

DEPARTMENT OF PHYSICS



PREFACE

DR. MOHAN NARAYAN

Head of the Department

Ph.D.

Department of Physics at the ICT has the distinction of being one of the earliest Departments in the Institute. It was started as Optics Section in 1935 which was subsequently changed as Physics Section in the Second Five Year Plan and then to Department of Physics under MUICT. Department of Physics undertakes undergraduate and post graduate teaching in Physics. The Department participates in 1st year B.Tech and B.Chem. UG teaching - theory and practical's. The Department offers electives at 2nd year B.Tech and B.Chem. The faculty of the Department undertakes a full course on Physical Methods of Analysis for all branches of M.Tech students in both the semesters which also serves as a credit course for majority of Ph.D. students. The Department has started M.Sc (Physics) (Material Science) course from year 2014 with maximum strength of 20. This is a unique course with industrial training as part of the syllabus.

The faculty of the Department are actively engaged in various research activities. The faculty undertake studies of various aspects of Polymer Morphology/Orientation, Polymer composites / nanocomposites, Nano-drug

delivery, Polymer dispersed Liquid crystals, Plasma processing of Materials, Statistical Mechanics applied to Chemical Engineering Thermodynamics, Synthesis and functionalization of CNTs, nano technology, Energy storage, Super-capacitors, Magnetism, transport properties of quantum magnets and Low-temperature Physics, Solar Thermal applications, Solar Energy Harvesting.

Faculty members have actively participated and attended national and international seminars / workshops and presented their papers. A good number of papers are published in peer reviewed journals. Faculty members have research projects from industry and various government funding agencies like from AICTE, DST and UGC; DAE/BRNS. Two patents on solar thermal system are also filed recently. Faculty does collaborative research with Polymer, Textile, Pharma and Chemical Engineering Departments. Also, with national institutions like Bharthiar University Coimbatore, BTRA, University of Delhi, BARC, IITB, etc. Department of Energy sciences of IITB had delivered a series of lectures on Solar Energy and Non-conventional Energy Sources in this year.

FACULTY



DR. MOHAN NARAYAN

B.Sc. (Mumbai, 1988), M.Sc. (Mumbai, 1990), Ph.D. (Madras, 1999)
Associate Professor

Fellowships/ Memberships of Professional Bodies :

- Member of the Board of Studies in Physics at University of Mumbai
- Member of ISTE (Indian Society for Technical Education)
- Member of the Board of Studies in Physics at Ramnarain Ruia College (Autonomous)

Highlights of research work done and it impart:

- Phenomenological Consequences of Neutrino masses and Oscillations. Effect on Solar, Atmospheric and Long Baseline experiments. Connecting neutrino parameters to Gravity via effective Planck operators. Possible signals of CPT violations in neutrino Physics.

- Development of advanced equations of states and applications to thermo physical phenomenon.

Publications (peer reviewed) so far: 28

Conference proceedings/papers: 03

Seminars/Lectures/Orations delivered : 01

Ph.D. s Awarded as single/ Co-Guide : 01

h-Index: 10

Citations : 370

Subjects taught :

Under Graduate:

- Statistical Mechanics (S.Y.C.E.)
- General Physics Lab (F.Y.B.Tech.)

Post Graduate:

- Quantum Mechanics (M.Sc., Physics)

- Molecular Quantum Mechanics (M.Sc., Physics)
- Classical Mechanics (M.Sc., Physics)

Research interests :

Theoretical High Energy Physics, Molecular dynamics, Chemical Engineering Thermodynamics

Research students :

Ph.D. (Sc) - 01

Research publications:

International - 03

Professional Activities:

- Member of the Board of Studies in Physics at University of Mumbai
- Member of ISTE (Indian Society for Technical Education)
- Member of Board of studies, Ramnarayan Ruia College

Undergraduate students' seminars/projects/home papers:

Research Projects

Ph.D. (Science)

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Kasturirangan Siddharth	University of Mumbai	x-ray spectroscopy of highly charged ions & plasma	Dr. Mohan Narayan
2	Ghoderao Pradnya Prabhakar	University department of Physics, University of Pune	Advanced cubic equations of state for fluids and fluid mixtures.	Dr. Mohan Narayan

Membership of In-house Committees:

- UGPC & PGPC
- Member of TA ICT.

Profile:

Basic training and research work including post-doctoral work in Theoretical High Energy Physics. Mainly on Neutrino Physics and

related phenomenology. Also developed constraints on low scale gravity models which are one of the approaches of addressing what is known as the “hierarchy” problem.

