ALVA'S INSTITUTE OF ENGINEERING AND TECHNOLOGY

(Affiliated to Visvesvaraya Technological University, Belagavi Approved by AICTE, New Delhi & Recognized by Government of Karnataka)

A REPORT ON

NANO-ORGANIC ELECTRONICS LAB (NOEL) & EARTH'S FIELD NUCLEAR MAGNETIC RESONANCE (EFNMR) LAB

CONTENTS

SL. NO.	DESCRIPTIONS	PAGE NO.
1.	ESTABLISHMENT, VISION & MISSION OF THE LAB	2
2.	RESEARCH INTERESTS OF THE LAB	3
3.	INTRODUCTION	4
4.	FACILITIES IN THE NOEL-EFNMR LAB	6
5.	REPORTS ON RESEARCH ACTIVITIES DURING 2017-18 IN THE LAB	7
6.	REPORTS ON RESEARCH ACTIVITIES DURING 2018-19 IN THE LAB	20
7.	REPORTS ON RESEARCH ACTIVITIES DURING 2019-20 IN THE LAB	39
8.	REPORTS ON RESEARCH ACTIVITIES DURING 2020-21 IN THE LAB	46

ESTABLISHMENT: 2017

ENTRANCE TO PHYSICS RESEARCH LAB IN THE MAIN BLOCK

ENTRANCE TO THE NOEL-EFNMR LAB

EFNMR MEASURMENTS

CONDUCTIVITY MEASURMENTS

VISION

"Excel in imparting knowledge in Physics and Propel Scientific Research to Technological Horizon"

MISSION OF THE LAB

- To generate PhD projects based on the scientific objectives of the lab.
- To generate mini/major projects for undergraduates (B.E.) and post-graduates (MTech. / M.Sc.) awarding for their respective master's thesis.
- To build Memorandum of Understanding (MOU) with Industries/Companies/Universities.
- To attract research funding from various government and non-government funding agencies.

RESEARCH INTERESTS OF THE LAB

- Fundamental research in the areas of interests that mainly focuses on smart materials, conducting polymers and Organic solar cells for advanced engineering applications.

- The other area that the lab is interested is in Nuclear Magnetic Resonance spectroscopy, Solid-state NMR of paramagnetic complexes, Paramagnetic Li-Na Battery materials and Earth's Field NMR studies of these potential systems.

- The lab also focuses on Quantum Chemical calculations such as density functional theory (DFT) using GAUSSIAN 16 to extract some important physical parameters from organic/metal-organic structures which finds application as smart materials.

INTRODUCTION

Nano-Organic Electronic Lab (NOEL) integrated with Earth's Field Nuclear Magnetic Resonance (EFNMR) facility, a research and development wing of Alva's Education Foundation (AEF) would aim at syntheses, design and fabrication and characterization of smart materials which find their use in advanced applications in sensors, biocompatible materials, green energy harnessing devices (such as Organic solar cells) etc. On the one hand NOEL lab would take up the task of syntheses, design and fabrication of these potential materials; on the other hand EFNMR lab would deal with the analytical part of the research along with advanced theoretical and computational calculations such as density functional theory (DFT) calculations on these smart materials. In this way NOEL-EFNMR lab along with computational techniques forms the strong work horse for the establishment of Research and Development wing of Department of Engineering Physics, Alva's Institute of Engineering and Technology, Mijar, Moodbidri.

The following briefly defines the vision of NOEL-EFNMR lab:

- Sensors: syntheses, design and fabrication of conducting polymer based materials for sensor applications in technological and medical world.
- Design and Fabrication of Organic Solar Cells.
- *In situ* Nuclear Magnetic Resonance (1D/2D) measurements/ (3D)

Imaging of (a.) Conducting polymers, Solar Cells: electrical measurements), (b.) Sensors: optical, heat and gas, (c.) Agro: systematic study of oil yield of line-seed, groundnut and other seeds, also NDT against adulteration, (d.) Petrochemicals: Higher chain hydrocarbons (d.) Small animal 1D/2D NMR and MRI: to understand biological activity (Enzymatic reaction)

- As Fund generating unit: (i.) NDT facility for Pharmaceutical, Chemical and Agro industries, (ii.) External Research/ Academic users, (iii.) Internal Research/ Academic users (subsidized).

FACILITIES AT THE NOEL-EFNMR LAB

Material Research Facility -*synthesis*

- Sonicator
- Hot air oven
- Small scale polymer syntheses set-ups

HOT AIR OVEN

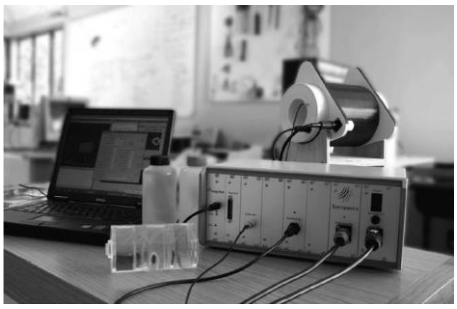
ULTRASONIC CLEANER

Characterization Facility –*instruments*

- Digital Source meter – Tektronix

KIETHLEY'S DIGITAL SOURCE METER - 2450

- **Earth's Field NMR spectrometer**
- NMR relaxation measurement
- Diffusion measurements at zero/ultra-low magnetic field
- 1D/2D/3D EFMRI for quantitative measurements & other imaging experiments



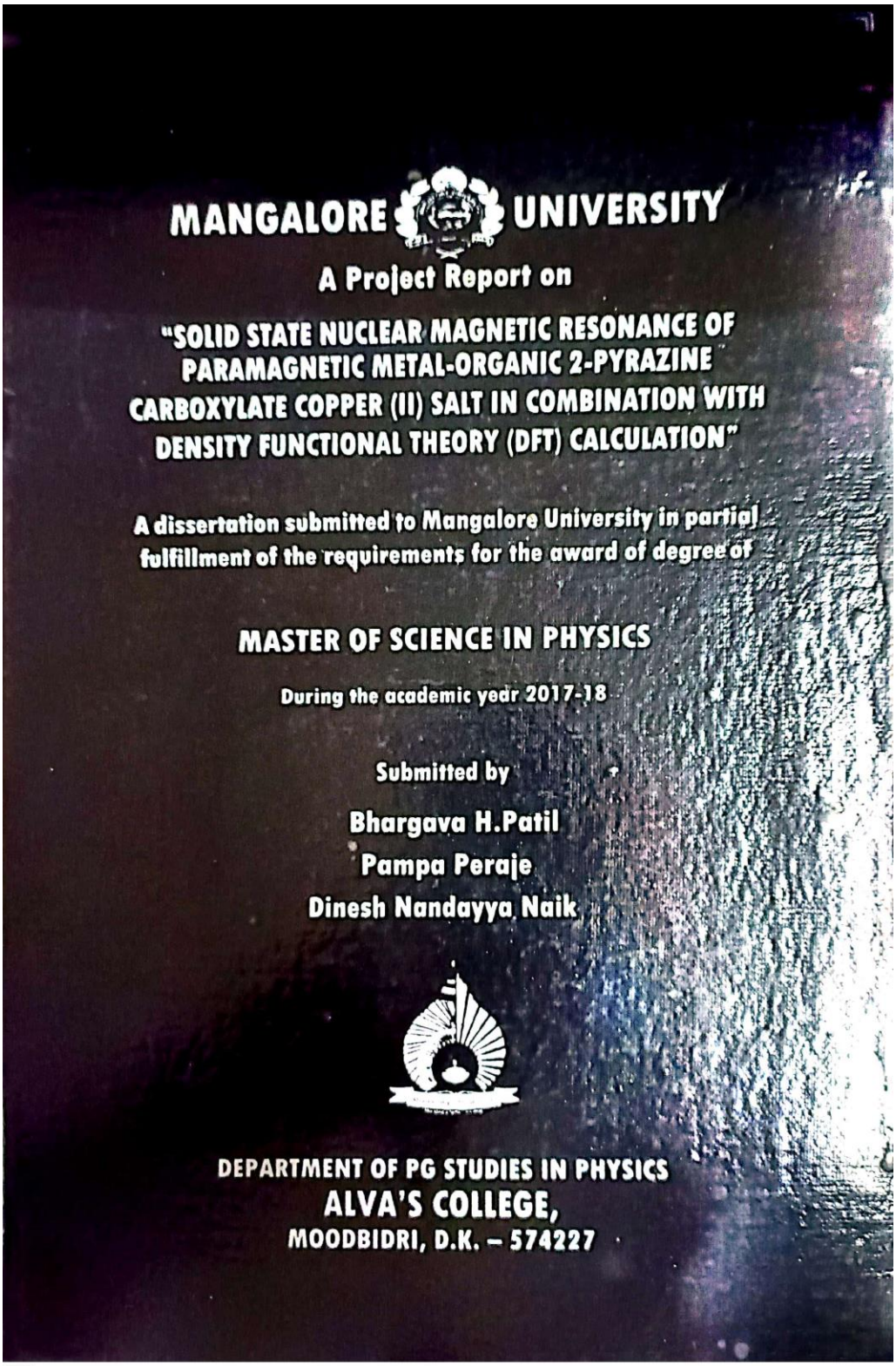
MAGRITEK'S TERRANOVA EFNMR/MRI

REPORTS ON RESEARCH ACTIVITIES DURING 2017-18 IN THE LAB

The Students of Masters of Physics utilize the lab for their master's project (Thesis) and the below table details out the list of students and their project supervisor with topic who have utilized the lab for the same.

Sl. No.	TITLE OF THE MASTER'S THESIS	STUDENT'S NAME	FACULTY
1.	Optical and Electrical Properties of Polyaniline Blend With PVA/Pullulan	Anchaleen Pius Sampath Siddharth Jain	Dr. Ramaprasad A. T.
2.	Optical And Electrical Properties of Poly-pyrrole Blend with Pullulan/PVA	Ashwini P R Shanthala Sushmitha Hegde	
3.	DC Electrical conduction mechanism of chitin polyaniline copolymer	Jyothsna Nikhitha S Parthavee Jain M	
4.	Solid state NMR of paramagnetic Cu(II) 2-Pyrazinecarboxylate salt	Bhargav H. Patil Pampa Peraje Dinesh N. Naik	Dr. Shashi Kumar K.
5.	NMR studies of natural products and herbs of medicinal importance in combination with quantum chemical calculations	Rashmitha Shetty Jyothsna M. M. Pooja H. S. Princy N. P.	

OUTCOME OF RESEARCH AT NOEL-EFNMR LAB, DEPT. OF PHYSICS AS MASTER THESIS OF M-Sc PG STUDENTS DURING 2017-18



MANGALORE UNIVERSITY

A Project Report on

"SOLID STATE NUCLEAR MAGNETIC RESONANCE OF PARAMAGNETIC METAL-ORGANIC 2-PYRAZINE CARBOXYLATE COPPER (II) SALT IN COMBINATION WITH DENSITY FUNCTIONAL THEORY (DFT) CALCULATION"

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2017-18

Submitted by

Bhargava H.Patil

Pampa Peraje

Dinesh Nandayya Naik

DEPARTMENT OF PG STUDIES IN PHYSICS

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MOODBIDRI, D.K. – 574227

MANGALORE UNIVERSITY

A Project Report on

"Solid State Nuclear Magnetic Resonance of Paramagnetic Metal-Organic 2-Pyrazine Carboxylate Copper (II) salt in combination with Density functional theory (DFT) calculation"

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2017-18

Submitted by

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CERTIFICATE

This is to certify that the dissertation entitled **"Solid State Nuclear Magnetic Resonance of Paramagnetic Metal-Organic 2-Pyrazine Carboxylate Copper(II) salt in combination with Density functional theory(DFT) calculation"** submitted by **Mr. Bhargava H. Patil, Mr. Pampa Peraje, Mr. Dinesh Nandayya Naik** bearing registration number **169984008,30,12** respectively is a record of project work carried out at Alva's Institute of Engineering & Technology (AIET), Mijar and Institut des Molécules et Matériaux du Mans (IMMM), Université du Maine, Le Mans, France under the Supervision of **Dr. Shashi Kumar K.** towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2017-2018.

Guide

Coordinator

Approved and submitted to Mangalore University.

