANTHINATH**, Assistant professor, Department of Materials science, Madurai Kamaraj University and **DR.MRS.ANCEMMA JOSEPH**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



Dr. ANCEMMA JOSEPH

M.Sc.,Ph.D.,SET.,GATE.,

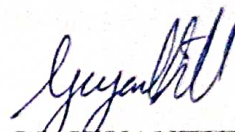
(INTERNALGUIDE)

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai- 625018.



Dr.M. JEYANTHINATH

M.Sc.,M.Sc.,Ph.D

(EXTERNALGUIDE)

Assistant Professor,

Department of Material Science,

Madurai Kamaraj University ,

Madurai- 625021.



HEAD OF THE DEPARTMENT

Dr. A .SHEELA VIMALA RANI M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College ,

Madurai- 625018.

DECLARATION

I do hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF CeO_2/CuO NANOCOMPOSITE FOR DYE DEGRADATION UNDER SUNLIGHT”** submitted to Fatima College in partial fulfillment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of **Dr.Mrs.Ancemma Joseph**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and **Dr.M. Jeyanthinath**, Assistant professor, Department of Material science, Madurai Kamaraj University, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/3/24

S. Sarumathi

S.SARUMATHI

(Reg. NO: 2022MSCP21)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Materials Research Centre, Madurai, and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this internship work.

My indebted thanks to **Dr. ANCEMMA JOSEPH**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my internship work.

I am greatly indebted to **Dr.M. JAYANTHINATH**, Assistant Professor, Department of material science, Madurai kamaraj University, Madurai, for his constant support and supervision throughout the internship work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

I thank **SRIPRITHA** and **RAGAVENTRAN** Research scholars, Madurai Kamaraj University, for their constant support throughout this internship work.

I thank my beloved parents **MR. R.A.SAKTHI VEL MURUGAN** and **Mrs. S.PARVATHI** for their motivation during this internship and friends for their valuable support.

S. Sarumathi
(S.SARUMATHI)

**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY
USING *CASSIA AURICULATA* (AAVARAMPOO) BASED
BIOMEMBRANE AS SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

M. SHIVADHARINI

(REG.NO: 2022MSCP22)

External Guide

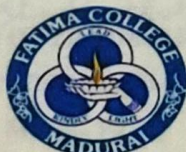
Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. M.V. LEENA CHANDRA, M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

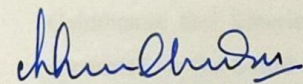
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CERTIFICATE

This is to certify that the work continued in this thesis entitled "**FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING CASSIA AURICULATA (AAVARAMPOO) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. M. SHIVADHARINI, 2022MSCP22**, II-M.Sc. Physics at **Materials Research Center, Madurai** under the guidance of **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and **Dr. M. V. LEENA CHANDRA** Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. M.V. LEENA CHANDRA

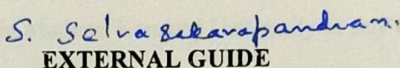
M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,

M.Sc., Ph.D.,

Director,

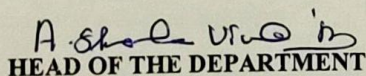
Materials Research Center,

Coimbatore – 641 045 &

Emeritus Professor,

Bharathiar University,

Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **"FABRICATION OF PRIMARY ZINC ION CONDUCTING BATTERY USING *CASSIA AURICULATA* (AAVARAMPOO) BASED BIOMEMBRANE AS SOLID ELECTROLYTE"** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **"Master Of Science In Physics"**, is the record of the original project work done by me under the guidance of Dr. M.V. Leena Chandra, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/3/24

M. Shivadharini

M. SHIVADHARINI

(Reg. NO: 2022MSCP22)

ACKNOWLEDGEMENT

"GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY"

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. A. FEMINADEVI**, for her motivation and support during this project. I thank my beloved Father **Mr. K. S. MURUGANANTHAM**, for giving me strength to chase my dreams.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

M. Shivadharini
(M. SHIVADHARINI)

**FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY
USING *CASSIA AURICULATA* (AAVARAMPOO) BASED
BIOMEMBRANE AS SOLID ELECTROLYTE**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

S. SUBASHINI

(REG.NO: 2022MSCP23)

External Guide

Dr. S. SELVASEKARAPANDIAN, M.Sc., Ph.D.,

Director, Materials Research Center, Coimbatore – 641 045 & Emeritus Professor,
Bharathiar University, Coimbatore – 641 046.