Since the last few years investigating certain aspects of Chemical Engineering Thermodynamics with the aim of developing better equations of state (EOS) to fit

thermophysical data and more efficient mixing rules to be applied to fluid mixtures. This is in collaboration with Dr. V. H. Dalvi from Chemical Engineering department. We have already developed a new Cubic EOS with four parameters which works very well for pure fluids and also well for mixtures which is now published.



PROF. R. R. DESHMUKH

B.Sc. (Pune, 1991), M.Sc. (N. M. U. Jalgaon, 1994),

B.Ed. (Mumbai, 1995) Ph.D. (Mumbai, 2002)

Professor

Fellowships/ Memberships of Professional Bodies :

- General Advisory Committee for Research and Liaison of Bombay Textile Research Association (BTRA), LBS Marg, Ghatkopar (W), Mumbai – 400 086
- Advisory Committee member of International conference on materials and characterization techniques held during Dec 14-16 at VIT, Vellore, India.
- Member, Board of Studies in Physics, BATU, Lonere
- Research Recognition Committee, BATU, Lonere.
- Member, Expert Committee in Physics, Nagpur University, Nagpur.
- Membership of Editorial Boards with name of journal and agency:
 - » International J of Materials Science and Applications, Science Publishing Group, USA.
 - » International J of Chemical and Physical Sciences.
- Member UGPC / PGPC, ICT
- Academic Council, ICT
- Member HOD Council, ICT

Highlights of research work done and it's impart:

(A) Plasma Processing of Polymeric materials:

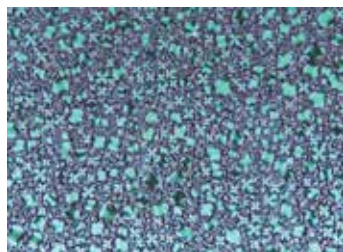
Low temperature plasma has attracted attention of Scientist and Researchers to convert inexpensive polymer in to a valuable product. Since the temperature of RF and DC glow discharge plasma is just around room temperature, it is the most suitable technique to modify most of the polymer surfaces, without affecting their bulk properties. Plasma is a one-step dry process, it does not require disposal of polluted water like wet chemistry. Therefore it is environment friendly and has many other advantages over other processes of surface modification. One can control plasma chemistry just by controlling plasma process parameters suitably. It is possible to attach certain functional groups such as Hydroxyl, Carboxyl, carbonyl, amine etc on nano particles or onto the polymer surfaces for further use in biomedical applications. Plasma functionalized nano particles can form covalent bonding in polymer composites, thus enhancing its mechanical and thermal properties. It is also possible to make super hydrophobic surfaces using fluorocarbon plasma. Polymers having low surface energy have poor adhesion properties, can be subjected to plasma treatment to enhance these properties. Our group at Physics Department has successfully shown that gaseous plasma treatment can enhance

surface energy of polymers and textile materials. Polymer surface activation have opened window for pervaporation membranes. Plasma processing can also be used for functionalization of nano materials for various applications.

(B) Polymer Dispersed Liquid Crystals.

Liquid crystals are familiar as the basis of the multi-billion dollar flat panel display industry. Over the years, liquid crystal research has transformed into a truly interdisciplinary area. Liquid crystal displays (LCDs) are experienced in most portable electronic equipments, large display systems, photonics devices etc. due to the inherent optical anisotropy of LCs, it has attracted attention in exploring the unique electro- optical effect of the polymer / LC composite film. At UICT, we are working in the area of polymer dispersed liquid crystal (PDLC) composite films. We have productively studied the electro-optical properties for different compositions of polymers, their co-polymers and different nematic liquid crystals. We showed that the electro-optical properties help us to select the proper composition for their use in displays, light shutters, and in non-display applications also. We have systematically carried out the temperature dependence of these

properties and the results help us to apply them in the field of temperature sensors.



Liquid crystal display technology would benefit from reduced switching times and driving voltages. For this purpose, very recently we have demonstrated the potential of dichroic dye-doped PDLC (DPDLC) films. Novel concepts involved in photopolymerization and optoelectronic behavior of DPDLCs have been explored. We have succeeded in optimizing dye content in these devices to obtain promising materials with minimum threshold and high contrast for display applications without the use of polarizers.

Future research may see the advent of exploring Polymer Stabilized liquid crystal devices, phase modulators, optical retarders, twisted LC devices, using ferroelectric, antiferroelectric, bent-core nematics etc. The research would also be focused on developing improved LC alignment for liquid crystal display device applications.

