Carbon Nanomaterials Lab

Photograph of CNM Lab Members

Ms. Mydhili.V

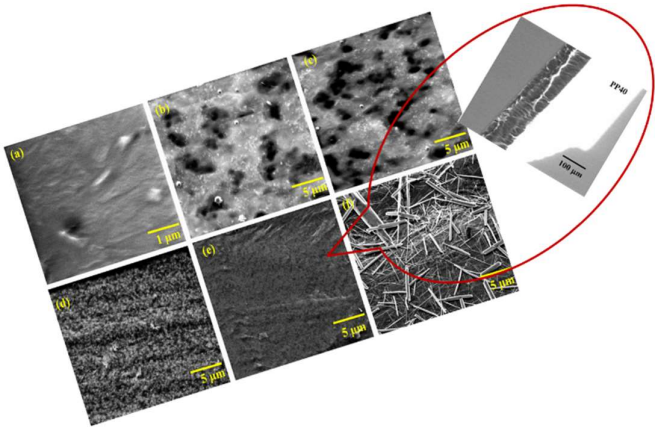
Ms. Mydhili. V joined as full-time research scholar in Department of Physics, National Institute of Technology, Tiruchirappalli in the year 2013. She has completed her post-graduation in Physics from St. Teresa's College, Ernakulum in the year 2009. Her research area of interest is on conducting polymer composites for dielectrics, sensors and transparent conducting films as electrodes. To her credit, she has published paper in international peer-reviewed journals and national/international conference proceedings/abstracts. She has qualified GATE in the year 2013 with an AIR of 619. She was awarded for best poster in IUMRS-ICYRAM 2016, at IISc Bangalore.

Research Interests

Conducting Polymer composites; polymer dielectrics; electrochemical properties of polymer composites and blends

Highlights of research activities

- Multi-functional use of conducting polymer composites (CPC)
- Efficient and simple route to fabricate and probing dipole polarization and relaxation mechanism
- Coupling morphological changes in CPC and dielectric phenomenon.
- Inter-barrier layer effects in CPC on dielectrics
- Electrochemical properties of CPC



Publications in peer-reviewed journals:

- **Mydhili. V, T. Kavinkumar** and **S. Manivannan (2019)** Electrochemical behaviour and temperature dependent electrical transitions in graphene oxide incorporated poly(vinyl alcohol)/poly(3,4-ethylenedioxythiophene): poly(styrenesulfonate) composites for dielectric and supercapacitor applications, Mater. Chem. Phys., 225, 261-271. DOI:10.1016/j.machemphys.2018.12.080

- **Mydhili. V** and **S. Manivannan** (2019) Electrochemical and dielectric behavior in poly(vinyl alcohol)/poly(3,4-ethylenedioxythiophene):poly(styrenesulfonate) blend for energy storage applications, Polym. Bull. DOI:10.1007/s00289-018-2630-5

- **Mydhili. V, Deepjyoti Das, L.R. Shobin and S. Manivannan** (2018) Surface Analysis and Electrothermal Performance of Highly Uniform PEDOT:PSS Spin-

coated Films using Infrared Thermography, AIP Conf. Proc. 1942, 080024, DOI: 10.1063/1.5028858

- **Mydhili. V** and **S. Manivannan** (2017) Effect of microstructure on the dielectric properties of poly(vinyl alcohol)–poly(3,4-ethylenedioxythiophene) doped with poly(styrenesulfonate) composite films, J. Appl. Polym. Sci., 134, 45079. DOI:10.1002/APP.45079

National/International conferences:

- **Mydhili. V, Deepjyoti Das, L.R. Shobin and S. Manivannan**, "Surface Analysis and Electrothermal Performance of Highly Uniform PEDOT:PSS Spin-coated Films using Infrared Thermography", DAE SSPS 2017, BARC , Mumbai.

- **Mydhili.V and S.Manivannan,** "Dielectric properties of PVA/H_3PO_4, PVA/PEDOT:PSS and PVA/PEDOT:PSS/H_3PO_4 gel electrolyte systems", International Conference of Young Researchers on Advanced Materials (IUMRS-ICYRAM 2016) , 11-15, December 2016, Indian Institute of Science, Bangalore, India. **(awarded for best poster)**

- **Mydhili.V and S.Manivannan,** "Investigation on the dielectric properties of poly(vinyl alcohol)/boric acid gel electrolytes", International Conference on Functional Materials (ICFM-2016), 07-10 September 2016**,** PSN College of Engineering and Technology, Tirunelveli, Tamilnadu, India.