Internal Guide

Dr. M.V. LEENA CHANDRA, M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)**

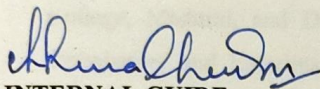
Re-Accredited With A++ by NACC

Mary Land, Madurai – 625 018.

March 2024

BONAFIDE CETIFICATE

This is to certify that the work continued in this thesis entitled "**FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY USING *CASSIA AURICULATA* (AAVARAMPOO) FLOWER BASED BIOMEMBRANE ASSOLID ELECTROLYTE**" is submitted to Fatima College, Madurai in partial fulfilment for the award of the degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original project work done by **Ms. S. SUBASHINI, 2022MSCP23, II-M.Sc. Physics** at Materials Research Center, Madurai under the guidance of **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore and **Dr. M.V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.—



INTERNAL GUIDE

Dr. M.V. LEENA CHANDRA

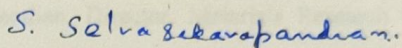
M.Sc., M.Phil., NET., Ph.D.,

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.



EXTERNAL GUIDE

Dr. S. SELVASEKARAPANDIAN,

M.Sc., Ph.D.,

Director,

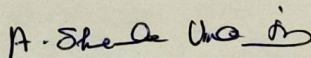
Materials Research Center,

Coimbatore – 641 045 &

Emeritus Professor,

Bharathiar University,

Coimbatore – 641 046.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai – 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled "**FABRICATION OF PRIMARY SODIUM ION CONDUCTING BATTERY USING *CASSIA AURICULATA* (AAVARAMPOO) BASED BIOMEMBRANE AS SOLID ELECTROLYTE**" submitted to Fatima College in partial fulfilment of the requirements for the award of the degree "**Master Of Science In Physics**", is the record of the original project work done by me under the guidance of Dr. M.V. Leena Chandra, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. S. Selvasekarapandian, Director, Materials Research Center, Coimbatore and Emeritus Professor, Bharathiar University, Coimbatore. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

S. Subashini

Place: Madurai

S. SUBASHINI

Date: 27.3.24

(Reg. NO: 2022MSCP23)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. S. SELVASEKARAPANDIAN**, Director, Materials Research Center, Coimbatore, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

My indebted thanks to **Dr. M. V. LEENA CHANDRA**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank **Ms. S. AAFRIN HAZAANA**, **Ms. R. MEERA NAACHIYAR**, **Mr. N. MUNIRAJ@VIGNESH**, Research Scholars, Materials Research Center, Madurai for their constant support throughout this project work.

I thank my beloved Mother **Mrs. S. VIMALA DEVI**, for her motivation and support during this project. I thank my beloved Father **Mr. B. SENTHILKUMAR**, for giving me strength to chase my dreams. I thank my dear brother **Mr. S. KARTHICK RAJA**, for her constant support and encouragement.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

S. Subashini
(S. SUBASHINI)

**SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE NANOPARTICLES FOR
METHYLENE BLUE DYE DEGRADATION UNDER SOLAR RADIATION**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To partial and fulfillment of the requirement for the degree of

MASTER OF SCIENCE IN PHYSICS

V.SUBASHINI

(REG NO: 2022MSCP24)

External Guide

Dr. JEYANTHINATH MAYANDI

Assistant Professor, Department of Material Science, Madurai Kamaraj University

Madurai- 625 021

Internal Guide

Dr. ANCEMMA JOSEPH , M.Sc., Ph.D., SET.,GATE

Assistant Professor, Research Center of Physics , Fatima College , Madurai-625 018



RESEARCH CENTER OF PHYSICS

FATIMA COLLEGE (AUTONOMOUS)

(Re-Accredited with A++ grade by NAAC)