Principal
Date:
Place: Moodbidri

ABSTRACT

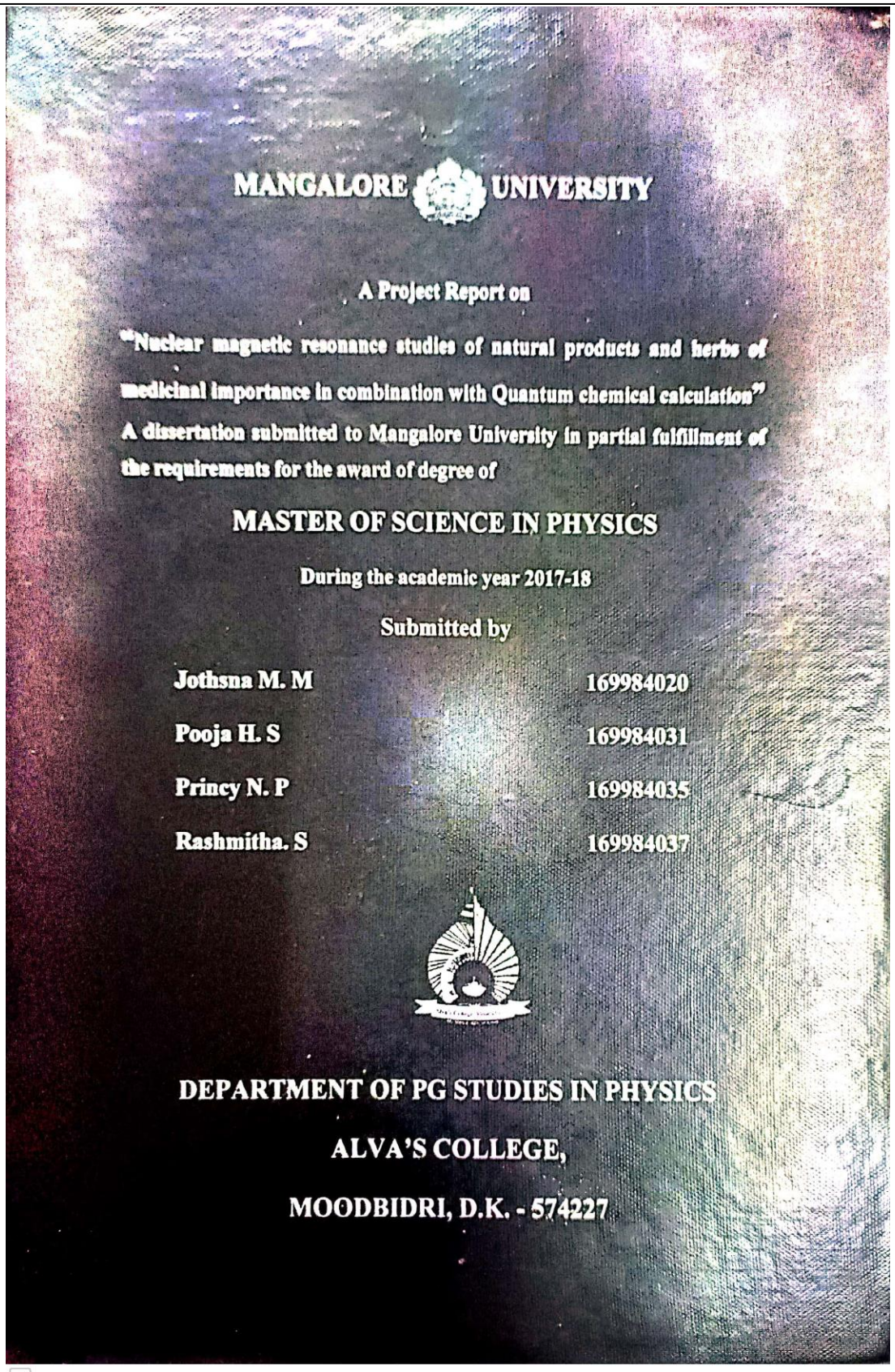
The purpose of our thesis is to understand the current developed techniques in Solid-state nuclear magnetic resonance(ssNMR) of paramagnetic metal organic system in combination with quantum chemical calculation method such as density functional theory (DFT) and hence to apply the same to paramagnetic metal organic system 2-Pyrazine carboxylate Copper(II) salt.

NMR is mostly performed on diamagnetic systems and the information obtained from it is rich of structural information. Despite the success of ssNMR it is very difficult to assign the NMR signals in the paramagnetic complexes. Signals from ssNMR of paramagnetic materials suffer from huge loss of sensitivity and resolution due to hyperfine interaction. Out of many interactions found in ssNMR the interaction between the unpaired electron and nucleus which causes the hyperfine splitting is the strongest in paramagnetic NMR. In one hand large broadening of signals which is due to the fast relaxation of nucleus causes huge loss in sensitivity and resolution. On the other hand diamagnetic shifts which contain valuable structural information are masked by Fermi contact interaction.

High resolution ssNMR of paramagnetic systems is still unexplored topic because of limited sensitivity/resolution and difficulty in assignment due to large paramagnetic shifts. In 2006 Ishii and co-workers showed that increase in magic angle spinning greater than 20 KHz can enhance the sensitivity. We have used the VFMAS (very fast magic angle spinning >40 KHz) approach to cope up with hyperfine interaction in our ssNMR of organic system with transition metal ion as copper[1]. Fermi contact shift[2] which is responsible for large shifts causes severe problems in signal assignments, at the same time it accounts to better spectral dispersion and hence enhances in resolution. We were able to exploit this idea similar to Ishi et al,[1] Kervern et al,[36] Kumaraswamy et al[3] and Toma et al[27] al and a well resolved ^{13}C and even ^{1}H solid state NMR spectrum in paramagnetic metal organic systems was obtained using a simple Hahn-echo/ 1D-DEPTH experiment.[28] Moreover fast relaxation in paramagnetic systems allows one to reduce the interscan delay and perform more number of experiments and hence increase the signal to noise ratio which compensates for loss in sensitivity. Fermi contact shifts are characteristics of unpaired electron spin density. Using DFT we have theoretically calculated the Fermi contact

shift. Our work is the first attempt to study the ssNMR spectra of 2-Pyrazine carboxylate copper(II) salt up to date. We have compared the experimental ssNMR shifts with the shifts from DFT for 2-Pyrazine carboxylate copper(II) salt. In paramagnetic metal-organic complexes the carbon-13 relaxation caused by the dipolar interaction with the unpaired electron depends on the distance of the carbon atoms to the central metal ion, therefore its rates in principle contain structural information. The thesis is confined to ^{1}H and ^{13}C ssNMR signal assignments of paramagnetic 2-Pyrazine carboxylate Cu(II) salt. This work assumes conceptual explanation of paramagnetic relaxation in paramagnetic metal organic complexes that are previously understood and explained in references.[1,3,4,35,105]

Novelty of this Report: The NMR spectral studies of 2-Pyrazine carboxylate copper(II) salt using ssNMR is nowhere reported, in this report 2-Pyrazine carboxylate copper(II) salt is characterized using ssNMR and the results were compared with the theoretically generated NMR (using Gaussian 09) for the first time.



MANGALORE UNIVERSITY

A Project Report on

"Nuclear magnetic resonance studies of natural products and herbs of medicinal importance in combination with Quantum chemical calculation"

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2017-18

Submitted by

Jothsna M. M	169984020
Pooja H. S	169984031
Princy N. P	169984035
Rashmitha. S	169984037

DEPARTMENT OF PG STUDIES IN PHYSICS

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MANGALORE UNIVERSITY

A Project Report on

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MASTER OF SCIENCE IN PHYSICS

duringthe academic year 2017-18

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Rashmitha. S	169984037

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CERTIFICATE

This is to certify that the dissertation entitled **"Nuclear magnetic resonance studies of natural products and herbs of medicinal importance in combination with Quantum chemical calculation"** submitted by

Ms. Jothsna M. M

Ms. Pooja H. S

Ms. Princy N. P

Rashmitha. S

bearing registration number **169984020, 169984031, 169984035, 169984037** respectively is a record of project work carried out at AIET Mijar under the Supervision of Dr.Shashikumar K towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2017-2018.

Internal guide

Coordinator

Co - Ordinator
Department of P. G. Studies in Physics
Alva's College, Moodbidri - 574 227

Approved and submitted to Mangalore University.

Date: 28-4-2018
Place: Moodbidri

Principal
ALVA'S COLLEGE
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DECLARATION

I hereby declare that the project work entitled **"Nuclear magnetic resonance studies of natural products and herbs of medicinal importance in combination with Quantum chemical calculation"** has been carried out by me at Alva's college, Moodbidri under the guidance of Dr.Shashikumar K, Department of Physics, AIET Mijar, during the academic year 2017-2018. This report is submitted to Mangalore University for the partial fulfillment of the requirement for Project work (PHP – 559) for the award of the degree of Master of Science in Physics.

Date: 28/04/018

Place: Moodbidri

Rashmitha S
Pooja H.S

(Name of the student)

[Rashmitha S]
[Jothsna M.M]
[Pooja H.S]
[Princy N.P]

Abstract:

The purpose of our project is to have conceptual understanding of application of Nuclear magnetic resonance spectroscopy on natural products and herbs of medicinal importance along with DFT calculations. The novelty in our work is obtaining NMR data of caffeine and curcumin using the Density functional theory. DFT calculation of Natural products have played a critical role in the identification of numerous medicines.The utility of natural products as biological function modifiers has won considerable attention. For this reason, the goal of our project work is to show the utility of NMR spectroscopy for the quantitative analysis of caffeine and curcumin extracted from natural products like coffee and turmeric. Therefore, we have concentrated on obtaining ^{1}H and ^{13}C NMR signals of caffeine and curcumin molecules and to assess these signals using the quantum chemical calculations such as Density functional theory calculations to elucidate the structural information. In DFT calculation ,Geometry optimization and NMR chemical shift calculations at Hartree-Fock level, using hybrid B3LYP method and 6-311G (d) basis set, are applied as tools in the structural characterization of these molecules. A comparison with the method was carried out to evaluate electron correlation contributions to the calculation of NMR chemical shifts and eventually to extend the applicability of such computational methods to the interpretation of NMR spectra.

OUTCOME OF RESEARCH AT NOEL-EFNMR LAB THROUGH PUBLICATIONS DURING 2017-18

1. Analysis of the barriers for implementing green supply chain management (GSCM) practices on organic irrigation: An interpretive structural modelling (ISM) approach, *Atul K. Shrivastava, Satyam Kumar,* ***Shashi Kumar Kumara Swamy****, Anil Midathada and Uday Krishna Ravella*, July **2017**, **International Journal of Mechanical Engineering and Technology**, 8 (7), 1446

2. Aluminum MMCS Reinforced with HBN –Review, *Kumari Ambe Verma*, ***Shashi Kumar Kumara Swamy***, *Dr. G. K. B. Nair*, Dr. *Uday Krishna Ravella*, July **2017**, **International Journal of Mechanical Engineering and Technology**, 8 (7), 1532

3. Investigation of Microstructure Of Cyclically Cryogenically Treated Specimens Of SS316L And Comparison Of Its Mechanical Properties With Cyclically Heat Treated Specimens, *Ravi Kumar, Ankit Singh,* ***Shashi Kumar Kumara Swamy****, Anil Midathada and Uday Krishna Ravella*, July **2017**, **International Journal of Mechanical Engineering and Technology**, 8 (7), 1726

