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

NOEL-EFNMR LAB,
Department of Physics
AIET

2023-24

CONTENTS

VISION

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

MISSION

- 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.

OBJECTIVES 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.

ESTABLISHMENT DETAILS OF THE LAB

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) was **established in the year 2017**, aims 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 takes 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 personifies 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).

FEW LAB PHOTOS

ENTRANCE TO PHYSICS RESEARCH LAB IN THE MAIN BLOCK

ENTRANCE TO THE NOEL-EFNMR LAB

EFNMR MEASURMENTS

CONDUCTIVITY MEASURMENTS

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*

KIETHLEY'S DIGITAL SOURCE METER - 2450

- Digital Source meter – IV Characteristics
- Dynamic measurements – Electrical measurements with variable temperature

EFNMR NMR SPECTROMETER – MAGRITEK'S TERRANOVA

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

FTIR SPECTROMETER – BRUKER ALPHA II

- FTIR Spectral analysis
- Characterization of synthesized material, mostly organic compounds
- Validation for the methodology developed in other spectroscopic techniques.

COMPOSITION OF THE LAB MEMBERS

COORDINATORS OF THE LAB:

1. NANO-ORGANO ELECTRONICS LAB (NOEL)

Dr. Ramaprasad A. T.
Associate Professor & Head
Department of Physics,
Alva's Institute of Engineering and Technology,
Shobhavana campus, Mijar, Moodbidiri-574225
Phone: +91-9449200658, Email: ramaprasadat@aiet.org.in

2. EARTH'S FIELD NUCLEAR MAGNETIC RESONANCE (EFNMR) LAB

Dr. Shashi Kumar K.
Associate Professor
Department of Physics,
Alva's Institute of Engineering and Technology,
Shobhavana campus, Mijar, Moodbidiri-574225
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Alva's Institute of Engineering & Technology

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

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REPORTS ON RESEARCH ACTIVITIES AT

NANO-ORGANO ELECTRONICS & EARTH'S FIELD NMR LAB (NOEL-EFNMR LAB)

DURING ACADEMIC YEAR 2023-24

Coordinators

Dr. Ramaprasad A T,
HoD, Assoc. Prof., Dept. of Physics, AIET

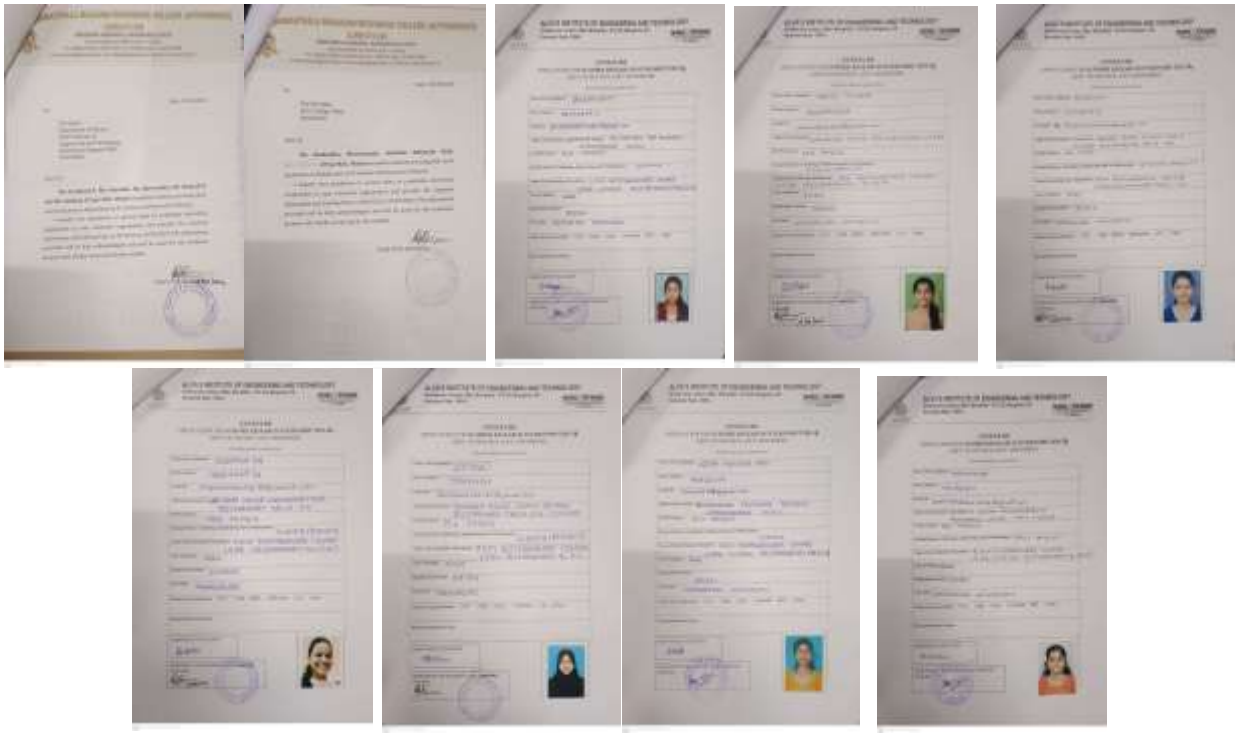
Dr. Shashi Kumar K,
Assoc. Prof., Dept. of Physics, AIET