MARY LAND, MADURAI-625 018

March 2024

BONAFIDE CERTIFICATE

This is to certify that an Project report entitled “ **SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE NANOPARTICLES FOR METHYLENE BLUE DYE DEGRADATION UNDER SOLAR RADIATION** “ submitted to Fatima College, Madurai in partial fulfillment for the award of degree of **MASTER OF SCIENCE IN PHYSICS**. This is the record of original Project work done by **Ms. V.SUBASHINI 2022MSCP24** at Madurai Kamaraj University , Madurai under the guidance of **Dr. JEYANTHINATH MAYANDI** , Assistant professor, Department of Material Science, School of Chemistry, Madurai Kamaraj University, Madurai and **Dr .Mrs .ANCEMMA JOSEPH**, Assistant Professor , Research centre of Physics , Fatima College , Madurai and submitted to Research centre of physics , Fatima college, Madurai.


Dr. ANCEMMA JOSEPH

M.Sc., Ph.D., SET., GATE.,

(INTERNAL GUIDE)

Assistant Professor,

Research Center Of Physics,

Fatima College,

Madurai- 625 018.

Dr.M. JEYANTHINATH

M.Sc., M.Sc.,Ph.D.,

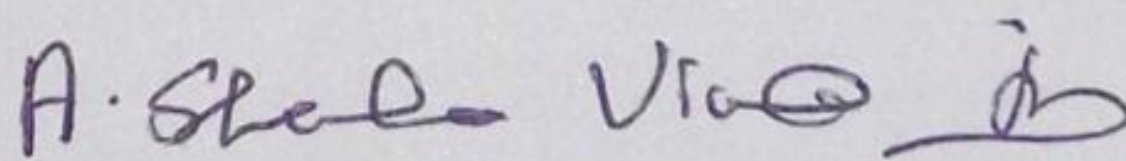
(EXTERNAL GUIDE)

Assistant Professor,

Department Of Material Science,

Madurai Kamaraj University,

Madurai- 625 021.


HEAD OF THE DEPARTMENT

Dr. A .SHEELA VIMALA RANI M.Sc., M Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics

Fatima College ,

Madurai- 625 018.

DECLARATION

I do hereby declare that the project work entitled” **SYNTHESIS AND CHARACTERIZATION OF ZINC OXIDE NANOPARTICLES FOR METHYLENE BLUE DYE DEGRADATION UNDER SOLAR RADIATION**” submitted to Fatima College in partial fulfillment of the requirements for the award of the degree of “**Master of Science in Physics**” is the record of the original project work done by me under the guidance of Dr. Ancemma Joseph, Assistant professor ,Research centre of physics , Fatima college, Madurai, and Dr.Jeyanthinath Mayandi Assistant Professor, Department of material science, Madurai Kamaraj university , Madurai. It has not been submitted for the award of any Degree /Diplomo in Madurai Kamaraj University or any other University /Institutions.

Place: Madurai

V.SUBASHINI

Date:

(2022MSCP24)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Materials Research Centre, Madurai, and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this internship work.

My indebted thanks to **Dr. ANCEMMA JOSEPH**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my internship work.

I am greatly indebted to **Dr. JRYANTHINATH MAYANDI**, Assistant Professor, Department of material science, Madurai kamaraj University, Madurai, for his constant support and supervision throughout the internship work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him. I considered myself extremely fortunate to get an opportunity to work under him.

I thank **SRIPRADHA** and **RAGAVENDRAN** Research scholar, Madurai Kamaraj University, for their constant support throughout this internship work.

I thank my beloved parents Mr. G. VENKATRAMANAN and Mrs. V.SAVITHIRI for their motivation during this internship and friends for their valuable support.

(V. Subashini)

SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED ZINC OXIDE BY SOL-GEL METHOD

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY**, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

A.SUSAN KEZIAH

(REG.NO: 2022MSCP25)

External Guide

Dr. M. GULAM MOHAMED, M.Sc., M.Phil., Ph.D., M.B.A (Edn.Mgt),

Dean of Research & i/c Head of the department, Department of Physics,
The New College(Autonomous), Royapettah, Chennai-600014.

Internal Guide

Dr. R. JOTHI MANI, M.Sc., M.Ed., M.Phil., Ph.D., SET., PGDCA.