4. Morphology and miscibility of chitin-polyaniline blend, *AT Ramaprasad, V Rao*, 2017, **Current Science**, 2415-2423

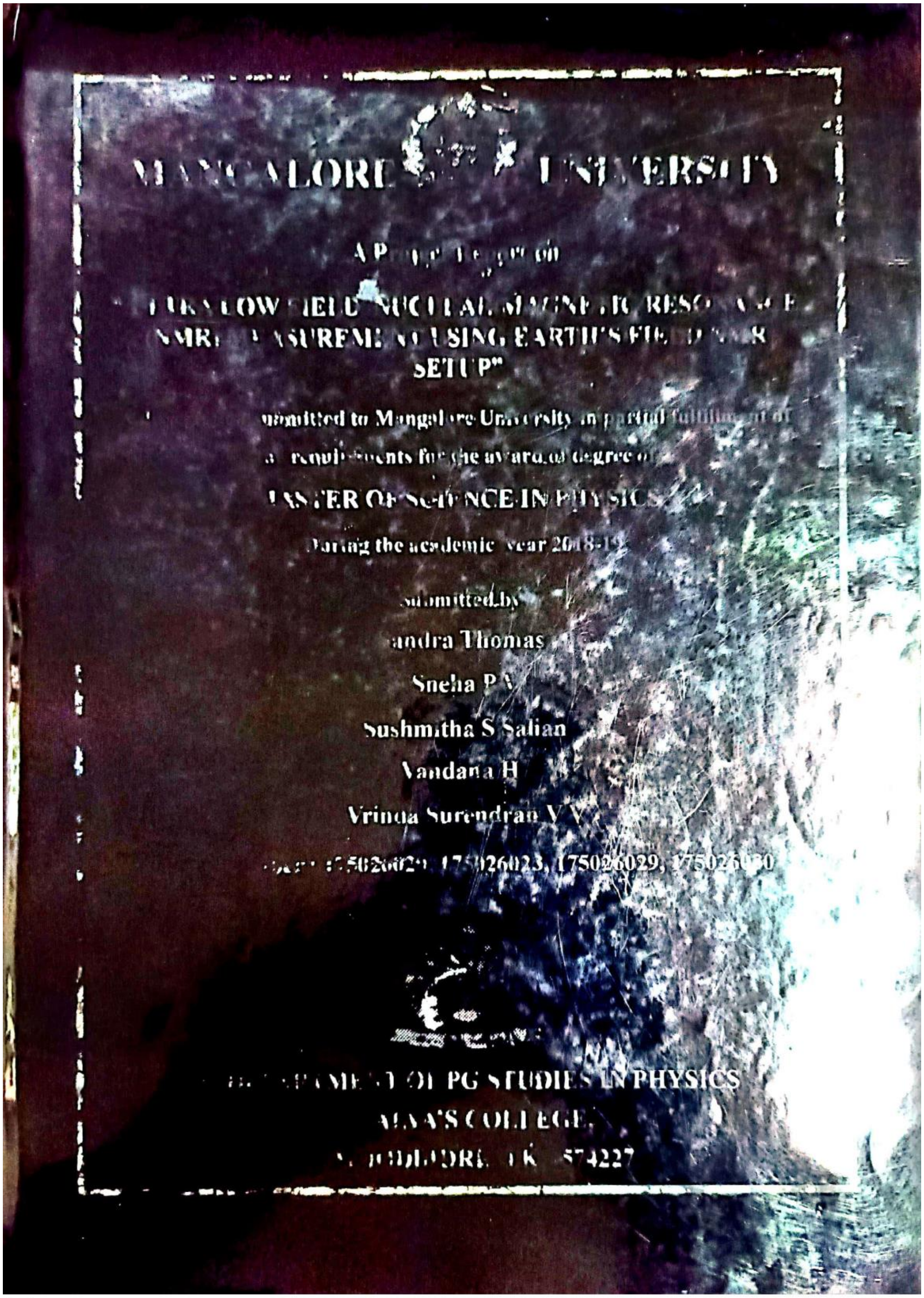
5. Synthesis and characterization of poly-pyrrole grafted chitin, *AT Ramaprasad, D Latha, V Rao*, 2017, **Journal of physics and chemistry of solids**, 104, 169-174

REPORTS ON RESEARCH ACTIVITIES DURING 2018-19 IN THE LAB

The Students of Masters of Physics utilize the lab for their master's project (Thesis) and the below table details out the list of students and their project supervisor with topic who have utilized the lab for the same.

Sl. No.	TITLE OF THE MASTER'S THESIS	STUDENT'S NAME	FACULTY
1.	Synthesis And Characterization of Polyaniline Grafted PVA/Pullulan Blend	Adithya K P Athira T Rachana T A	Dr. Ramaprasad A. T.
2.	Polyaniline Grafted Chitosan/PVA Blend as Radiation Attenuators	Anjali George Sreelekha M Traicy Mathew	
3.	Ultra-Low Field Nuclear Magnetic Resonance (NMR) Measurement Using Earth's Field NMR Set-up	Sushmitha Salian Sneha P V Sandra Thomas Vandana H Vrinda Surendran V Sandra Thomas	Dr. Shashi Kumar K.

OUTCOME OF RESEARCH AT NOEL-EFNMR LAB, DEPT. OF PHYSICS AS MASTER THESIS OF M-Sc PG STUDENTS DURING 2018-19



MANGALORE UNIVERSITY

A P... ...

"...LOW FIELD NUCLEAR MAGNETIC RESONANCE (NMR) MEASUREMENT USING EARTH'S FIELD NMR SETUP"

submitted to Mangalore University in partial fulfilment of ... requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2018-19

submitted by

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Sneha PA

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MANGALORE UNIVERSITY

A Project Report on

"ULTRA LOW FIELD NUCLEAR MAGNETIC RESONANCE (NMR) MEASUREMENT USING EARTH'S FIELD NMR SETUP"

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2018-19

Submitted by

Sandra Thomas

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Sushmitha S Salian

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CERTIFICATE

This is to certify that the dissertation entitled **"Ultra low field nuclear magnetic resonance (NMR) using earth field nuclear magnetic resonance (EFNMR) setup"** submitted by **Ms. Sandra Thomas, Ms. Sneha P V, Ms. Sushmitha S Salian, Ms. Vandana H, Ms. Vrinda Surendran V.V** bearing registration numbers **175026020, 175026023, 175026028, 175026029 ,175026030** is a record of project work carried out at Alva's Institute of Engineering & Technology(AIET), Mijar under the Supervision of **Dr. Shashi Kumar K** towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore University for the academic year 2018-2019.

31/5/19
Internal guide

Coordinator
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Date: 31/5/2019
Place: Moodbidri

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CERTIFICATE

This is to certify that from second year **Ms. Sandra Thomas, Ms. Sneha P V, Ms. Sushmitha S Salian, Ms. Vandana H, Ms. Vrinda Surendran V.V** bearing registration numbers **175026020, 175026023, 175026028, 175026029 ,175026030 M.Sc. (Physics), Centre for Post Graduate Studies and Research, Alva's College, Moodbidri, Karnataka** has worked on the project entitled **"Ultra low field nuclear magnetic resonance (NMR) using earth field nuclear magnetic resonance (EFNMR) set up".** This work is for partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore University for the academic year 2018-2019.

Guide

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DECLARATION

I hereby declare that the project work entitled "**Ultra low field nuclear magnetic resonance (NMR) using earth field nuclear magnetic resonance (EFNMR) set up**" has been carried out by me at Alva's Institute of Engineering & Technology(AIET), Mijar under the guidance of Dr.Shashi Kumar K, during the academic year 2018-2019. This report is submitted to Mangalore University for the partial fulfillment of the requirement for Project work (PHP – 559) for the award of the degree of Master of Science in Physics.

Date:

Place: Moodbidri

(NAME OF THE STUDENTS)

Sandra Thomas

Sneha P V

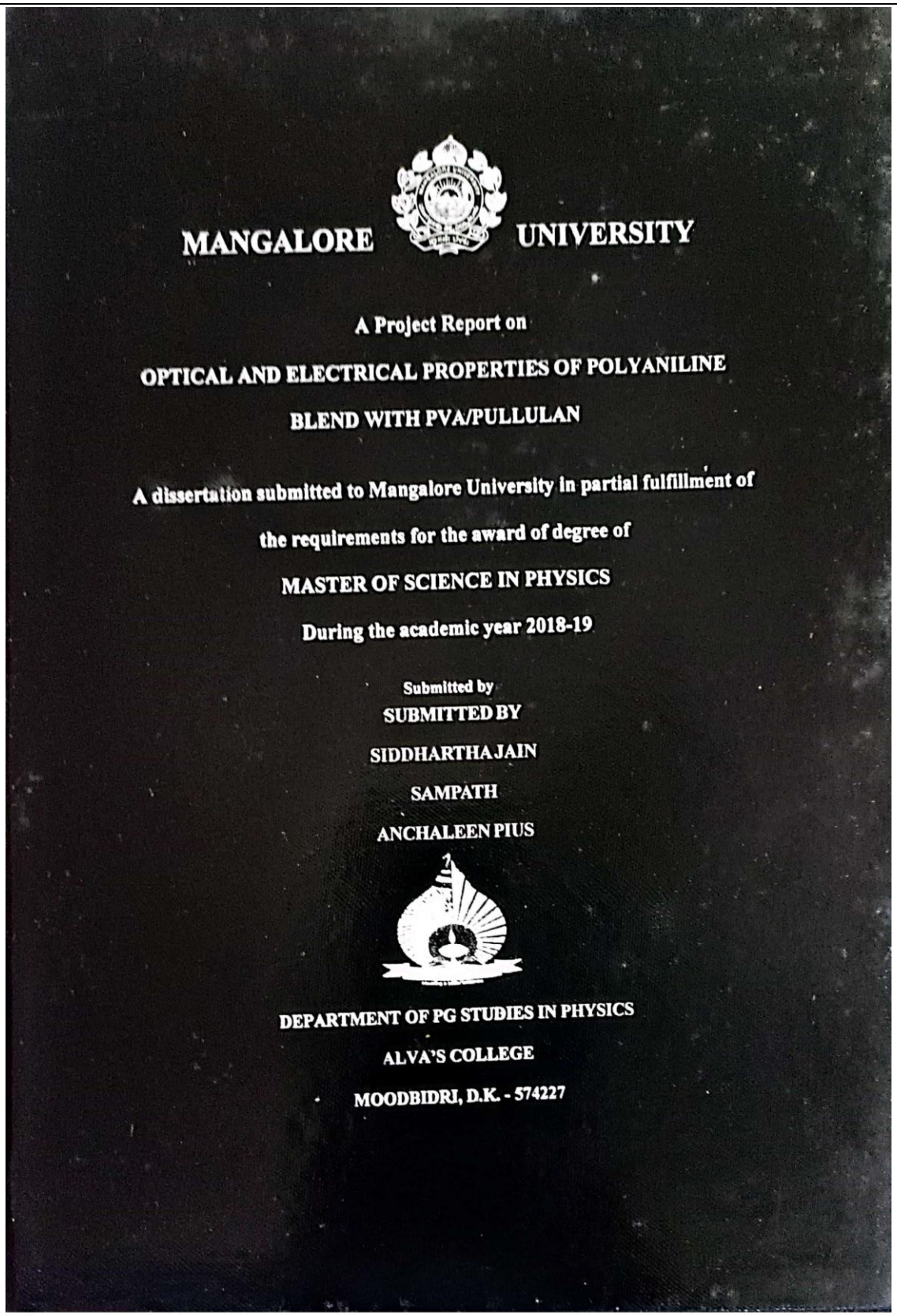
Sushmitha S Salian

Vandana H

Vrinda Surendran V V

ABSTRACT

The main aim of our report is to comprehend the fundamental aspects of NMR or EFNMR by using Magritek's Terranova Spectrometer. During the signal acquisition from EFNMR setup, the NMR signal is hindered by the external electric fields from main AC line of 50 Hz, signals from nearby electronic instruments etc. So the main goal is to reduce the level of noise using some shield and to get a decent signal free of noise. For this purpose, we are fabricating Faraday cage using conducting material like aluminium, gold, copper etc. We prefer aluminium as it is inexpensive compared to other materials. The effectiveness of shield can be obtained from the consideration of skin depth. The thickness of the shield was found using the skin depth formula. So Faraday cage of 1cm thickness is fabricated. After the fabrication, some basic experiments are performed with and without using Faraday cage to observe the reduction in the noise from the NMR signal.