Publications (peer reviewed) so far: 99 / 6 book chapters

Patents : 01

Conference proceedings/papers: 01

Seminars/Lectures/Orations delivered : 02

Ph.D.s Awarded as single/ Co-Guide : 05

Masters Awarded as single/ Co-Guide : 04

h-Index : 20

Citations : 1529

Subjects taught :

UNDER GRADUATE

Subject: General Physics Laboratory

Class: F. Y. B. Chem. Engg.

Sem.: I

Subject: Applied Physics I

Class: F. Y. B. Chem. Engg.

Sem.: I

Subject: Applied Physics I

Class: F. Y. B. Tech.

Sem.: I

Subject: Applied Physics II

Class: F. Y. B. Chem. Engg.

Sem.: II

Subject: Applied Physics II

Class: F. Y. B. Tech.

Sem.: II

POST GRADUATE

Subject: Analytical Techniques I

Class: M. Sc. (Physics)

Sem.: II

Subject: Analytical Techniques II

Class: M. Sc. (Physics)

Sem.: III

Subject: Physical Methods of Analysis

Class: M. Tech

Subject: Instrumental Methods of Analysis

Class: M. Sc. (Text. Chemistry)

Research interests :

Plasma Technology, Polymer Physics, Functionalization of nanoparticles, Molecular tailoring of surfaces using plasma for biomedical applications, textile physics, Electro-optical properties of Polymer Dispersed Liquid Crystals, Polymer nano – composite materials, Dissociation of the dye molecule using photoelectron chemical method.

Research students:

Ph.D. (Sc) - 02

Research publications:

International - 08 Professional Activities:

- Subject Expert (VC nominee), G. M. Vedak, Institute of Technology, Raigad.
- Subject Expert, The Board of Studies, Thakur College of science and commerce, Mumbai.
- Member, Board of studies, Dr. Homi Bhabha State University, Mumbai.
- Governing body, nominee of University, Terna college of Engineering, Navi Mumbai.

Postdoctoral/Ph.D. students' research projects :

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Singh Ravi	University department of physics, University of Mumbai	Synthesis and characterization of plasma functionalized polymer Nano composites	Dr. R. R. Deshmukh
2	Trimukhe Ajinkya Mahadev	University of Mumbai	Functionalization of materials by plasma processing synthesis and characterization of polymer nano composites for bio medical applications	Dr. R. R. Deshmukh

3	Nimbekar Ashish	University of Mumbai	Synthesis and characterization of different polymeric composites using various methods and their applications	Dr. R.R. Deshmukh
4	Ambre Manoj G.		Preparation of Natural Fibres Reinforced Composite Particles separates from cotton	Dr. R.R. Deshmukh
5	Kambli Nishant Digamber		Extraction of fibres from Cornhusk (Maize Cob Sheath) and its Applications in Textiles	Dr. R.R. Deshmukh

Details of sponsored projects – Government and Private

Government Agencies:

Sponsor	DST
Title	Studies in surface sterilization of spices using non-thermal processes
Duration	2 years
Total amount	26 lakhs 48 thousand
Principal Investigator	Dr. R. R. Deshmukh
Research Fellows	

Private agencies:

Sponsor	BIR Horizons pvt. Ltd.
Title	Effect of Plasma Processing on surface Properties and Dyeability of Textile Material"
Duration	2 years
Total amount	8 Lakhs
Principal Investigator	Dr. R. R. Deshmukh
Research Fellows	

Details of National and International collaborations

- Dr. K. Navneetha Pandiyaraj, Dept. of Physics, SSIET, Coimbatore.
- Dr. VarshaKelkar - Mane, Department of Bio-tech, University of Mumbai.
- Professor N.V. Bhat, BTRA. Mumbai.
- Professor R. Dabrowski, Institute of Chemistry, Military University of Technology, Wrsaw 00-908, Poland.
- Professor R. B. Timmons, University of Texas, Arlington, USA.
- Professor U. S. Annapure, ICT, Mumbai.