Assistant Professor, Research Centre of Physics, Fatima College, Madurai-625018.

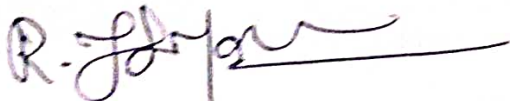


**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited With A++ by NACC**

Mary Land,
Madurai – 625 018.
March 2024

BONAFIDE CERTIFICATE

This is to certify that the work contained in this thesis entitled "SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED ZINC OXIDE BY SOL-GEL METHOD" is submitted to Fatima College, Madurai in partial fulfillment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by Ms. A. SUSAN KEZIAH, 2022MSCP25, II-M.Sc. Physics at The New College, Chennai under the guidance of Dr. M. GULAM MOHAMED, Dean of Research & i/c Head of the department, Department of Physics, The New College (Autonomous), Royapettah, Chennai and Dr. R. JOTHI MANI, Assistant Professor, Research Centre of Physics, Fatima College, Madurai.



INTERNAL GUIDE

Dr. R. JOTHI MANI

M.Sc., M.Ed., M.Phil., Ph.D., SET, PGDCA.

Assistant Professor,

Research Centre of Physics,

Fatima College,

Madurai - 625 018.



EXTERNAL GUIDE

Dr. M. GULAM MOHAMED

M.Sc., M.Phil., Ph.D., M.B.A (Edn. Mgt),

Dean of Research &

i/c Head of the department,

Department of Physics,

The New College (Autonomous),

Chennai-600014.

Dr. M. GULAM MOHAMED
M.Sc., M.Phil., M.B.A., Ph.D.
Associate Professor & Research Supervisor
i/c Head of the Department of Physics
The New College (Autonomous)
Chennai-600 014.



HEAD OF THE DEPARTMENT

Dr. A. SHEELA VIMALA RANI,

M.Sc., M.Phil., Ph.D.,

Head & Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai - 625 018.

DECLARATION

I hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF PURE AND CERIUM DOPED ZINC OXIDE BY SOL-GEL METHOD”** submitted to Fatima College in partial fulfilment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of Dr. R. Jothi Mani, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, and Dr. M. Gulam , Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27/3/2024

A. Susan Keziah

A. SUSAN KEZIAH

(Reg. NO: 2022MSCP25)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai for permitting us to carry out our project at Materials Research Center, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Centre of Physics, Fatima College, Madurai for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **DR. M. GULAM MOHAMED**, Dean of Research & i/c Head of the department, Department of Physics, The New College(Autonomous), Royapettah, Chennai, for his constant support and supervision throughout the project work and for initiating my interest in research. I owe a lot to him and express my deep sense of gratitude to him.

My indebted thanks to **Dr. R. JOTHI MANI**, Assistant Professor, Research Centre of Physics, Fatima College, for her constructive and sustained interest towards each and every stage of this work

I thank Research Scholars, The New College, Chennai for their constant support throughout this project work.

With a deep sense of reverence I record my gratitude towards my parents and friends who helped me in finalising this project.

We acknowledge project fund received under DST CURIE core Grant for Women PG Colleges **DST/CURIE-PG/2022/11**.

A. Susan Keziah
(A.SUSAN KEZIAH)

**SYNTHESIS AND CHARACTERIZATION of Eu^{3+} and Dy^{3+} DOPED
 $\text{Sr}_3\text{Bi}(\text{PO}_4)_3$ PHOSPHORS OF LIGHT APPLICATIONS**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to MADURAI KAMARAJ UNIVERSITY, Madurai)

To Partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

R .M. THIVYAVANI

(REG.NO: 2022MSCP26)

External Guide

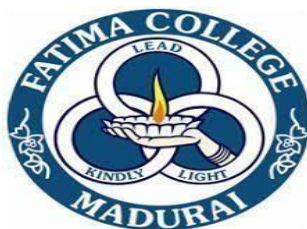
Dr. S. Masilla Moses Kennedy, M.Sc.,M.Phil.,Ph D

(Professor and Head, Department of Physics, SSN College of
Engineering, Kalavakkam -603 110)