CONTENTS

RESEARCH ACTIVITY

A one-month Summer Research Internship 2023-24 was conducted for students of Post Graduate in Physics of SDM Autonomous college, Ujire, Dakshina Kannada. Give below are their details from

Sl. No.	Name of the Student
1	Geethanjali
2	Nisha Mukunda Naik
3	Deepika R P
4	Prakrathi
5	Shreevidya
6	Rashmitha
7	Saminaz



One-year Master thesis project by PG Physics students of Alva's Degree college, Vidyagiri

Sl. No.	Name of the Student
1	Deepthi Nayak
2	M Tejaswini
3	Karthik Nayak
4	Jishnu Lal N
5	Deepa Boi
6	Rakshitha

Alva's Institute of Engineering & Technology

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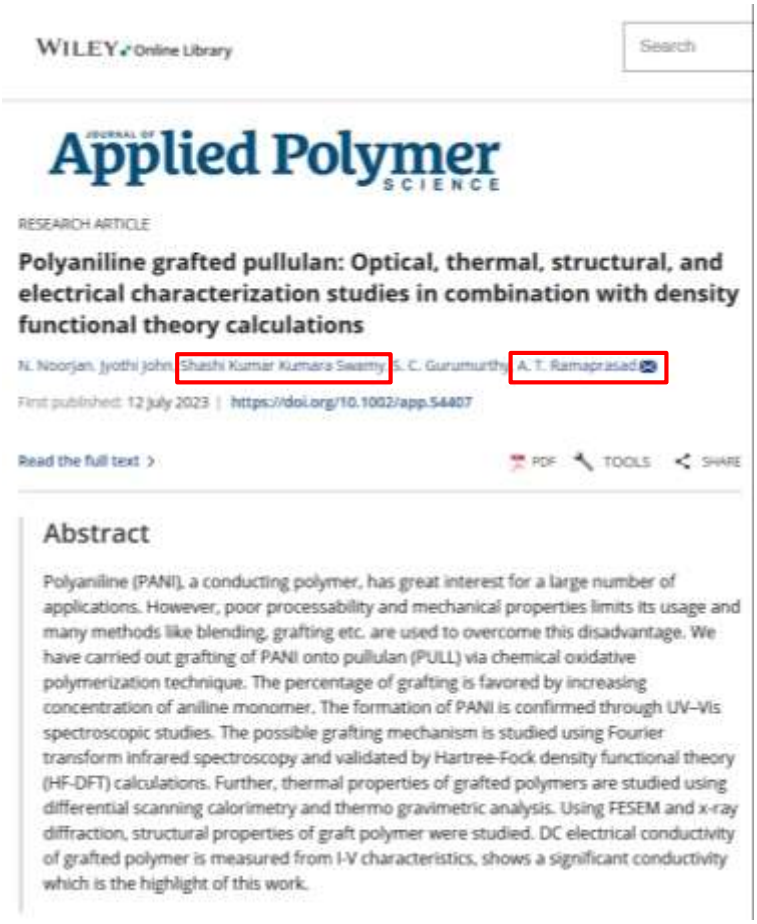
OUTCOME OF RESEARCH AT NOEL-EFNMR LAB THROUGH PUBLICATIONS DURING 2023-24