Publications

No.	Title and authors	Journal	Vol. No.	Pages	Year
1	Effect of cold plasma treatment on Xanthan gum properties	Polymer Testing,		106056	2019
2	Electro-optical and dielectric study of multi-walled carbon nanotube doped polymer dispersed liquid crystal films	Liquid Crystals	46 (8)	1191-1202	2019
3	Physico-chemical and surface properties of air plasma treated PVDF/PMMA/Attapulgitte/hexagonal-Boron Nitride blends	Progress in Organic Coatings	131	17-26	2019
4	Reduced power consumption in nickel zinc ferrite nanoparticles doped blue phase chiral nematic liquid crystal devices	Journal of Molecular Liquids	281	480-489	2019
5	Evaluation of surface properties of low-density polyethylene (LDPE) films tailored by atmospheric pressure non-thermal plasma (APNTP) assisted co-polymerization and immobilization of chitosan for improvement of antifouling properties	Materials Science and Engineering: C	94	150-160	2019
6	Influence of operating parameters on development of polyethylene oxide-like coatings on the surfaces of polypropylene films by atmospheric pressure cold plasma jet-assisted polymerization to enhance their antifouling properties KN Pandiyaraj, MC RamKumar, A Arun Kumar, PVA Padmanabhan, AM Trimukhe, RR Deshmukh, P Cools, R Morent, N De Geyter, V Kumar, P Gopinath, SK Jaganathan	Journal of Physics and Chemistry of Solids IF:2.048			2018

Book chapter:

No.	Author(s)	Title	Editor	Publisher	Place	Year	Page
1	R. R. Deshmukh, A. M. Trimukhe, K.N.Pandiyaraj, A. Tripathi	Advances in Biomaterials for Biomedical Applications (Plasma surface modification of biomaterials for biomedical)	A. Tripathi, J. S. Melo	Springer		2017	
2	R. R. Deshmukh, K. Deshmukh, G. M. Joshi, A. Sharma, S. Arora, R. Tibrawala, S. Kalinathan	Functionalized Engineering Materials and their Applications (Study of Morphology and Electrical Properties of Pure and Hybrid Polymer Composites)	S. Thomas, N. Kalarikkal, Pious C. V., Z. Ahmad, J. T. Haponiuk	CRC Press		2016	
3	R. R. Deshmukh, K. Deshmukh, M. B. Ahmad, S. K.K. Pasha, P.R. Bhagat, K.Chidambaram,	Biopolymer Composites in Electronics (Biopolymer Composites with High Dielectric Performance: Interface Engineering)	K. K. Sadasivuni, D. Ponnamma, John-John	Elsevier Publisher		2016	

4	R. R. Deshmukh	Liquid Crystalline Polymers: Volume 2--Processing and Applications (Electro-optic and Dielectric Responses in PDLC Composite Systems)		Springer		2015	
5	N. V. Bhat, R. R. Deshmukh	Plasma Technologies for Textile & Apparel (Plasma processing of textiles to enhance their dyeing and surface properties)	S.K. Nema, P.B. Jhala	Woodhead Publishing	India	2014	
6	N. V. Bhat, R. R. Deshmukh	Textile Dyeing (Pre-treatments of Textiles Prior to Dyeing: Plasma Processing)	Ira S. Krull, Sebastiano D'Amico	Intech Publisher		2012	

Profile:

Dr. Deshmukh joined ICT (formerly known as UDCT) as an Assistant Professor in 1996. Currently he is working as a Professor of Physics and Controller of Examinations in the Institute of Chemical Technology (ICT), Matunga, Mumbai,

He has completed M. Sc Physics from North Maharashtra University, Jalgaon (INDIA) in 1994 and Ph.D. from University of Mumbai in 2002. The title of the Ph.D. Thesis is: "Studies in Plasma Processing of Polymers and Their Applications".

He has visited University of Maryland under TEQIP for three months in 2007. He was a Post-Doctoral Fellow at the University of Texas, Arlington (USA) from February 2009 to March 2010. His research interest are Plasma Technology, Polymer Physics, Functionalization of nano-particles. Molecular tailoring of surfaces using plasma for biomedical applications, textile physics, PECVD, thin films, Electro-optical properties of Polymer Dispersed Liquid Crystals. Polymer nano composites materials.

His Skills and expertise

- Surface Analysis: FTIR, XPS, SEM, contact angle, AFM,
- Plasma Enhanced Chemical Vapor Deposition (PECVD)
- Polymer etching
- X-ray diffraction, DSC,
- High vacuum systems
- Dielectric studies

He has been working on various committees with in the institute and outside the institute.



PROF. (MRS.) V. D. DESHPANDE

M.Sc. (Delhi, 1978), M.Phil. (Delhi, 1980), Ph.D. (Delhi, 1986)

Professor

Publications (peer reviewed) so far: 23

Patents : 01

Conference proceedings/papers: 03

Seminars/Lectures/Orations delivered : 01

Ph.D.s Awarded as single/ Co-Guide: 07

Masters Awarded as single/ Co-Guide : 05

h-Index : 06

Citations : 87

Subjects taught :

UNDER GRADUATE

Subject: Applied Physics I

Class: F. Y. B. Chem. Engg.