Internal Guide

Mrs. R. Alphonsa Fernando, M.Sc.,M.Phil.,PGDCA

(Associate Professor, Research Centre of Physics,
Fatima College , Madurai - 625 018)



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**

BONAFIDE CERTIFICATE

This is to certify that the project work entitled “**SYNTHESIS AND CHARACTERIZATION of Eu^{3+} and Dy^{3+} DOPED $\text{Sr}_3\text{Bi}(\text{PO}_4)_3$ PHOSPHORS OF LIGHT APPLICATIONS**” submitted by **THIVYAVANI R M (Reg.No:2022MSCP26)** under the guidance of **Dr. S. Masilla Moses Kennedy**, Professor and Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering(Autonomous, Affiliated to Anna University, Chennai), Kalavakkam is submitted to Department of Physics, Fatima College. This work has been completed successfully towards the partial fulfillment of requirements for the award of the Degree of Master of Science in Physics during the academic year 2022-2024.



Dr.S. Masilla Moses Kennedy

(External Guide)

Professor and Head,

Department of Physics,

SSN College of Engineering,

Kalavakkam-603110.

Mrs. R. Alphonsa Fernando

(Internal Guide)

Associate Professor,

Research Centre of Physics,

Fatima College,

Madurai-625018.

Dr. A. SHEELA VIMALA RANI

(Head & Associate Professor)

Research Centre of Physics,

Fatima College,

Madurai-625018.

EXTERNAL EXAMINER

DECLARATION

I do hereby declare that this dissertation entitled **“SYNTHESIS AND CHARACTERIZATION of Eu^{3+} and Dy^{3+} DOPED $\text{Sr}_3\text{Bi}(\text{PO}_4)_3$ PHOSPHORS OF LIGHT APPLICATIONS”** submitted to Fatima College in partial fulfillment of the requirements for the award of the degree **“Master of Science in Physics”**, is the record of original Project work done by **THIVYAVANI.R.M (Reg.No:2022MSCP26)** under the guidance of and **Dr. S. Masilla Moses Kennedy**, Professor and Head, Department of Physics, SSN College of Engineering, Kalavakkam, Chennai and **Mrs. R. Alphonsa Fernando**, Associate Professor, Research Centre of Physics, Fatima College, Madurai

R.M.THIVYAVANI
(2022MSCP26)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY”

We are grateful to **Dr.Sr.G.CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our internship at Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 and also, I would like to thank **Dr.Sr.M.FRANCISCA FLORA**, Secretary, Fatima College, Madurai for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head, Research Centre of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this internship work.

I would like to express my special thanks of gratitude to the principal **Prof.V.E.ANNAMALAI** as well as our vice principal **Prof.S.RADHA** who gave me the golden opportunity to do this wonderful project in Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Chennai-603110.

I would like to express my sincere thanks to **Prof. S. Masilla Moses Kennedy**, Head, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), Kalavakkam-603110 for his constant support and for initiating my interest in research.

I thank, **Ms. V. Rathina Mala**, Research Scholar, Department of Physics, Sri Sivasubramaniya Nadar College of Engineering (Autonomous), for her constant support throughout this internship work.

I thank my beloved mother **Mrs.P.MALA** and my guardian **Mrs.P.MAHESWARI** for their motivation during this internship and friends for their valuable support.

(R.M.THIVYAVANI)

**SYNTHESIS AND CHARACTERIZATION OF TITANIUM CARBIDE
(Ti₃C₂T_x) FOR SUPERCAPACITOR APPLICATION**

A dissertation submitted to

FATIMA COLLEGE (AUTONOMOUS)

(Affiliated to **MADURAI KAMARAJ UNIVERSITY, Madurai**)

To Partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE IN PHYSICS

Submitted by

M. YOGADHARSHINI

(REG. NO: 2022MSCP27)

External Guide

Dr. SUJIN P JOSE, M.Sc., Ph.D.

(Assistant Professor and Head, Department of Computational
Physics, School of Physics, Madurai Kamaraj University, Madurai-625021)

Internal Guide

Dr. M. RAGAM, M.Sc., M.Phil., Ph.D., PGDCA., SET.