- **Mydhili.V and S.Manivannan,** "Temperature dependent dielectric behavior of Poly(vinyl alcohol)/Poly(3,4-ethylenedioxythiophene): Poly(styrenesulfonate) freestanding films", Second International Conference on Material Science and Technology (ICMST-2016), 05-08 June 2016, St. Thomas College, Pala, Kottayam, Kerala, India.

- **Mydhili.V and S.Manivannan**, "Dielectric and optical studies on Poly(vinyl alcohol)/Poly(3,4-ethylenedioxythiophene): Poly(styrenesulfonate) transparent freestanding films", International Conference on Recent Advances in Material and Chemical Sciences (ICRAMCS-2015), 14-15 December 2015, Gandhigram Rural Institute, Gandhigram, Tamilnadu, India.

Workshops attended:

- Workshop on Nurturing IPR and Technology Transfer NITT 2017 held at National Institute of Technology, Tiruchirappalli during March 15, 2017.

- Workshop on Elemental, compound and phase analysis by powder X-ray diffraction held at Department of Physics, National Institute of Technology, Tiruchirappalli during September 19-20, 2014.

- Participated in 2nd INUP Familiarization Workshop on Nanofabrication Technology conducted by IIT Bombay during November 28-30, 2014.

- Attended OPTICS'14- International Conference on Light held at National Institute of Technology, Calicut during March 19-21, 2014.

Mrs. N. Ambikeswari

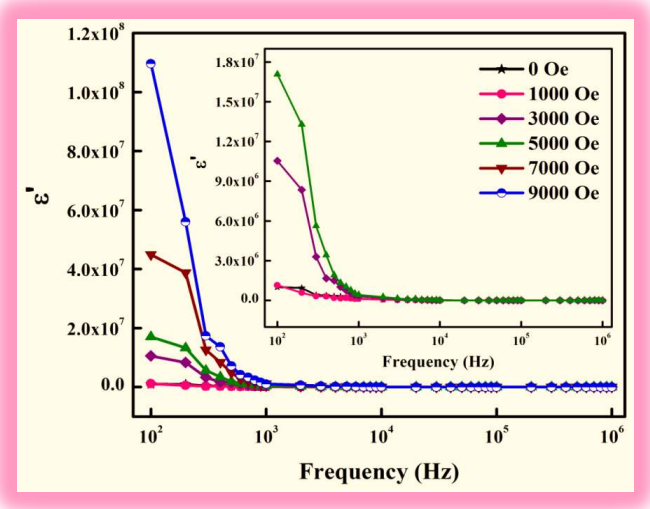
Mrs. N. Ambikeswari, joined her Ph.D in August 2014. She completed her post-graduation in Bishop Heber College, Trichy and under graduation in Holy Cross College, Trichy. She has 4-5 years of teaching experience as an Assistant Professor in MAM College of Engineering, Trichy and Rajalakshmi Engineering College, Chennai. Her area of interest are electric and magnetic properties of graphene oxide related nanocomposites.

Research Interest

Synthesis of graphene oxide, graphene and different ferrites and their composites. She also focussed on the superparamagnetic and magnetodielectric properties and their real time applications in different technological demands such as data storage and erasable memory devices.

Highlights of research activities

Magnetodielectric Studies



Publications in peer-reviewed journals:

N. Ambikeswari and S. Manivannan, "Effect of reaction time on the dielectric behaviour of reduced graphene oxide - layered cobalt hydroxide composite for high k-gate dielectrics" Materials Research Bulletin 100 (2018) 7-4.

N. Ambikeswari and S. Manivannan, "Superior magnetodielectric properties of room temperature synthesized superparamagnetic cobalt ferrite – graphene oxide composite" Journal of Alloys and Compounds 763 (2018) 711-718.