Sem.: I

Subject: Applied Physics I

Class: F. Y. B. Tech.

Sem.: I

Subject: Colour Physics & Colour Harmony

Class: S. Y. B. Tech.

Sem.: IV

Subject: Colour Physics & Colour Harmony Lab

Class: S. Y. B. Tech.

Sem.: IV

POST GRADUATE

Subject: Colour Science

Class: M. Sc. (Physics)

Sem.: IV

Research interests :

Polymer nanocomposites, Polymer

blends: Crystallization kinetics, Mechanical and optical properties, study of dielectric behavior, Orientation behavior, structure-property relationship; Colour Physics: Colour assessment of dyed textiles; Assessment of the effect of the background on the colour perception; Polymer embedded nano-drug delivery; background on the colour perception; Polymer embedded nano-drug delivery

Research students :

Ph.D.(Sc) - 05

Research publications:

International- 03

Conference proceeding- 03

Postdoctoral/Ph.D. students' research projects:

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Dubey Satish Chandra	Jhunjhunwala college, Mumbai	Study of Paints and Their Coatings on various Substrates for Solar Thermal Applications	Prof. V. D. Deshpande
2	Gaonkar Amita	University of Mumbai	Morphological mechanical and thermal behavior of reorganized polyethylene terephthalate and its Nano composites	Prof. V. D. Deshpande
3	Murudkar Vrishali Vijaykumar	Pune University, Fergusson College.	"Physical and mechanical properties of polysiloxane Nano composites"	Prof. V. D. Deshpande
4	Singh Arvind R	University of Mumbai	Preparation of Polymer nanocomposites using Carbon nanotubes and surface modified Carbon nanotubes	Prof. V. D. Deshpande
5	Nikam Pravin		"Studies in polymer / metal oxide nanocomposites"	Prof. V. D. Deshpande

Details of sponsored projects – Government and Private

Government Agencies:

Sponsor	BARC/DAE
Title	Development and characterization of selective coating for enhancement of radiation absorption of solar receivers
Duration	3 years
Total amount	1.2 crores
Principal Investigator	Prof. (Mrs.) V. D. Deshpande
Research Fellows	Mr. Satishchandra Dubey

Publications

No.	Title and authors	Journal	Vol. No.	Pages	Year
1	Thermal and tensile properties of alumina filled PET nanocomposites Nikam, P.N., Deshpande, V.D.	AIP Conference Proceedings	1953	090058	2018
2	Study of nano mechanical properties polydimethylsiloxane (PDMS)/MWCNT composites Murudkar, V., Gaonkar, A., Deshpande, V.D., Mhaske, S.T.	AIP Conference Proceedings	1953	09555	2018
3	Melt rheological properties of nucleated PET/MWCNT nanocomposites Gaonkar, A., Murudkar, V., Deshpande, V.D.	AIP Conference Proceedings	1953	050001	2018
4	Evaluation of thermal transitions in Poly (butylene terephthalate)/15A MMT nanocomposites: Nonisothermal experiments and modelling using isoconversional methods Kalkar, A.K., Deshpande, V.D., Purkar, B.R.	Thermochimica Acta IF:1.99	660	23-36	2018
5	Nonisothermal crystallization kinetics of nylon 66/LCP blends Jape, S.P., Deshpande, V.D.	Thermochimica Acta IF:1.99	655	1-12	2017
6	Morphology, crystallization and melting behaviour of poly(trimethylene terephthalate)/thermotropic liquid crystalline polymer blends Deshpande, V.D., Jape, S.P.	Journal of Thermal Analysis and Calorimetry IF:1.74	128(3)	1479-1493	2017



DR. NEETU JHA

Ph.D.

UGC Assistant Professor

Fellowships/ Memberships of Professional Bodies :

- Materials Research Society
- Society of Materials Chemistry

Highlights of research work done and its impart:

Nanomaterial based fuel cell electrocatalyst:

Pt nanoparticles based catalyst supported on carbon nanostructures are synthesized and analyzed for its oxygen reduction reaction (ORR) activity using electrochemical techniques. We are also looking at the effect of catalyst support on fuel cell performance. Change in property of catalyst support has been found to have a profound effect on the cell performance. Our research group deals with detailed study of the low temperature fuel cell electrocatalyst.