MANGALORE UNIVERSITY

A Project Report on

OPTICAL AND ELECTRICAL PROPERTIES OF POLYANILINE BLEND WITH PVA/PULLULAN

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2018-19

Submitted by

SUBMITTED BY

SIDDHARTHA JAIN

SAMPATH

ANCHALEEN PIUS

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DEPARTMENT OF PG STUDIES IN PHYSICS

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CERTIFICATE

This is to certify that the dissertation entitled **"Optical and electrical properties of polyaniline blend with PVA/pullulan"** submitted by **Mr. SIDDHARTHA JAIN, SAMPATH** and **ANCHALEEN PIUS** is a record of project work carried out at Alva's Institute of Engineering and Technology, Mijar towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2018-2019

Internal Guide

Coordinator

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Date: 31/5/19

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CERTIFICATE

This is to certify that **Siddhartha Jain, Sampath** and **Anchaleen Pius** from second **M.sc (Physics), Centre for Post Graduate Studies and Research, Alva's college, Moodbidri, Karnataka,** has worked out on the project entitled **"Optical and electrical properties of polyaniline blend with PVA/pullulan "**.This work is for partial fulfillment of project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2018-19.

04/05/2019.

Guide

Dr. Ramaprasad A. T

H. O. D.

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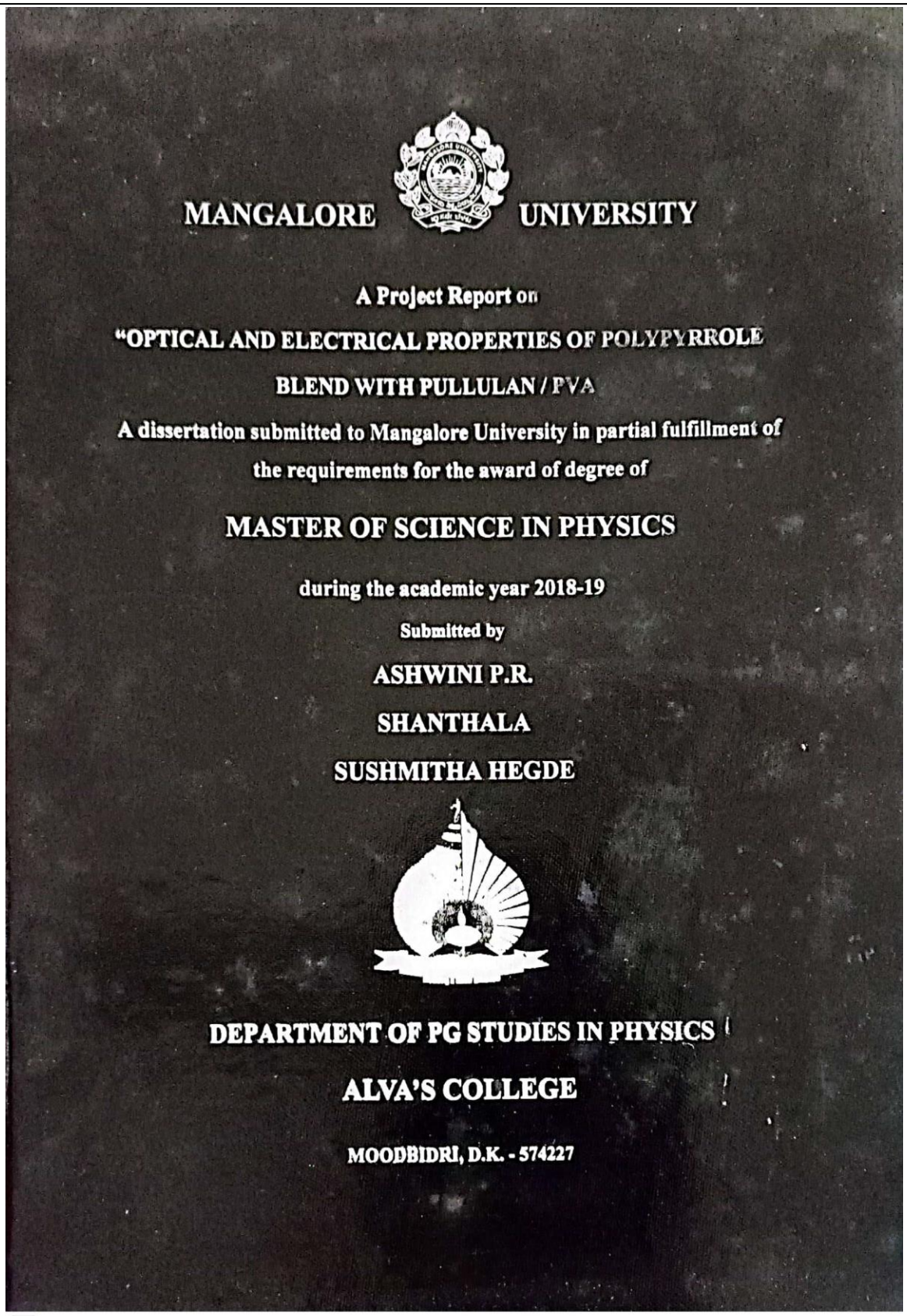

MANGALORE UNIVERSITY

A Project Report on

"OPTICAL AND ELECTRICAL PROPERTIES OF POLYPYRROLE BLEND WITH PULLULAN / PVA

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

during the academic year 2018-19

Submitted by

ASHWINI P.R.

SHANTHALA

SUSHMITHA HEGDE

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MANGALORE UNIVERSITY

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CERTIFICATE

This is to certify that the dissertation entitled **"Optical and electrical properties of polypyrrole blend with pullulan/PVA"** submitted by **Mrs.Ashwini P.R.** (register number **175026009), Mrs.Shanthala** (register number **175026021**) and **Ms.Sushmitha Hegde** (register number **175026025**) is a record of project work carried out at, Alva's Institute of Engineering and Technology, Mijar towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2018-2019.

Internal Guides

(Mrs.Jyothi John)
(Ms.Archana N)

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(Dr. Shashidhara Bhat)
Co - Ordinator
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Alva's College, Moodbidri - 574 227.

Approved and submitted to Mangalore University.

Date: 03/05/19
Place: Moodbidri

Principal
(Dr. Kurian)

Principal
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MOODBIDRI - 574227 D K

Alva's Institute of Engineering & Technology

Shobhavana Campus, Mijar, Moodbidri, D.K – 574225

Phone: 08258-262725, Fax: 08258-262726

CERTIFICATE

This is to certify that **Mrs.Ashwini P.R.** (Reg.No:**175026009**), **Mrs.Shanthala** (Reg.No:**175026021**) and **Ms. Sushmitha Hegde** (Reg.No:**175026025**) from second **M.sc (Physics), Centre for Post Graduate Studies and Research, Alva's college, Moodbidri, Karnataka,** has worked out on the project entitled **"Optical and electrical properties of polypyrrole blend with pullulan/PVA".**This work is for partial fulfillment of project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2018-19.

04/05/2019

Guide

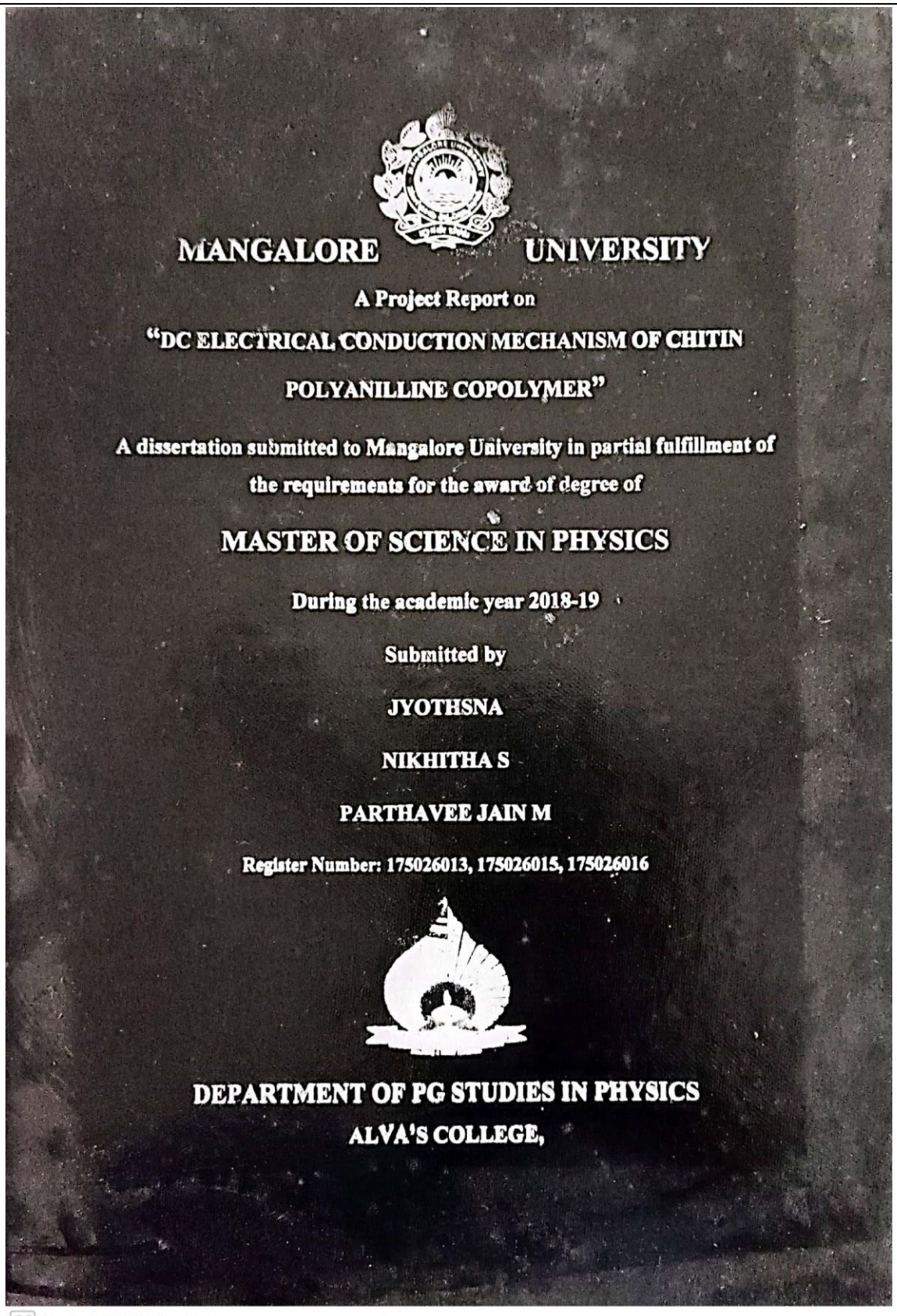
(Dr. Ramaprasad A.T)

H. O. D.

Dept. Of Physics

Alva's Institute of Engg. & Technology

Mijar, MOODBIDRI - 574 225



MANGALORE UNIVERSITY

A Project Report on

"DC ELECTRICAL CONDUCTION MECHANISM OF CHITIN POLYANILLINE COPOLYMER"

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2018-19

Submitted by

JYOTHSNA

NIKHITHA S

PARTHAVEE JAIN M

Register Number: 175026013, 175026015, 175026016

DEPARTMENT OF PG STUDIES IN PHYSICS

ALVA'S COLLEGE,

MANGALORE UNIVERSITY

A Project Report on

"DC ELECTRICAL CONDUCTION MECHANISM OF CHITIN POLYANILLINE COPOLYMER"

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DEPARTMENT OF PG STUDIES IN PHYSICS

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ALVA'S COLLEGE

MOODBIDRI, D.K. - 574227

CERTIFICATE

This is to certify that the dissertation entitled **"DC Electrical conduction mechanism of Chitin polyanilline copolymer"** submitted by **Jyothsna, Nikhitha S, Parthavee Jain M** bearing registration number is 175026013, 175026015, 175026016 a record of project work carried out at AIET Mijar under the Supervision of Dr.A.T.Ramaprasad towards the partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore university for the academic year 2018-2019.

03/05/19

Internal guide

Coordinator
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Approved and submitted to Mangalore University.

Date: 03-05-2019

Place: Moodbidri

Principal

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CERTIFICATE

This is to certify that **Jyothsna, Nikhitha S, Parthavee Jain M** (Reg.No. 175026013,175026015,175026016) from **second year M.Sc. (Physics), Centre for Post Graduate Studies and Research, Alva's College, Moodbidri, Karnataka** has worked on the project entitled **"DC Electrical conduction mechanism of Chitin polyanilline copolymer".**This work is for partial fulfillment of Project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore University for the academic year 2018-2019.