N. Ambikeswari and S. Manivannan, "Enhanced dielectric response from room temperature synthesized superparamagnetic nickel substituted cobalt ferrite ─ graphene oxide nanocomposites" (Communicated)

Presented paper in National/International conferences:

Ambikeswari N. and Manivannan S. Rapid synthesis of reduced graphene oxide-Cobalt hyhroxide composite and their dielectric properties, International Conference on Recent Advances in Materials and Chemical Sciences (ICRAMCS-2015) , Gandhigram Rural Institute, Dindigul , 14 - 15 December –2015.

Ambikeswari N. and Manivannan S. Enhanced dielectric properties of rapidly synthesized reduced graphene oxide - nickel ferrite nanocomposites, National Conference on Advanced Materials (NCMA-2016), Oct - 07, 2016, St. Josephs college, Trichy

Ambikeswari N. and Manivannan S. Investigation on the dielectric and magnetic properties of facile synthesized reduced graphene oxide – cobalt ferrite nanocomposite, International Conference on Material Processing & Applications (ICMPA 2016) , Vellore Institute of Technology, Vellore, 14 -16 December - 2016 .

Ambikeswari N. and Manivannan S. Magnetodielectric properties of superparamagnetic cobalt ferrite – graphene oxide nanocomposite, International Conference on Nanoscience and Nanotechnology (ICONN -2017), Aug 09-11, 2017, SRM University, Chennai

Mr. Prakash D

Mr. Prakash D, joined his Ph.D as a full-time research scholar in Department of Physics, National Institute of Technology, Tiruchirappalli in the year 2015. He completed his M.Phil in Gandhigram Rural University, Dindigul in the year 2012, post-graduation in National College (Bharathidasan University), Trichy in the year 2011, and under graduation in Arignner Anna Government Arts College (Bharathidasan University), Musiri in the year 2009. He has worked as an Assistant Professor in Physics at Bharath University, Chennai from Sept. 2012- Feb. 2015. His area of interest 1D, 2D materials for energy storage application

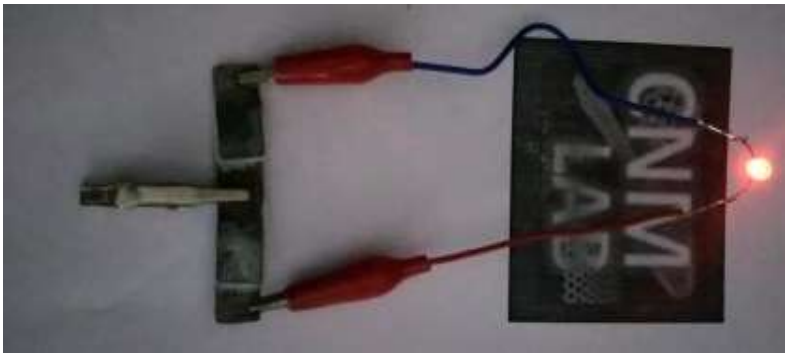
He also joined as Senior Research Fellow March 2017 onwards in the CSIR project entitled "Single-Walled Carbon Nanotubes-Reduced Graphene Oxide-Metal Oxide Nanowires Hybrid Electrodes for Supercapacitor Applications".

Research Interest:

Synthesis of graphene oxide, graphene and various metal oxides nanostructures and their composites for energy storage applications.

Highlights of research activities

Supercapacitor Device



The simple fabricating process and cell configuration of metal oxide/RGO-metal oxide//RGO based asymmetric devices achieve high energy and high power density with high potential window. We connected the two supercapacitor devices are in series to light a light-emitting diode (LED). Notably, the device could light the LED for over 2 min, after charged few seconds at 10 Ag^{-1} for 3 V.

Presented papers in International conferences

Prakash D and Manivannan S, "Superior Electrochemical Properties of Hausmannite - Mn_3O_4 Nanocrystal for Supercapacitor Electrodes", International Conference on Nanoscience and Nanotechnology (ICONN -2017), August 09-11, 2017, SRM University, Chennai.

D. Prakash and S. Manivannan "Simultaneous oxidation and reduction of GO and KMnO4 for synthesis of RGO-Mn_3O_4 hybrid electrode material for supercapacitor application", MRSI National Symposium on "Advances in Functional and Exotic Materials" to be held at SRM Hotel, February 14 -16, 2018, Bharathidasan University, Tiruchirappalli.