Graphene Synthesis using solar radiation

Graphene oxide is being synthesized at room temperature and ambient conditions using modified hummers method. Then natural source of light for rapid, chemical free and low temperature method is being used for high throughput production of graphene by exfoliation of graphite oxide was using focused solar radiation. The simple method of preparation holds promise for easy scalability of cost effectiveness for huge practical applications.

Carbon Based samples for heavy metal removal

The adsorption of metal ions from aqueous solution has been studied with the variation in the degree of functionalization of the graphene samples. It was observed that increasing oxygen functionalities amplifies the uptake of metal ions.

Supercapacitor cells

Two electrode supercapacitor cells are fabricated using highly conducting and porous carbon nanomaterials for charge storage studies. Our research focus is on the development of carbon nanocomposites for increase in charge storage property. Capacitors are known to possess very high power density but its energy density is limited. Hence along with the charge storage we also focus on enhancing the energy density of capacitors.

Publications (peer reviewed) so far: 37

Patents : 04

Conference proceedings/papers: 10

Ph.D.s Awarded as single/ Co-Guide: 01

Masters Awarded as single/ Co-Guide : 06

h-Index : 13

Citations : 730

Subjects taught:

UNDER GRADUATE

Subject: General Physics Laboratory

Class: F. Y. B. Chem. Engg.

Sem.: I

Subject: General Physics Laboratory

Class: F. Y. B. Tech.

Sem.: II

POST GRADUATE

Subject: Nanotechnology, Nanomaterials and Its Applications

Class: M. Tech. Green Technology

Subject: NanoScience

Class: M.Sc. (Physics)

Sem.: IV

Subject: General Physics Laboratory

Class: M. Sc. (Physics)

Sem.: I

Research interests :

Carbon Nanotubes, Graphene, Fuel Cell electrocatalyst, Energy storage supercapacitors and Electrochemical Sensors

Research students :

Ph.D. (Tech.) - 1

Ph.D.(Sc) - 3

M.Tech. - 1

Research publications:

International - 04

Sponsored projects :

Government- 1

Post graduate students' seminars/projects :

Seminars

No.	Name of the Student	Topic
1	Goyal Pranav	Electrocatalyst for PEM Fuel Cell

Research Projects

Ph.D. (Tech)

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Ahirrao Dinesh J.	North Maharashtra Jalgaon University	Development of Pseudocapacitors for Charge Storage	Dr. Neetu Jha

Ph.D. (Science)

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Mohanapriya K.	Anna University	Carbon based nanostructured materials for energy storage and capacitive deionization of water applications	Dr. Neetu Jha
2.	Kireeti Kumar	Nagajurn University	Development of nanomaterials based electrocatalyst for polymer electrolyte membrane fuel cell	Dr. Neetu Jha
3.	Shakeel Rahman	North Maharashtra Jalgaon University	Synthesis of CdSe quantum dot and its hybrid photocatalyst for hydrogen evolution from water under visible light	Dr. Neetu Jha
4.	Sukruta Pethe	University of Pune	Generation of Steam by Solar Energy Using Nanoparticles of Graphene Oxide and Applications of the same	Dr. Neetu Jha

M. Tech. (Green Tech)

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Shital Rajwadkar	UDCT, Jalgaon	Determination of Arsenic using electrochemical method	Dr. Neetu Jha

Details of sponsored projects – Government and Private

Government Agencies:

Sponsor	DST Inspire
Title	Development of Pt alloy based electrocatalyst for fuel cell
Duration	5 Yrs
Total amount	35 Lakh
Principal Investigator	Dr. Neetu Jha
Research Fellows	

Details of National and International collaborations

- Dr. Shubra Singh, Anna University, Tamil Nadu
- Dr. Ashish Mishra, B.H.U., UP.
- Dr. Shaijumon M. M., IISER, Trivandrum.
- Prof. S. Ramaprabhu, IIT Madras, Chennai.