03/05/2019

Guide

Dr.A.T.Ramaprasad
H.O.D.
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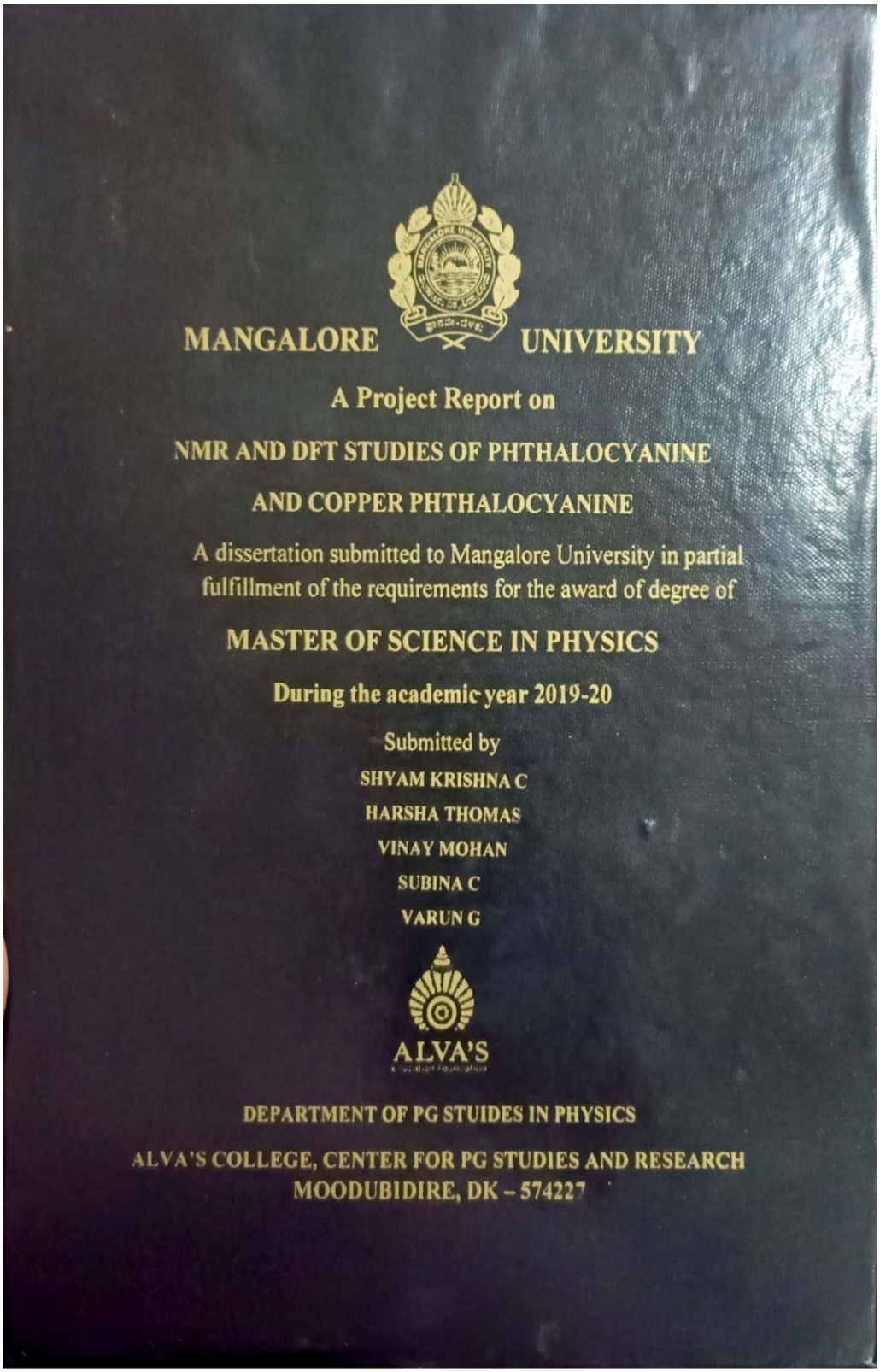
REPORTS ON RESEARCH ACTIVITIES DURING 2019-20 IN THE LAB

The Students of Masters of Physics utilize the lab for their master's project (Thesis) and the below table details out the list of students and their project supervisor with topic who have utilized the lab for the same.

Sl. No.	TITLE OF THE MASTER'S THESIS	STUDENT'S NAME	FACULTY
1.	PVA/Pullulan/Polyaniline composite as humidity sensors	Chaithanya Balakrishnan Rohit P	Dr. Ramaprasad A. T.
2.	Synthesis and characterization of polypyrrole grafted PVA/Pullulan blend	Neenu Jolly Sampath Marathe	
3.	Bi_2O_3 Nano particle dispersed chitosan PVA polymer nano composite as radiation attenuator	Sanoj T I Sreeshma G Vinayak K V	
4.	NMR and DFT Studies of Phthalocyanine and Copper Phthalocyanine	Shyam Krishna C Harsha Thomas Vinay Mohan Subina C Varun G	Dr. Shashi Kumar K.

OUTCOME OF RESEARCH AT NOEL-EFNMR LAB, DEPT. OF PHYSICS AS MASTER THESIS OF M-Sc PG STUDENTS DURING 2019-20



MANGALORE UNIVERSITY

A Project Report on

NMR AND DFT STUDIES OF PHTHALOCYANINE AND COPPER PHTHALOCYANINE

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2019-20

Submitted by

SHYAM KRISHNA C
HARSHA THOMAS
VINAY MOHAN
SUBINA C
VARUN G

ALVA'S

DEPARTMENT OF PG STUIDES IN PHYSICS

ALVA'S COLLEGE, CENTER FOR PG STUDIES AND RESEARCH
MOODUBIDIRE, DK – 574227

MANGALORE UNIVERSITY

A Project Report on

NMR AND DFT STUDIES OF PHTHALOCYANINE AND COPPER PHTHALOCYANINE

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2019-20

Submitted by

HARSHA THOMAS

Register Number: **186015709**

ALVA'S
Education Foundation

DEPARTMENT OF PG STUIDES IN PHYSICS

ALVA'S COLLEGE, CENTER FOR PG STUDIES AND RESEARCH
MOODUBIDIRE, DK – 574227

ALVA'S

DEPARTMENT OF PG STUDIES IN PHYSICS

ALVA'S COLLEGE, CENTER FOR PG STUDIES AND RESEARCH

MOODUBIDIRE, DK – 574227

CERTIFICATE

This is to certify that the dissertation entitled **"NMR AND DFT STUDIES OF PHTHALOCYANINE AND COPPER PHTHALOCYANINE"** submitted by **Ms. HARSHA THOMAS** bearing registration number **186015709** is a record of project work carried out at Department of PG Studies in Physics, Alva's College, Center For PG Studies and Research, Moodubidire towards the partial fulfillment of project work (PHP-559) required for the award of degree of **MASTER OF SCIENCE IN PHYSICS** from Mangalore University for the academic year 2019-20.

Guide

(Dr. SHASHI KUMAR KUMARASWAMY)

Coordinator

(Dr. SHASHIDHARA BHAT)

Internal Guide

(Dr. SHASHIDHARA BHAT)

Department of P.G. Studies in Physics, Alva's College, Moodbidri

---

Approved and submitted to Mangalore University.

Date: 12/9/2020

Place: Moodubidire

Principal

(Dr. Kurian)

DECLARATION

I hereby declare that the project work entitled **"NMR AND DFT STUDIES OF PHTHALOCYANINE AND COPPER PHTHALOCYANINE"** has been carried out by me Alva's College, Moodubidire under the guidance of **Dr. SHASHI KUMAR KUMARASWAMY**, Department of PG Studies in Engineering Physics, Alvas's Institute of Engineering and Technology, Mijar, during the academic year 2019-20. This report is submitted to the Mangalore University for the partial fulfillment of the requirement for Project work (PHP - 559) for the award of the degree of Master of Science in Physics.

Date:

HARSHA THOMAS

Abstract

The purpose of our thesis is to understand the current developed techniques in solution-state nuclear magnetic resonance(NMR) of paramagnetic metal organic system in combination with quantum chemical calculation method such as density functional theory (DFT) and hence to apply the same to paramagnetic metal organic copper-phthalocyanine (CuPc) complexes.

NMR is the most powerful method for the identification of organic compounds and is widely applied in many fields. NMR is mostly performed on diamagnetic systems and the information obtained from it is rich of structural information. Despite the success of NMR it is very difficult to assign the NMR signals in the paramagnetic complexes. Signals from NMR of paramagnetic materials suffer from huge loss of sensitivity and resolution due to hyperfine interaction. Out of many interactions found in NMR the interaction between the unpaired electron and nucleus which causes the hyperfine splitting is the strongest in paramagnetic NMR. In one hand large broadening of signals which is due to the fast relaxation of nucleus causes huge loss in sensitivity and resolution. On the other hand diamagnetic shifts which contain valuable structural information are masked by Fermi contact interaction. Recent developments in the area of solution state NMR of paramagnetic metal-organic systems such as results from the work of Pell et al.,[66] , Bertini et al.,[67] form the major inspiration of this work.

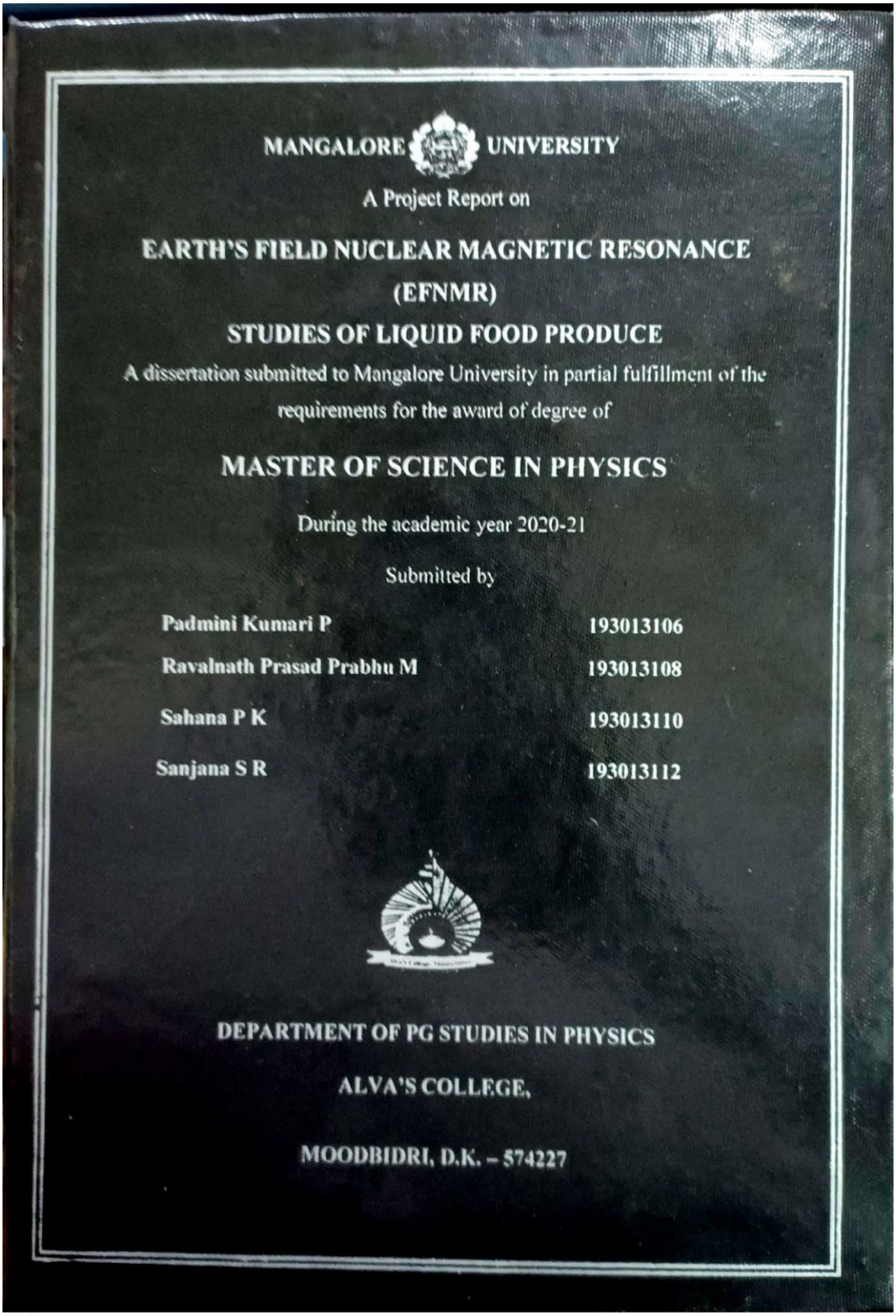
Nuclear magnetic shielding tensors of PC, CuPc and Znpc been calculated at density functional B3LYP using the gauge independent atomic orbital (GIAO) method. The geometries used were optimized using the 6-311G, 6311D(d) basis set and the NMR calculations were performed using 6-311G(d,p) basis sets. The calculated NMR shielding tensors and chemical shifts of phthalocyanine and metal phthalocyanine are compared with previous calculations as well as experimental data and satisfying results are obtained. Further NMR calculations are extended to metal-free and metal-phthalocyanine, for the first time and the results are compared with experimental data available. The chemical shifts of the atoms in these compounds are assigned according to the experimental data available.