PUBLICATION



WILEY Online Library

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Applied Polymer SCIENCE

RESEARCH ARTICLE

Polyaniline grafted pullulan: Optical, thermal, structural, and electrical characterization studies in combination with density functional theory calculations

N. Noorjan, Jyothi John, Shashi Kumar Kumara Swamy, S. C. Gurumurthy, A. T. Ramaprasad

First published: 12 July 2023 | https://doi.org/10.1002/app.54407

Read the full text > PDF TOOLS SHARE

Abstract

Polyaniline (PANI), a conducting polymer, has great interest for a large number of applications. However, poor processability and mechanical properties limits its usage and many methods like blending, grafting etc. are used to overcome this disadvantage. We have carried out grafting of PANI onto pullulan (PULL) via chemical oxidative polymerization technique. The percentage of grafting is favored by increasing concentration of aniline monomer. The formation of PANI is confirmed through UV–Vis spectroscopic studies. The possible grafting mechanism is studied using Fourier transform infrared spectroscopy and validated by Hartree-Fock density functional theory (HF-DFT) calculations. Further, thermal properties of grafted polymers are studied using differential scanning calorimetry and thermo gravimetric analysis. Using FESEM and x-ray diffraction, structural properties of graft polymer were studied. DC electrical conductivity of grafted polymer is measured from I-V characteristics, shows a significant conductivity which is the highlight of this work.

ELSEVIER

Optical Materials

Volume 157, Part 1, November 2024, 116083

Research Article

The functional moieties impact on optical, thermal, and nonlinear properties of chalcone derivatives. A comprehensive study on FT2MP

S.R. Shankara [a b], K.M. Eshwarappa [c], Shashi Kumar Kumara Swamy [d], Deekshitha K [e], Shree Vidya [f], Jayarama A [d], Richard Pinto [g]

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[b] Department of Physics, BGS Institute of Technology, Adichunchanagiri University, B.G Nagara, 571448, India

[c] Department of Studies in Physics, Davangere University, Shivagangothri, Davanagere, 577007, Karnataka, India

[d] Department of Physics, Alva's Institute of Engineering and Technology, Moodabidri, 574225, India

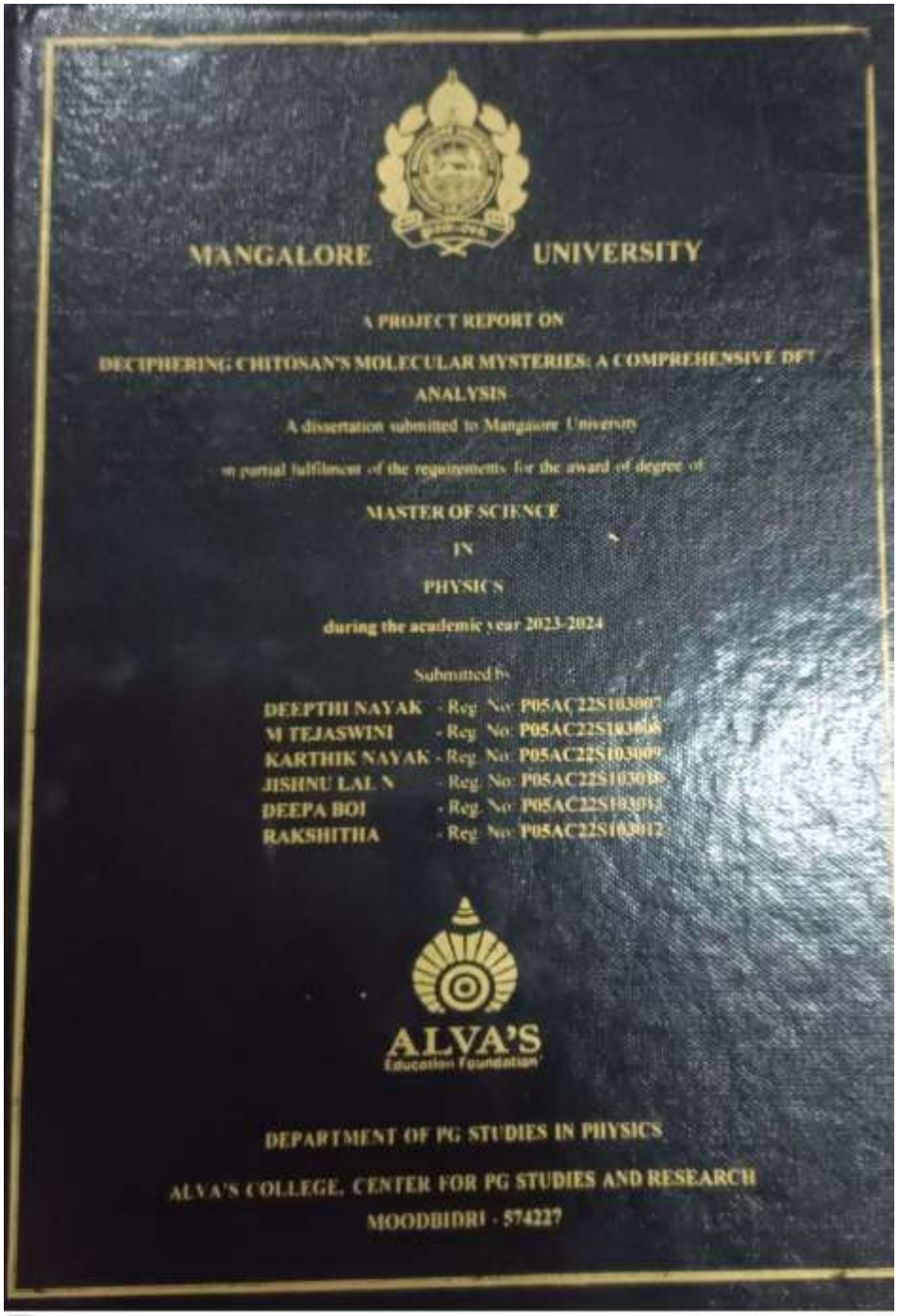
[e] Department of Civil Engineering, NMAM Institute of Technology, Nitte, Affiliated to Nitte (Deemed to be University), Udupi, India