Prakash D and Manivannan S, "Defect Induced RGO-MnOx Hybrid Electrodes for Supercapacitor Applications" 63rd DAE Solid State Physics Symposium, December 18-22, 2018,Guru Jambheshwar University of Science and Technology, Hisar, Haryana.

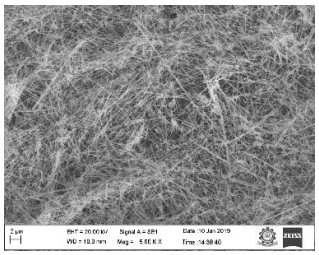
Prakash D and Manivannan S, "Rapid Synthesis of Activated Carbon - Manganese Oxide Composite for Supercapacitor Applications", International Conference on Nanoscience and Nanotechnology (ICONN -2019), January 28-30, 2019, SRM University, Chennai.

Workshops attended:

- Workshop on Nurturing IPR and Technology Transfer NITT 2017 held at National Institute of Technology, Tiruchirappalli during March 15, 2017.

Mr.K.Lakshmanamoorthy

Mr.K.Lakshmanamoorthy, he joined in CNM group in the year 2016. He completed his undergraduate degree at Presidency College, Chennai (University of Madras) in 2010 and master degree in the department of Physics at Loyola College, Chennai (University of Madras) in the year 2012. In the year 2013 he was qualified NET exam. He was completed his M.Phil degree in physics at University of Madras in the year 2014, then he worked as a Gust Faculty in the Department of Physics, Central University of Tamil Nadu, Thiruvarur in the same year. The next year he got appointed as an Assistant Professor (On contract) in the same department for the academic year 2015-2016. His field of research interest is synthesis of functionalized carbon nanomaterials and metal/metal oxide nanomaterials for gas sensing applications. He prepared silver nanowires with good aspect ratio, the SEM image of that one is given here.



Workshop s attended:

- Workshop on Nurturing IPR and Technology Transfer NITT 2017 held at National Institute of Technology, Tiruchirappalli during March 15, 2017.

Ms. Amrutha E G

Ms. Amrutha E G has joined as a full – time research scholar in Department of Physics, National Institute of Technology, Tiruchirappalli in the year 2018. She did her undergraduate course in Physics from Sree Kerala Varma College, Thrissur, Kerala. She has completed her Postgraduation in Physics from Pondicherry University, Puducherry in 2017. She qualified Graduate Aptitude Test in Engineering (GATE) in 2009 (score : 316). Her research area of interest is Carbon Quantum Dots and their applications.

RESEARCH INTEREST

Carbon Quantum Dots(CDs), being a new member of the carbon nanomaterials family, has become an interest among the scientific community in recent years. Excitation dependent and excitation independent luminescence, Photostability, low cytotoxicity and tunable optical properties makes them suitable for a verity of applications like bioimaging, biosensing, chemical sensing and other material science applications. A reasonable explanation for the photoluminescence and a facile synthesis route to produce high quantum yield CDs are the two major issues to be fixed in this field.

Workshops attended:

GIAN Program on Nanostructure based wideband gap materials for sensor applications, 11-17/10/2018 Mangalore University, Mangalagangotri, Karnataka.

Alumni

Dr. L. R. Shobin

Mr. L. R. Shobin has completed his Ph.D. in Physics, National Institute of Technology, Tiruchirappalli in the year 2016.

Thesis title: Carbon Nanotubes and Silver Nanowires for Gas Sensors and Transparent Devices.

Current status: Institute Postdoctoral Fellow at Technical University of Munich (TUM), Germany.

Dr. T. Kavinkumar

Dr. T. Kavinkumar has completed his Ph.D. in Physics, National Institute of Technology, Tiruchirappalli in the year 2017.

Thesis title: Electrical, Gas Sensing, Biomedical applications of Graphene Oxide and Reduced Graphene Oxide Composites

Current status: Institute Postdoctoral Fellow at SRM University, Kattangulathur, Chennai, Tamil Nadu, India.

M.Sc Project Student

Ms. KASTHURI.E

Ms. KASTHURI.E has joined as a M.Sc. student in Department of Physics, National Institute of Technology, Tiruchirappalli in the year 2017. She did her undergraduate course in Physics from Shri Sakthikailassh Women's College Salem in the year 2017. She is doing her M.Sc. project titled "Investigation of Mechanical Properties of Graphene oxide and its Composites".