REPORTS ON RESEARCH ACTIVITIES DURING 2020-2021 IN THE LAB

The Students of Masters of Physics utilize the lab for their master's project (Thesis) and the below table details out the list of students and their project supervisor with topic who have utilized the lab for the same.

Sl. No.	TITLE OF THE MASTER'S THESIS	STUDENT'S NAME	FACULTY
1.	Earth's Field Nuclear Magnetic Resonance (EFNMR) Studies of Liquid Food Produce	Padmini Kumari P Ravalnath Prasad Prabhu M Sahana P K Sanjana S R	Dr. Shashi Kumar K.

OUTCOME OF RESEARCH AT NOEL-EFNMR LAB, DEPT. OF PHYSICS AS MASTER THESIS OF M-Sc PG STUDENTS DURING 2020-21



MANGALORE UNIVERSITY

A Project Report on

EARTH'S FIELD NUCLEAR MAGNETIC RESONANCE (EFNMR) STUDIES OF LIQUID FOOD PRODUCE

A dissertation submitted to Mangalore University in partial fulfillment of the requirements for the award of degree of

MASTER OF SCIENCE IN PHYSICS

During the academic year 2020-21

Submitted by

Padmini Kumari P	193013106
Ravalnath Prasad Prabhu M	193013108
Sahana P K	193013110
Sanjana S R	193013112

DEPARTMENT OF PG STUDIES IN PHYSICS

ALVA'S COLLEGE,

MOODBIDRI, D.K. – 574227

MANGALORE UNIVERSITY

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MASTER OF SCIENCE IN PHYSICS

During the academic year 2020-21

Submitted by

Padmini Kumari P	193013106
Ravalnath Prasad Prabhu M	193013108
Sahana P K	193013110
Sanjana S R	193013112

DEPARTMENT OF PG STUDIES IN PHYSICS

ALVA'S COLLEGE,

MOODBIDRI, D.K. – 574227

DEPARTMENT OF PG STUDIES IN PHYSICS ALVA'S COLLEGE

MOODBIDRI, D.K. - 574227

CERTIFICATE

This is to certify that the dissertation entitled "EARTH'S FIELD NUCLEAR MAGNETIC RESONANCE (EFNMR) STUDIES OF LIQUID FOOD PRODUCE" submitted by **Ms. Padmini Kumari P, Ms. Sanjana S R, Ms. Sahana P K, Mr Ravanath Prasad Prabhu M** bearing registration number **193013106, 193013112, 193013110 , 193013108** is a record of project work carried out at Alva's Institute of Engineering & Technology(AIET), Mijar under the Supervision of Dr.ShashiKumar K towards the partial fulfillment of Project work (PHP-559) required for the award of degree of MASTER OF SCIENCE IN PHYSICS from Mangalore university for the academic year 2020-2021.

Guide 29/10/2021

(Dr. SHASHI KUMAR KUMARASWAMY)

Internal guide

(Mrs SOMYA RAI)

Coordinator

(Dr. SHASHIDHARA BHAT)

Co - Ordinator
Department of P. G. Studies in Physics
Alva's College, Moodbidri - 574 227.

Approved and submitted to Mangalore University.

Date:

DECLARATION

I hereby declare that the project work entitled "**EARTH'S FIELD NUCLEAR MAGNETIC RESONANCE (EFNMR) STUDIES OF LIQUID FOOD PRODUCE**". has been carried out by me at Alva's Institute of Engineering & Technology(AIET), Mijar and Instituteunder the guidance of Dr.ShashiKumar K, during the academic year 2020 – 2021. This report is submitted to Mangalore University for the partial fulfillment of the requirement for Project work (PHP559) for the award of the degree of Master of Science in Physics.

Date: 29/10/2021

Place: Moodbidri

(NAME OF THE STUDENT)

Sahana P K - Sanjana.S.R

- Padmini.P

- Ravinath.P

ACKNOWLEDGEMENT

The success and final outcome of this project required a lot of guidance and assistance from many people and I am extremely privileged to have got this all along the completion of my project. All that I have done is only due to such supervision and assistance and I would not forget to thank them.

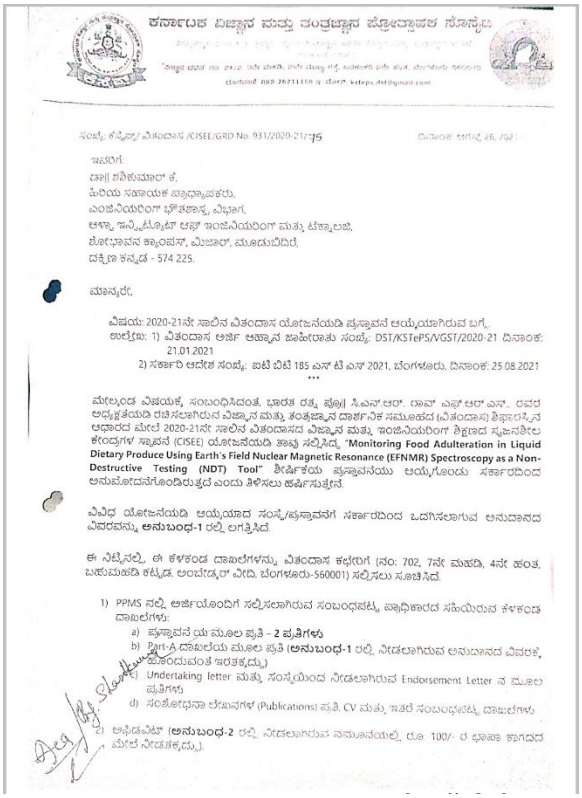
I owe my deep gratitude to my project guide **Dr. Shashi Kumar K,** assistant professor, Department of Physics at Alva's institute of engineering and technology, Mijar who took keen interest on my project work and guided me all along, till the completion of my project work by providing all the necessary information.

I heartly thank **Dr. Shashidhar Bhat,** co-ordinator Department of physics for his guidance and also other faculties for their encouragement and support during this project work.

I would like to express my heart full gratitude to thank **Dr. Kurian,** Principal Alva's college, Moodbidri for valuable suggestions and moral support throughout the course of the project.

Finally, I wish to thank my family, friends and others who have helped me in innumerable ways in completing this project work successfully.

Outcome of NOEL-EFNMR Lab activities of Department of Physics has led to obtaining a funding of 30.00 Lakhs under **CENTRE FOR INNOVATION IN SCIENCE AND ENGINEERING EDUCATION, VISION GROUP OF SCIENCE & TECHNOLOGY, KSTePS, Department of Elecronics, IT & BT, Government of Karnataka**, for project titled "Monitoring Food Adulteration in Liquid Dietary Produce Using Earth's Field Nuclear Magnetic Resonance (EFNMR) Spectroscopy as a Non-Destructive Testing (NDT) Tool" with PI as Dr. Shashi Kumar K, and Co-PI as Dr. Ramaprasad A T.



ಕರ್ನಾಟಕ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಪ್ರೋದ್ಯಾಪಕ ಸೌಸ್ಯಬ

ಸಂಖ್ಯೆ: ಕೆಸ್ಟೆಪ್ಸ್/ ವಿತಂದಾಸ /CISEE/GRD No. 931/2020-21/75 ದಿನಾಂಕ: ಆಗಸ್ಟ್ 26, 2021

ಇವರಿಗೆ:
ಡಾ|| ಶಶಿಕುಮಾರ್ ಕೆ.
ಹಿರಿಯ ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು,
ಎಂಜಿನಿಯರಿಂಗ್ ಭೌತಶಾಸ್ತ್ರ ವಿಭಾಗ,
ಆಳ್ವಾ ಇನ್ಸ್‌ಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ,
ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ,
ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.

ಮಾನ್ಯರೇ,

ವಿಷಯ: 2020-21ನೇ ಸಾಲಿನ ವಿತಂದಾಸ ಯೋಜನೆಯಡಿ ಪ್ರಸ್ತಾವನೆ ಆಯ್ಕೆಯಾಗಿರುವ ಬಗ್ಗೆ.
ಉಲ್ಲೇಖ: 1) ವಿತಂದಾಸ ಅರ್ಜಿ ಆಹ್ವಾನ ಜಾಹೀರಾತು ಸಂಖ್ಯೆ: DST/KSTePS/VGST/2020-21 ದಿನಾಂಕ: 21.01.2021
2) ಸರ್ಕಾರಿ ಆದೇಶ ಸಂಖ್ಯೆ: ಐಟಿ ಬಿಟಿ 185 ಎನ್ ಟಿ ಎಸ್ 2021, ಬೆಂಗಳೂರು, ದಿನಾಂಕ: 25.08.2021

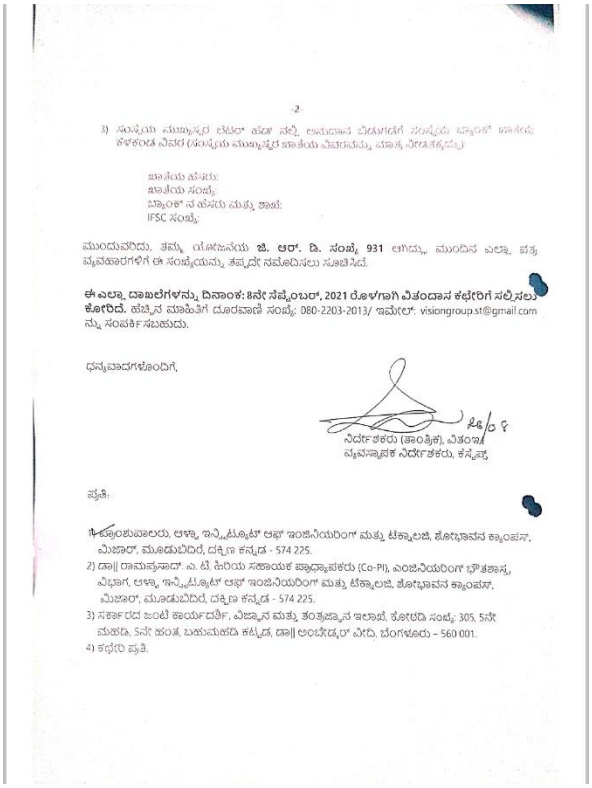
***

ಮೇಲ್ಕಂಡ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ಭಾರತ ರತ್ನ ಪೂಜ್ಯ ಸಿ.ಎನ್.ಆರ್. ರಾವ್ ಎಫ್.ಆರ್.ಎಸ್., ರವರ ಅಧ್ಯಕ್ಷತೆಯಡಿ ರಚಿಸಲಾಗಿರುವ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ದಾರ್ಶನಿಕ ಸಮೂಹದ (ವಿತಂದಾಸ) ಶಿಫಾರಸ್ಸಿನ ಆಧಾರದ ಮೇಲೆ 2020-21ನೇ ಸಾಲಿನ ವಿತಂದಾಸದ ವಿಜ್ಞಾನ ಮತ್ತು ಇಂಜಿನಿಯರಿಂಗ್ ಶಿಕ್ಷಣದ ಸೃಜನಶೀಲ ಕಂದಮ್ಮಗಳ ಸ್ಪಾವನೆ (CISEE) ಯೋಜನೆಯಡಿ ತಾವು ಸಲ್ಲಿಸಿದ್ದ, **"Monitoring Food Adulteration in Liquid Dietary Produce Using Earth's Field Nuclear Magnetic Resonance (EFNMR) Spectroscopy as a Non-Destructive Testing (NDT) Tool"** ಶೀರ್ಷಿಕೆಯ ಪ್ರಸ್ತಾವನೆಯು ಆಯ್ಕೆಗೊಂಡು ಸರ್ಕಾರದಿಂದ ಅನುಮೋದನೆಗೊಂಡಿರುತ್ತದೆ ಎಂದು ತಿಳಿಸಲು ಹರ್ಷಿಸುತ್ತೇನೆ.