[f] Department of PG Studies and Research in Physics, Sri Dharmasthala Manjunatheshwara College (Autonomous), Ujire, 574240, India

[g] Department of Electronics and Communication Engineering, Alva's Institute of Engineering and Technology, Moodabidri, 574225, India

Received 8 March 2024, Revised 11 August 2024, Accepted 5 September 2024, Available online 12

MASTER THESIS



MANGALORE UNIVERSITY

A PROJECT REPORT ON

DECIPHERING CHITOSAN'S MOLECULAR MYSTERIES: A COMPREHENSIVE DFT ANALYSIS

A dissertation submitted to Mangalore University

in partial fulfilment of the requirements for the award of degree of

MASTER OF SCIENCE

IN

PHYSICS

during the academic year 2023-2024

Submitted by

DEEPTHI NAYAK - Reg. No: P05AC22S103007
M TEJASWINI - Reg. No: P05AC22S103008
KARTHIK NAYAK - Reg. No: P05AC22S103009
JISHNU LAL N - Reg. No: P05AC22S103010
DEEPA BOI - Reg. No: P05AC22S103011
RAKSHITHA - Reg. No: P05AC22S103012

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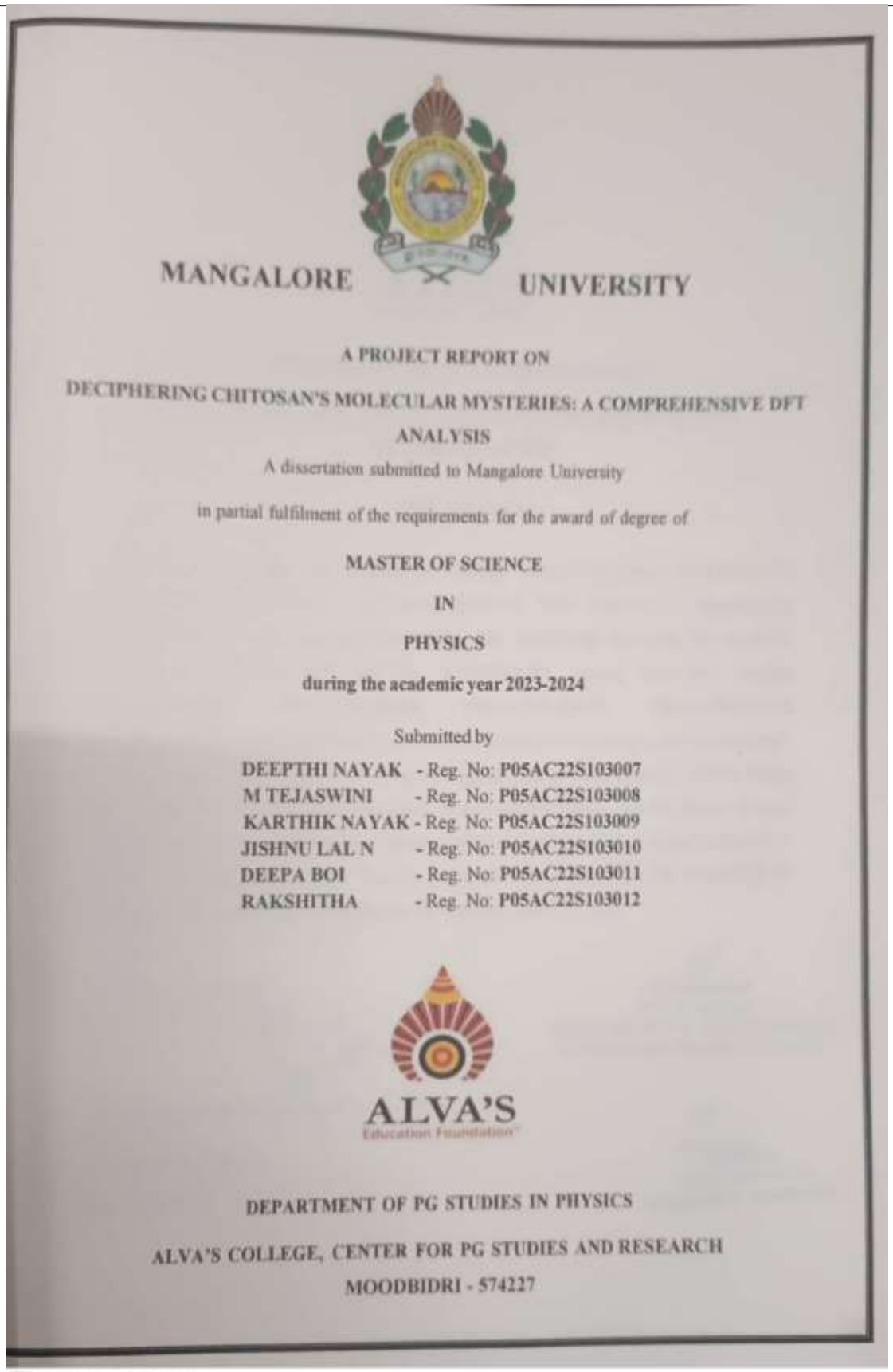