Publications

No.	Title and authors	Journal	Vol. No.	Pages	Year
1	Functionality modification of SWCNT for improved methanol oxidation reaction Kota VMK Kireeti, Neetu Jha	Nanotechnology (IEEE-NANO), 2017 IEEE 17th International Conference on		630-631	2017
2	Preparation of ZnO nanoribbon–MWCNT composite film and its application as antimicrobial bandage, antibacterial filter and thermal IR camouflage material Prasad Upasani, TV Sreekumar, VG Gaikar, Neetu Jha	Bulletin of Materials Science IF: 0.870	40,4	865-876	2017
3	Surface tailored single walled carbon nanotubes as catalyst support for direct methanol fuel cell Kota VMK Kireeti, Neetu Jha	Journal of Power Sources IF:6.945	364	392-399	2017
4	Preparation of ZnO/MWCNT/PP composite film and its application as multifunctional protective film Prasad Upasani, TV Sreekumar, VG Gaikar, Neetu Jha	Polymer Composites IF:1.86	39,1	157-170	2018
5	Carbon fabric based solar steam generation for waste water treatment MW Higgins, AR Shakeel Rahman, Rami Reddy Devarapalli, Manjusha V Shelke, Neetu Jha	Solar Energy IF:4.76	159	800-810	2018
6	Highly crumpled solar reduced graphene oxide electrode for supercapacitor application K Mohanapriya, Dinesh J Ahirrao, Neetu Jha	American Institute of Physics Conference Series	1942,5		2018
7	Synthesis of metal free ultrathin graphitic carbon nitride sheet for photocatalytic dye degradation of Rhodamine B under visible light irradiation Shakeelur Rahman, Bilal Momin, Uday S Annapure, Neetu Jha	AIP Conference Proceedings	1942,1	120017	2018
8	Bulk to nanostructured vanadium pentaoxide-nanowires (V2O5-NWs) for high energy density supercapacitors Dinesh J Ahirrao, Neetu Jha	AIP Conference Proceedings	1942,1	140066	2018

9	Non-platinum metal-organic framework based electro-catalyst for promoting oxygen reduction reaction Dipanwita Das, Vrushali Raut, Kota VMK Kireeti, Neetu Jha	AIP Conference Proceedings	1942,1	140049	2018
10	Development of an enzyme free glucose sensor based on copper oxide-graphene composite by using green reducing agent ascorbic acid Yogesh Pandit Palve, Neetu Jha	AIP Conference Proceedings	1953,1	030259	2018
11	Synthesis of Aqueous Dispersible Reduced Graphene Oxide by the Reduction of Graphene Oxide in Presence of Carbonic Acid Pravin H Wadekar, Dinesh J Ahirrao, Rahul V Khose, Dattatray A Pethsangave, Neetu Jha, Surajit Some	Chemistry Select IF: 1.46	3,20	5630-5638	2018
12	Enhanced electrochemical performance of hyperbranched poly (amidographene) Kiran Babasaheb Dhopte, K Mohanapriya, Neetu Jha, Parag R Nemade	Energy Storage Materials IF:5.208			2018
13	Fabrication of one dimensional graphene nanoscrolls for high performance supercapacitor application K Mohanapriya, Neetu Jha	Applied Surface Science IF:3.38	449	461-467	2018

Membership of In-house Committees:

Member of Purchase Committee for research instruments.

Profile:

Dr. Neetu Jha obtained her Bachelor in Science degree in Physics (Honors) from Calcutta University in 2002. This was followed by M.Sc(Physics) from Banaras Hindu University in 2004, with specialization in Spectroscopy. She obtained her PhD degree in Physics from Indian Institute of Technology Madras (IIT Madras) in 2009 with thesis titled "Development of Carbon based materials and its application in Direct Methanol Fuel cell, Nanofluids and Biosensors". She joined University of California Riverside as Postdoctoral Researcher from Sep 2009 to Dec 2011 and joined Institute of Chemical Technology Mumbai in January 2012 as DAE-ICT Scientist A. In April 2013, she joined the same institute as DST Inspire faculty and July 2014 changed the position from DST Inspire Faculty to UGC Assistant Professor in Physics.



DR. ASHWIN MOHAN

Ph.D.

Assistant Professor

Highlights of research work done and its impact:

My research work has mainly dealt with probing correlations between structure, magnetism, and thermal transport phenomena in fundamentally interesting and technologically promising classes of materials. Through my research work I have contributed towards understanding of the above-mentioned aspects in transition metal oxides, particularly low-dimensional quantum magnets, where antiferromagnetically coupled spins are arranged in two-dimensional planar or one-dimensional ladder-like and chain-like geometries. I have investigated the synthesis, structure, and physical properties of single crystalline compounds like the one-dimensional spin-chain compounds, Sr_2CuO_3 , SrCuO_2 , $\text{Ba}_2(\text{Mn,Ni})(\text{PO}-4)_2$, the two-dimensional Heisenberg antiferromagnet $\text{La}_2\text{CuO}-4$, the spin-ladder compound $\text{La}_8\text{Cu}_7\text{O}_{19}$, battery materials LiCoO_2 and LiNiO_2 , using solid-state synthesis, optical floating zone method, and various other microscopic and macroscopic measurement techniques in a wide range of temperature.