ವಿವಿಧ ಯೋಜನೆಯಡಿ ಆಯ್ಕೆಯಾದ ಸಂಸ್ಥೆ/ಪ್ರಸ್ತಾವನೆಗಳಿಗೆ ಸರ್ಕಾರದಿಂದ ಒದಗಿಸಲಾಗುವ ಅನುದಾನದ ವಿವರವನ್ನು **ಅನುಬಂಧ-1** ರಲ್ಲಿ ಲಗತ್ತಿಸಿದೆ.

ಈ ನಿಟ್ಟಿನಲ್ಲಿ, ಈ ಕೆಳಕಂಡ ದಾಖಲೆಗಳನ್ನು ವಿತಂದಾಸ ಕಛೇರಿಗೆ (ನಂ: 702, 7ನೇ ಮಹಡಿ, 4ನೇ ಹಂತ, ಬಹುಮಹಡಿ ಕಟ್ಟಡ, ಅಂಬೇಡ್ಕರ್ ವೀದಿ, ಬೆಂಗಳೂರು-560001) ಸಲ್ಲಿಸಲು ಸೂಚಿಸಿದೆ.

1) PPMS ನಲ್ಲಿ ಅರ್ಜಿಯೊಂದಿಗೆ ಸಲ್ಲಿಸಲಾಗಿರುವ ಸಂಬಂಧಪಟ್ಟ ಪ್ರಾಧಿಕಾರದ ಸಹಿಯಿರುವ ಕೆಳಕಂಡ ದಾಖಲೆಗಳು:
   a) ಪ್ರಸ್ತಾವನೆಯ ಮೂಲ ಪ್ರತಿ – **2 ಪ್ರತಿಗಳು**
   b) ಫಾರ್ಮ್-A ದಾಖಲೆಯ ಮೂಲ ಪ್ರತಿ (**ಅನುಬಂಧ-1** ರಲ್ಲಿ ನೀಡಲಾಗಿರುವ ಅನುದಾನದ ವಿವರಕ್ಕೆ ಹೊಂದುವಂತೆ ಇರತಕ್ಕದ್ದು.)
   c) Undertaking letter ಮತ್ತು ಸಂಸ್ಥೆಯಿಂದ ನೀಡಲಾಗಿರುವ Endorsement Letter ನ ಮೂಲ ಪ್ರತಿಗಳು
   d) ಸಂಶೋಧನಾ ಲೇಖನಗಳ (Publications) ಪ್ರತಿ, CV ಮತ್ತು ಇತರೆ ಸಂಬಂಧಪಟ್ಟ ದಾಖಲೆಗಳು
2) ಅಫಿಡವಿಟ್ (**ಅನುಬಂಧ-2** ರಲ್ಲಿ ನೀಡಲಾಗಿರುವ ನಮೂನೆಯಲ್ಲಿ, ರೂ 100/- ರ ಭಾಷಾ ಕಾಗದದ ಮೇಲೆ ನೀಡತಕ್ಕದ್ದು.)



-2-

3) ಸಂಸ್ಥೆಯ ಮುಖ್ಯಸ್ಥರ ಲೆಟರ್ ಹೆಡ್ ನಲ್ಲಿ, ಅನುದಾನ ಬಿಡುಗಡೆಗೆ ಸಂಸ್ಥೆಯ ಬ್ಯಾಂಕ್ ಖಾತೆಯ ಕೆಳಕಂಡ ವಿವರ (ಸಂಸ್ಥೆಯ ಮುಖ್ಯಸ್ಥರ ಖಾತೆಯ ವಿವರವನ್ನು ಮಾತ್ರ ನೀಡತಕ್ಕದ್ದು.)

ಖಾತೆಯ ಹೆಸರು:
ಖಾತೆಯ ಸಂಖ್ಯೆ
ಬ್ಯಾಂಕ್ ನ ಹೆಸರು ಮತ್ತು ಶಾಖೆ:
IFSC ಸಂಖ್ಯೆ:

ಮುಂದುವರಿದು, ತಮ್ಮ ಯೋಜನೆಯ **ಜಿ. ಆರ್. ಡಿ. ಸಂಖ್ಯೆ 931** ಆಗಿದ್ದು, ಮುಂದಿನ ಎಲ್ಲಾ ಪತ್ರ ವ್ಯವಹಾರಗಳಿಗೆ ಈ ಸಂಖ್ಯೆಯನ್ನು ತಪ್ಪದೇ ನಮೂದಿಸಲು ಸೂಚಿಸಿದೆ.

ಈ ಎಲ್ಲಾ ದಾಖಲೆಗಳನ್ನು ದಿನಾಂಕ: 8ನೇ ಸೆಪ್ಟೆಂಬರ್, 2021 ರೊಳಗಾಗಿ ವಿತಂದಾಸ ಕಛೇರಿಗೆ ಸಲ್ಲಿಸಲು ಕೋರಿದೆ. ಹೆಚ್ಚಿನ ಮಾಹಿತಿಗೆ ದೂರವಾಣಿ ಸಂಖ್ಯೆ: 080-2203-2013/ ಇಮೇಲ್: visiongroup.st@gmail.com ನ್ನು ಸಂಪರ್ಕಿಸಬಹುದು.

ಧನ್ಯವಾದಗಳೊಂದಿಗೆ,

ನಿರ್ದೇಶಕರು (ತಾಂತ್ರಿಕ), ವಿತಂದಾಸ
ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ಕೆಸ್ಟೆಪ್ಸ್

ಪ್ರತಿ:

1) ಕುಲಸಚಿವರು, ಆಳ್ವಾ ಇನ್ಸ್‌ಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ, ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ, ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.
2) ಡಾ|| ರಾಮಪ್ರಸಾದ್. ಎ. ಟಿ, ಹಿರಿಯ ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು (Co-PI), ಎಂಜಿನಿಯರಿಂಗ್ ಭೌತಶಾಸ್ತ್ರ ವಿಭಾಗ, ಆಳ್ವಾ ಇನ್ಸ್‌ಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ, ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ, ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.
3) ಸರ್ಕಾರದ ಜಂಟಿ ಕಾರ್ಯದರ್ಶಿ, ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಇಲಾಖೆ, ಕೋಠಡಿ ಸಂಖ್ಯೆ 305, 5ನೇ ಮಹಡಿ, 5ನೇ ಹಂತ, ಬಹುಮಹಡಿ ಕಟ್ಟಡ, ಡಾ|| ಅಂಬೇಡ್ಕರ್ ವೀದಿ, ಬೆಂಗಳೂರು – 560 001.
4) ಕಛೇರಿ ಪ್ರತಿ.

CISEE, VGST, KSTePS, GRANT SANCTION LETTER

ಕರ್ನಾಟಕ ಸರ್ಕಾರ
ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ದಾರ್ಶನಿಕ ಸಮೂಹ
ಮಾಹಿತಿ ತಂತ್ರಜ್ಞಾನ, ಜೈವಿಕ ತಂತ್ರಜ್ಞಾನ ಹಾಗೂ ವಿಜ್ಞಾನ ಮತ್ತು ತಂತ್ರಜ್ಞಾನ ಇಲಾಖೆ
ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ಸಚಿವಾಲಯ, 7ನೇ ಮಹಡಿ, 4ನೇ ಗೇಟ್, ಬಹುಮಹಡಿ ಕಟ್ಟಡ, ಡಾ॥ ಅಂಬೇಡ್ಕರ್ ವೀದಿ, ಬೆಂಗಳೂರು-560 001
ದೂರವಾಣಿ: 080-2203 2013, ಇ-ಮೇಲ್: visiongroup.st@gmail.com, ವೆಬ್‌ಸೈಟ್: www.vgst.in

ಸಂಖ್ಯೆ: ವಿತಂದಾಸ/ಅನುಮೋದನೆ ಪತ್ರ/ಜಿ.ಆರ್.ಡಿ ಸಂಖ್ಯೆ: 931/2020-21/191 ದಿನಾಂಕ: 21.12.2021

ಇವರಿಗೆ,
ಪ್ರಾಂಶುಪಾಲರು,
ಆಳ್ವಾ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ,
ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ,
ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.

ಮಾನ್ಯರೆ,

ವಿಷಯ: **CISEE** ಯೋಜನೆಯಡಿಯಲ್ಲಿ ಆಯ್ಕೆಯಾಗಿರುವ ಫಲಾನುಭವಿ ವಿದ್ಯಾಸಂಸ್ಥೆಗಳಿಗೆ ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನದಿಂದ ಉಪಕರಣಗಳ/ವಸ್ತುಗಳ (ಪಾರ್ಟ್-ಎ) ಖರೀದಿಗೆ (ಜಿ.ಆರ್.ಡಿ- **931**) ಅನುಮೋದನೆ ನೀಡುವ ಬಗ್ಗೆ.

ಉಲ್ಲೇಖ: 1.ಸೂಚನೆ ಪತ್ರ ಸಂಖ್ಯೆ: ಕೆಸ್ಟೆಪ್ಸ್/ ವಿತಂದಾಸ /CISEE/GRD No.931/2020-21/75
ದಿನಾಂಕ: ಆಗಸ್ಟ್ 26, 2021
2. ತಮ್ಮ ಸಂಸ್ಥೆಯಿಂದ ದಾಖಲೆಗಳನ್ನು ಸಲ್ಲಿಸಿದ ದಿನಾಂಕ:06-09-2021.
3.ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನ ಬಿಡುಗಡೆಯ ಪತ್ರದ ಸಂಖ್ಯೆ:KSTePS/VGST/2020-21/CISEE/**GRD- 931/09**/2021-22/774 ದಿನಾಂಕ: 29-10-2021.

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ಈ ಮೇಲಿನ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ, ವಿಜ್ಞಾನ ಹಾಗೂ ತಂತ್ರಜ್ಞಾನ ದಾರ್ಶನಿಕ ಸಮೂಹ (ವಿತಂದಾಸ) ದ ವಿವಿಧ ಯೋಜನೆಗಳಲ್ಲೊಂದಾದ **CISEE** ಕಾರ್ಯಕ್ರಮದಡಿ 2020-21ನೇ ಸಾಲಿನಲ್ಲಿ ಆಯ್ಕೆಯಾಗಿದ್ದ **ಡಾ॥ ಶಶಿಕುಮಾರ್ ಕೆ, ಎಂಜಿನಿಯರಿಂಗ್ ಭೌತಶಾಸ್ತ್ರ ವಿಭಾಗ, ಆಳ್ವಾ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ, ದಕ್ಷಿಣ ಕನ್ನಡ** (ಜಿ.ಆರ್.ಡಿ- 931) ರವರು ಸಲ್ಲಿಸಿದ **"Monitoring Food Adulteration in Liquid Dietary Produce Using Earth's Field Nuclear Magnetic Resonance (EFNMR) Spectroscopy as a Non-Destructive Testing (NDT) Tool"** ಶೀರ್ಷಿಕೆಯ ಪ್ರಸ್ತಾವನೆಗೆ ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನವಾಗಿ ರೂ. **15,00,000/-** ಗಳನ್ನು RTGSನ ಮೂಲಕ ಬಿಡುಗಡೆ ಮಾಡಲಾಗಿರುವುದು ಸರಿಯಷ್ಟೆ.