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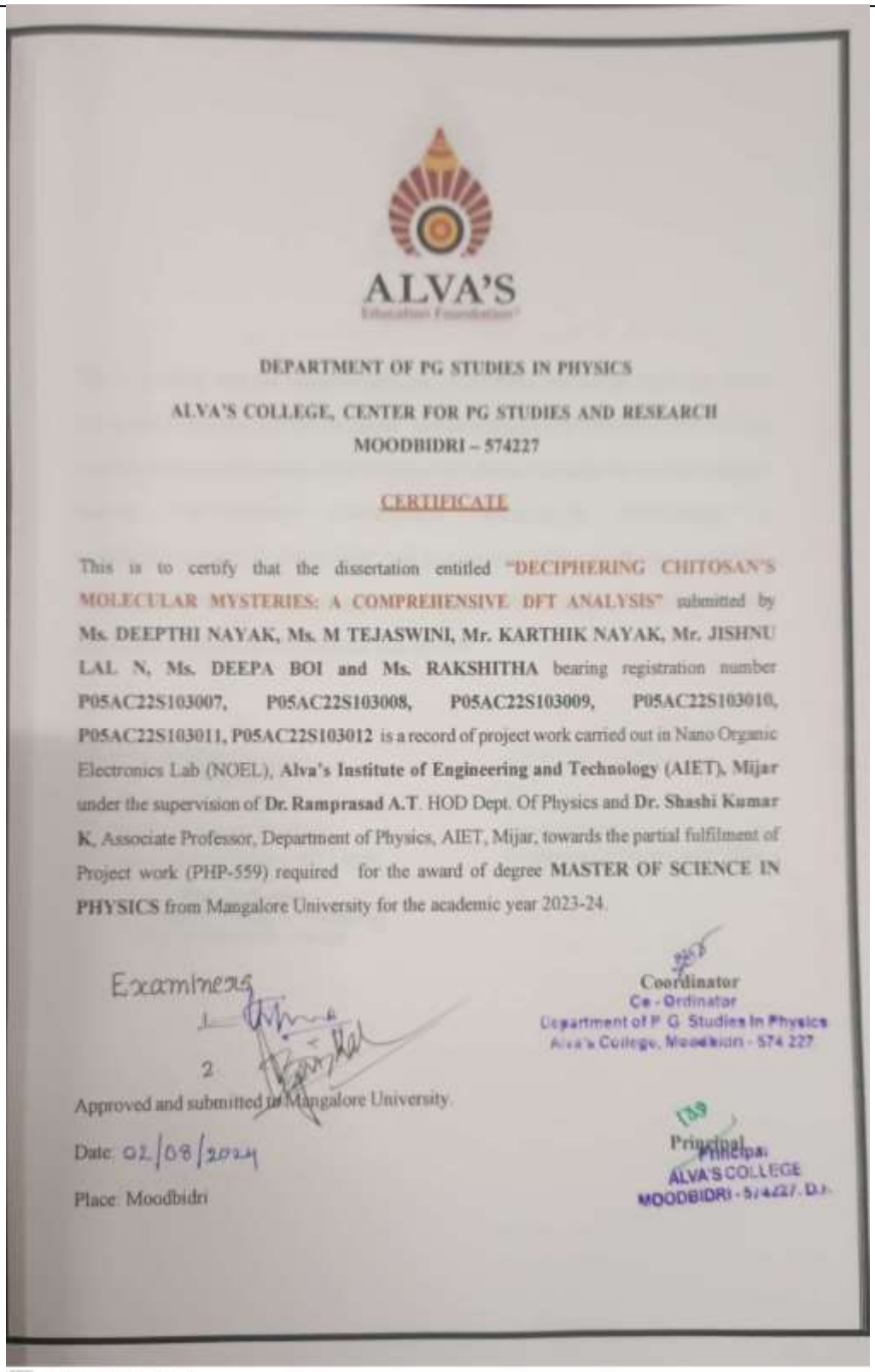

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CERTIFICATE

This is to certify that the dissertation entitled "DECIPHERING CHITOSAN'S MOLECULAR MYSTERIES: A COMPREHENSIVE DFT ANALYSIS" submitted by **Ms. DEEPTHI NAYAK, Ms. M TEJASWINI, Mr. KARTHIK NAYAK, Mr. JISHNU LAL N, Ms. DEEPA BOI and Ms. RAKSHITHA** bearing registration number **P05AC22S103007, P05AC22S103008, P05AC22S103009, P05AC22S103010, P05AC22S103011, P05AC22S103012** is a record of project work carried out in Nano Organic Electronics Lab (NOEL), **Alva's Institute of Engineering and Technology (AIET), Mijar** under the supervision of **Dr. Ramprasad A.T**. HOD Dept. Of Physics and **Dr. Shashi Kumar K**, Associate Professor, Department of Physics, AIET, Mijar, towards the partial fulfilment of Project work (PHP-559) required for the award of degree **MASTER OF SCIENCE IN PHYSICS** from Mangalore University for the academic year 2023-24.

Examiners

1

2

Coordinator

Co - Ordinator

Department of P. G. Studies in Physics

Alva's College, Moodbidri - 574 227

Approved and submitted to Mangalore University.