(Assistant Professor, Research Centre of Physics, Fatima College, Madurai)



**RESEARCH CENTRE OF PHYSICS
FATIMA COLLEGE (AUTONOMOUS)
Re-Accredited with A++ Grade by NACC
Mary Land, Madurai – 625 018.
March 2024**


BONA FIDE CERTIFICATE

This is to certify that the project report entitled "SYNTHESIS AND CHARACTERIZATION OF TITANIUM CARBIDE (Ti_3C_2Tx) FOR SUPERCAPACITOR APPLICATION" has been submitted to Fatima College, Madurai in partial fulfillment for the award of the degree of MASTER OF SCIENCE IN PHYSICS. This is the record of original project work done by M.YOGADHARSHINI, 2022MSCP27, II-M.SC at Advanced Materials Laboratory, School of Physics, Madurai Kamaraj University, Madurai, under the guidance of Dr. SUJIN P JOSE, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University, Madurai and Dr. M. Ragam, Assistant Professor, Research Centre of Physics, Fatima College, Madurai and submitted to Research Centre of Physics, Fatima College, Madurai.



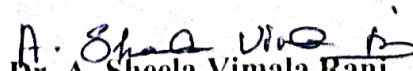
Dr. Sujin P Jose 25.3.24

Assistant Professor and Head,
Department of Computational Physics,
School of Physics,
Madurai Kamaraj University,
Madurai-625021.



Dr. M. Ragam

Assistant Professor,
Research Centre of Physics,
Fatima College,
Madurai -625018.



Dr. A. Sheela Vimala Rani

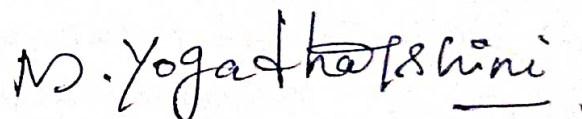
Head & Associate Professor,
Research Centre of Physics,
Fatima College,
Madurai-625018.

DECLARATION

I do hereby declare that the project work in this thesis entitled **“SYNTHESIS AND CHARACTERIZATION OF TITANIUM CARBIDE FOR SUPERCAPACITOR APPLICATION”** submitted to Fatima College in partial fulfillment of the requirements for the award of the degree **“Master Of Science In Physics”**, is the record of the original project work done by me under the guidance of **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Madurai, and **Dr. SUJIN P JOSE**, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University, Madurai. It has not been submitted for the award of any Degree/Diploma in Madurai Kamaraj University or any other University/Institutions.

Place: Madurai

Date: 27.03.2024



M.YOGADHARSHINI

(Reg. NO: 2022MSCP27)

ACKNOWLEDGEMENT

“GLORY TO GOD ALMIGHTY WHO GIVES US THE VICTORY “

We are grateful to **Dr. Sr. G. CELINE SAHAYA MARY**, Principal, Fatima College, Madurai, for permitting us to carry out our project at Material Research Centre, Madurai and also, I would like to thank **Dr. Sr. M. FRANCISCA FLORA**, Secretary, Fatima College, Madurai, for her prayers and blessings.

I thank **Dr. A. SHEELA VIMALA RANI**, Head and Associate Professor, Research Center of Physics, Fatima College, Madurai, for her constant support and encouragement in the successful completion of this project work.

I am greatly indebted to **Dr. SUJIN P JOSE**, Assistant Professor and Head, Department of Computational Physics, School of Physics, Madurai Kamaraj University, for her constant support and supervisions throughout the project work and for initiating my interest in research. I owe a lot to her and express my deep sense of gratitude to her. I consider myself extremely fortunate to get an opportunity to work under her.

My indebted thanks to **Dr. M. RAGAM**, Assistant Professor, Research Centre of Physics, Fatima College, Madurai, for her constructive and sustained interest towards each and every stage of this work and her valuable suggestions throughout my project work.

I thank, **P. SIVAHARINI** Research Scholar, Advanced Material Laboratory, for her constant support throughout this project work.

I thank my beloved mother **Mrs. A. GEETHA**, for her motivation and support during the internship. I thank my beloved father **Mr. S. MARIMUTHU**, for his guidance and support during the project. I would like to thank my friends for their valuable support.

M. Yogadharshini
(M.YOGADHARSHINI)