ಈ ನಿಟ್ಟಿನಲ್ಲಿ, ವಿತಂದಾಸದ ವಿಮರ್ಶಾ ಸಮಿತಿಯ ಶಿಫಾರಸ್ಸಿನ ಆಧಾರದ ಮೇಲೆ ಮತ್ತು ಯೋಜನಾ ಸಂಯೋಜಕರು ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನಕ್ಕೆ ಸಲ್ಲಿಸಿದ್ದ PART-A ದಾಖಲೆಗೆ ಅನುಗುಣವಾಗಿ ರೇಕರಿಂಗ್ ಮತ್ತು ನಾನ್-ರೇಕರಿಂಗ್ ವಸ್ತುಗಳ ಅಡಿಯಲ್ಲಿ ಉಪಕರಣಗಳು / ವಸ್ತುಗಳ ಖರೀದಿಗೆ ಅನುಮೋದನೆಯನ್ನು ಈ ಕೆಳಗಿನಂತೆ ನೀಡಲಾಗಿದೆ:

Table 1: PART-A ಪ್ರಕಾರ ನಾನ್-ರೇಕರಿಂಗ್ ಮತ್ತು ರೇಕರಿಂಗ್ ವಿವರಗಳ ಪಟ್ಟಿ ಈ ಕೆಳಗಿನಂತಿವೆ

ಕ್ರಮ ಸಂಖ್ಯೆ	ವಿವರಗಳು ನಾನ್-ರೇಕರಿಂಗ್	ಒಟ್ಟು ಪ್ರಮಾಣ	ವಿತಂದಾಸದಿಂದ ಅನುಮೋದನೆ ನೀಡಿದ ಮೊತ್ತ (ರೂ. ಗಳಲ್ಲಿ)
	ಇ-ಟೆಂಡರ್		
1	UV-VIS NIR Spectrometer (Double validation of EFNMR as Food adulteration monitoring tool)	01	9,00,000
2	Glove Box (Inert storage space for dry liquid produce samples of longer shelf life viz., oils, syrups, honey etc.)	01	2,30,000
	A) ಇ-ಟೆಂಡರ್ ಮೊತ್ತ		**11,30,000.00**
	ಮಾನ್ಯುಯಲ್ ಟೆಂಡರ್		
3	Refrigerator (Inert storage space for wet liquid produce samples of shorter shelf life viz., Milk, Clarified Butter, Cream etc.)	01	31,000
4	Desktop Computer Workstation with monitor (For EFNMR/MRI data acquisition and processing)	01	99,000
5	Hot Air Oven (Homogenous heating of the samples and dry estimation of adulterants)	01	50,000
6	Magnetics Stirrer Ceramic Hot Plate(Homogenizing samples before EFNMR measurement)	01	20,000
7	Micro-pipette with disposable tips (Used in samples preparation for EFNMR experiment)	02	20,000
	B) ಮಾನ್ಯುಯಲ್ ಟೆಂಡರ್ ಮೊತ್ತ		**2,20,000.00**
	ಒಟ್ಟು ನಾನ್-ರೇಕರಿಂಗ್ ಮೊತ್ತ (A+B)		**13,50,000.00**
	ರೇಕರಿಂಗ್ ಪಟ್ಟಿ		
1	Chemicals/Glassware/plastic ware/ Biological specimens		90,000
2	Electrical & Electronics spare parts		11,250
3	Mechanical spare parts		11,250
4	Contingency		30,000
5	Books and Journal		7,500
	ಒಟ್ಟು ರೇಕರಿಂಗ್ ಮೊತ್ತ		**1,50,000.00**
	ಒಟ್ಟು ನಾನ್-ರೇಕರಿಂಗ್ ಮತ್ತು ರೇಕರಿಂಗ್ ಮೊತ್ತ		**15,00,000.00**

Table 2: ನಾನ್-ರೇಕರಿಂಗ್ ಮತ್ತು ರೇಕರಿಂಗ್ ವಿವರಗಳಿಗೆ ಅನುಮೋದನೆ ಈ ರೀತಿ ನೀಡಲಾಗಿದೆ:

ವಿವರಗಳು		ಮೊತ್ತ (ರೂ. ಗಳಲ್ಲಿ)
i)	ಹಂಚಿಕೆಯಾದ ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನದ ಮೊತ್ತ	**15,00,000.00**
ii)	ಮೊದಲನೇ ಕಂತಿಗೆ ಬಿಡುಗಡೆ ಮಾಡಲಾದ ಅನುದಾನದ ಮೊತ್ತ	**15,00,000.00**

a) ನಾನ್ ರೇಕರಿಂಗ್ ಒಟ್ಟು ವೆಚ್ಚ	**13,50,000.00**
b) ರೇಕರಿಂಗ್ ಒಟ್ಟು ವೆಚ್ಚ	**1,50,000.00**
ಫಾರ್ಟ್-ಎ ಗಾಗಿ ವಿತಂದಾಸದಿಂದ ಅನುಮೋದಿತಗೊಂಡ ಮೊತ್ತ ಒಟ್ಟು (a) + (b)	**15,00,000.00**

ಯೋಜನೆಯ ಅನುಷ್ಠಾನಕ್ಕೆ ಅನುದಾನವನ್ನು ಬಳಸುವಾಗ ಈ ಕೆಳಕಂಡ ಅಂಶಗಳನ್ನು ಅನುಸರಿಸಲು ಕೋರಲಾಗಿದೆ:

1) ಉದ್ದೇಶಿತ ಯೋಜನೆ/ಕಾರ್ಯಕ್ರಮವನ್ನು ತಮ್ಮ ಸಂಸ್ಥೆಯಿಂದಾಗಲೀ ಅಥವಾ ಬೇರೆ ಸಂಸ್ಥೆಗಳ ಮುಖಾಂತರವಾಗಲೀ ಅನುಷ್ಠಾನಗೊಳಿಸುವಾಗ ಕರ್ನಾಟಕ ಸಾರ್ವಜನಿಕ ಸಂಗ್ರಹಣೆಯಲ್ಲಿ ಪಾರದರ್ಶಕತೆ ಅಧಿನಿಯಮ - 1999 ಮತ್ತು ನಿಯಮಗಳು 2000 (KTPP Act - 1999 & Rules - 2000), ಕರ್ನಾಟಕ ಆರ್ಥಿಕ ಸಂಹಿತೆ (KFC) ಹಾಗೂ ಕರ್ನಾಟಕ ಸರ್ಕಾರದ ಮಾರ್ಗಸೂಚಿಗಳನ್ನು ಕಟ್ಟುನಿಟ್ಟಾಗಿ ಮತ್ತು ಕಡ್ಡಾಯವಾಗಿ ಅನುಸರಿಸುವುದು/ ಪಾಲಿಸುವುದು.

2) ಉದ್ದೇಶಿತ ಯೋಜನೆಯ ಅನುಷ್ಠಾನಕ್ಕೆ ಬಿಡುಗಡೆಯಾಗುವ ಅನುದಾನದಿಂದ ಅನುಮೋದಿತ ಪಾರ್ಟ್-ಎ (Part-A) ನಲ್ಲಿ ನಮೂದಿತವಾಗಿರುವ ಯಂತ್ರಗಳನ್ನು ಮಾತ್ರ ಖರೀದಿಸುವುದು ಇದರಲ್ಲಿ ಯಾವುದೇ ಬದಲಾವಣೆಗೆ ಅವಕಾಶವಿರುವುದಿಲ್ಲ.

3) ರೂ.1. ಲಕ್ಷ ಮತ್ತು ಅದಕ್ಕಿಂತ ಹೆಚ್ಚಿನ ಬೆಲೆಯ ಉಪಕರಣಗಳನ್ನು ಇ-ಟೆಂಡರ್ ಮೂಲಕ ಮಾತ್ರ ಖರೀದಿಸತಕ್ಕದ್ದು. ರೂ.1. ಲಕ್ಷಕ್ಕಿಂತ ಕಡಿಮೆ ಬೆಲೆಯ ಉಪಕರಣಗಳನ್ನು ಮಾನ್ಯುಯಲ್ ಟೆಂಡರ್ ಮೂಲಕ ಖರೀದಿಸ ಬಹುದು

4) ಫಲಾನುಭವಿ ಸಂಸ್ಥೆಗೆ ಬಿಡುಗಡೆ ಮಾಡುವ ಅನುದಾನವನ್ನು ಅಗತ್ಯಕ್ಕೆ ಅನುಗುಣವಾಗಿ ನೀಡಲಾದ ಉದ್ದೇಶಕ್ಕೆ ಮಾತ್ರ ಬಳಸುವುದು ಹಾಗೂ ಸದರಿ ಅನುದಾನಕ್ಕೆ ಬರುವ ಬ್ಯಾಂಕ್ ಬಡ್ಡಿ ಮೊತ್ತವನ್ನು ಯಾವುದೇ ಕಾರಣಕ್ಕೂ ಉದ್ದೇಶಿತ ಯೋಜನೆಯ ಅನುಷ್ಠಾನಕ್ಕೆ ಬಳಸಿಕೊಳ್ಳಲು ಅನುಮತಿ/ಅವಕಾಶವಿರುವುದಿಲ್ಲ. ಈ ಬಡ್ಡಿಯ ಮೊತ್ತವನ್ನು ಉಪಯೋಗಿತ ಪ್ರಮಾಣ - ಪತ್ರದೊಂದಿಗೆ ವ್ಯವಸ್ಥಾಪಕ ನಿರ್ದೇಶಕರು, ಕೆಸ್ಟೆಪ್ಸ್ ರವರ ಹೆಸರಿನಲ್ಲಿ ಚೆಕ್ / ಡಿ.ಡಿ. ಮೂಲಕ ಹಿಂತಿರುಗಿಸುವುದು.

5) ತಮ್ಮ ವಿದ್ಯಾಸಂಸ್ಥೆಗೆ ಸದರಿ ಕಾರ್ಯಕ್ರಮದ ಅನುಷ್ಠಾನಕ್ಕೆ ಬಿಡುಗಡೆ ಮಾಡುತ್ತಿರುವ ಮೊದಲನೇ ಕಂತಿನ ಅನುದಾನದಲ್ಲಿ ಬಳಕೆಯಾಗದೆ ಉಳಿಕೆಯಾಗುವ ಮೊತ್ತವನ್ನು ಮುಂದಿನ ಕಂತಿನ ಅನುದಾನಲ್ಲಿ ಕಡಿತಗೊಳಿಸಿ ಉಳಿದ ಅನುದಾನವನ್ನು ಬಿಡುಗಡೆ ಮಾಡಲಾಗುವುದು.

6) ಯೋಜನೆಯನ್ನು ಕಾರ್ಯಗತಗೊಳಿಸುವಾಗ ಸರ್ಕಾರದ ಎಲ್ಲಾ ಮಾರ್ಗಸೂಚಿಗಳು, ನಿಯಮಗಳು ಮತ್ತು ಪರತ್ತುಗಳನ್ನು ಕಟ್ಟುನಿಟ್ಟಾಗಿ ಅನುಸರಿಸತಕ್ಕದ್ದು.

ವಂದನೆಗಳೊಂದಿಗೆ

ತಮ್ಮ ವಿಶ್ವಾಸಿ

ಡಾ॥ ರೋಹಿತ್ ಕುಮಾರ್ .ಹೆಚ್. ಜಿ

ವಿಜ್ಞಾನಿ–ಎಸ್.ಡಿ, ಕೆಸ್ಟೆಪ್ಸ್ /ಸಂಯೋಜಕರು.ವಿತಂದಾಸ

ಪ್ರತಿ:

1)ಡಾ॥ ಶಶಿಕುಮಾರ್ ಕೆ, ಹಿರಿಯ ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು, ಎಂಜಿನಿಯರಿಂಗ್ ಭೌತಶಾಸ್ತ್ರ ವಿಭಾಗ, ಆಳ್ವಾ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ, ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ, ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.

2) ಡಾ॥ ರಾಮಪ್ರಸಾದ್. ಎ. ಟಿ, (Co-PI) ಹಿರಿಯ ಸಹಾಯಕ ಪ್ರಾಧ್ಯಾಪಕರು, ಎಂಜಿನಿಯರಿಂಗ್ ಭೌತಶಾಸ್ತ್ರ ವಿಭಾಗ, ಆಳ್ವಾ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆಫ್ ಇಂಜಿನಿಯರಿಂಗ್ ಮತ್ತು ಟೆಕ್ನಾಲಜಿ, ಶೋಭಾವನ ಕ್ಯಾಂಪಸ್, ಮಿಜಾರ್, ಮೂಡುಬಿದಿರೆ, ದಕ್ಷಿಣ ಕನ್ನಡ - 574 225.