Date: 02/08/2024

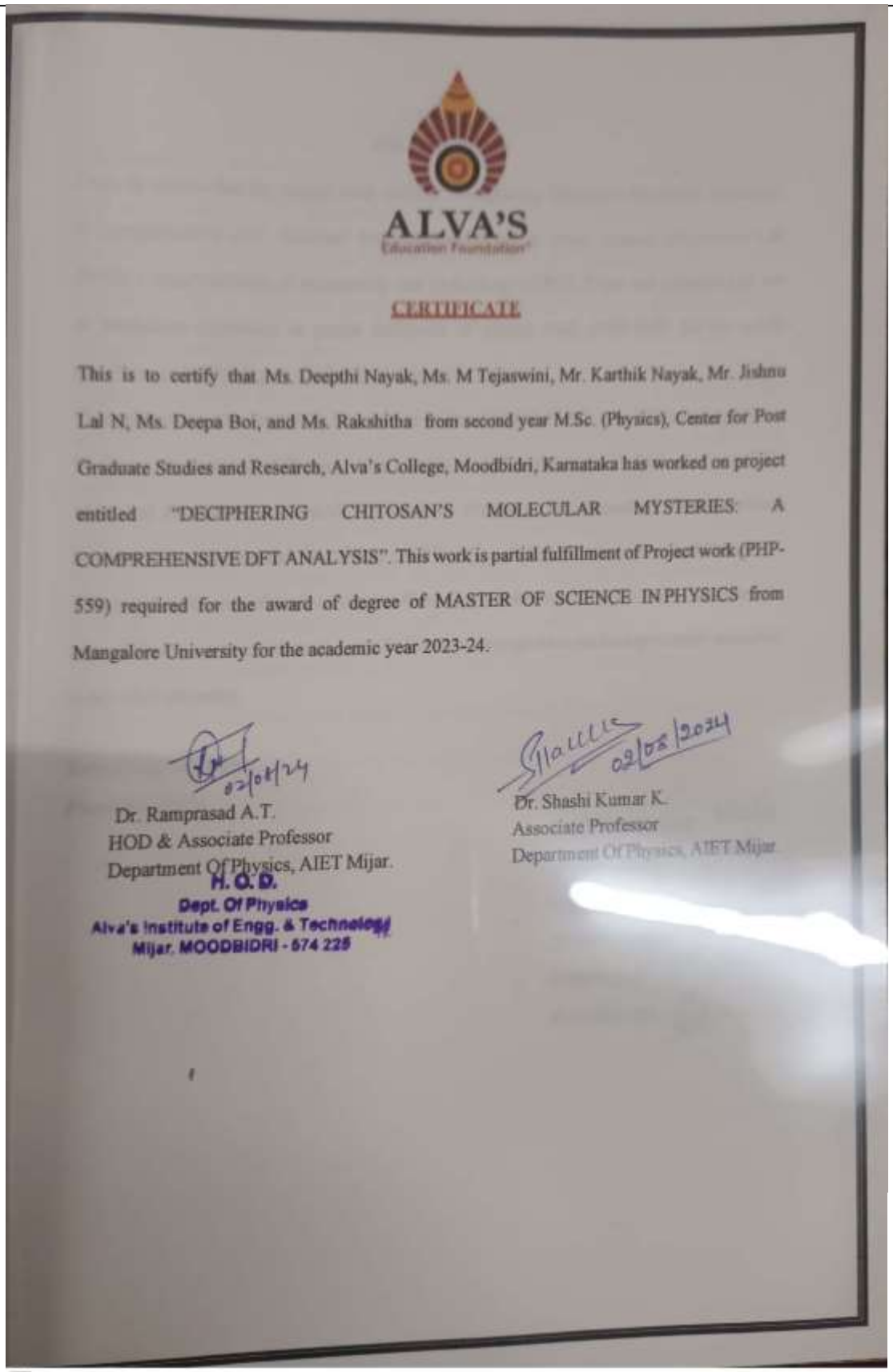
Place: Moodbidri

Principal

Principal

ALVA'S COLLEGE

MOODBIDRI - 574227. D.K.



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CERTIFICATE

This is to certify that Ms. Deepthi Nayak, Ms. M Tejaswini, Mr. Karthik Nayak, Mr. Jishnu Lal N, Ms. Deepa Boi, and Ms. Rakshitha from second year M.Sc. (Physics), Center for Post Graduate Studies and Research, Alva's College, Moodbidri, Karnataka has worked on project entitled "DECIPHERING CHITOSAN'S MOLECULAR MYSTERIES: A COMPREHENSIVE DFT ANALYSIS". This work is 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 2023-24.

02/04/24

Dr. Ramprasad A.T.
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02/04/2024

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