In low-dimensional materials that exhibit large anisotropic thermal conductivity mediated by magnetic excitations, my research has shed light on the relevant

scattering mechanisms, over a large temperature range from 5 K to 800 K, that are responsible for heat conduction in such materials. These oxide materials, with their unconventionally large and novel thermal transport channel find use in heat dissipation applications in microprocessors. In this regard, the effect of external perturbations like impurity-induced disorder on magnetic excitations and their propagation was also looked at. These results have provided unprecedented information about scattering mechanisms and evidence of strong coupling between spin and lattice degrees of freedom in such materials. I have also investigated magnetic and electrical properties of rare-earth intermetallic shape memory alloys for their use in solid state refrigeration technology. Here, we have found substantially large magnetocaloric effect near room temperature for compounds doped in a controlled fashion for achieving tunability for specific cooling applications. Recently, I have started work on synthesis of single-crystalline battery materials $\text{Li}(\text{Co,Ni})\text{O}_2$ with an aim to investigate the propagation of Li and O atoms through the bulk of the material and better understand the mechanism of charge transport in these technologically important materials. I have also started working on ferroelectric oxides of

$\text{A}-3\text{B}2\text{O}7$ type for investigating the newly discovered hybrid improper ferroelectric mechanism.

Publications (peer reviewed) so far : 8

Conference proceedings/papers : 5
Seminars/Lectures/Orations delivered : 8

Masters Awarded as single/ Co-Guide : 1

h-Index : 03

Citations : 62

Subjects taught :

Applied Physics I & II, Colour Physics Laboratory, Chemical Physics Laboratory, General Physics Laboratory (MSc, BChem, BTech)

Research interests:

Materials Physics, Functional materials, Magnetism and Transport phenomena, Material Synthesis, Single Crystal Growth

Research students :

M.Sc - 01

Research publications:

International - 01

Peer-reviewed - 01

Conference proceeding - 01

Special Awards/Honours:

Best Poster Award, DAE-Solid State Physics Symposium, December 2018, Hisar, Harayana

Post graduate students' seminars/projects :

Seminars

No.	Name of the Student	Topic
1.	Mirzapure Vinay	Structural studies of Zn doped LiNiO_2 & Study of Magnetic Properties in Sn doped $\text{Ca}_3\text{Mn}_2\text{O}_7$

Details of National and International collaborations

- Leibniz Institute for Solid State Research (IFW), Dresden, Germany
- Tata Institute of Fundamental Research (TIFR), Mumbai
- BARC, Mumbai

Publications

No.	Title and authors	Journal	Vol. No.	Pages	Year
1	Zigzag spin chains in the spin-5/2 antiferromagnet $\text{Ba}_2\text{Mn}(\text{PO}_4)_2$ A.Yogi, AK Bera, Ashwin Mohan, R.Kulkarni, SM Yusuf, A Hoser, AA Tsirlin, A Thamizhavel	Inorganic Chemistry Frontiers			2019
2	Optical Floating-Zone Growth of Large Single Crystal of Li-ion Battery Material LiCoO_2 A. Jain, S. M. Yusuf and Ashwin Mohan	DAE-Solid State Physics Symposium Proceedings			2018

Membership of In-house Committees:

Library Committee, Waste & Scrap Committee, Convocation Committee, NIRF core committee

Seminars/ Lectures/ Conferences/ Symposia/ Workshops/ Summer or Winter Training Schools attended/Oral OR Poster Presentations :

- DAE-Solid State Physics Symposium, Haryana (Poster Presentation)
- Indus Synchrotrons Users' Meeting (ISUM), RRCAT, Indore (Poster Presentation)

Events Organized :

Materials in Industry – a one-day Workshop in ICT Mumbai

Details of Post-graduate/Ph.D. students who passed out :

Name	Course	Title
Mirzapure Vinay	MSc	Structural studies of Zn doped LiNiO_2 & Study of Magnetic Properties in Sn doped $\text{Ca}_3\text{Mn}_2\text{O}_7$

Profile:

After obtaining my Masters' degree in Solid State physics, I have been engaged in experimental efforts to synthesize and investigate physical properties of a range of functional materials typically in the single crystalline form. During PhD and postdoctoral work, my focus was to understand correlations between structure, magnetism, and thermal transport phenomena from very low to very high temperatures in pure and doped transition metal oxide compounds. I have considerable experience in synthesizing single crystals of oxides and intermetallic compounds using the optical floating zone and the flux methods, determining crystal structure using diffraction methods, and low-temperature property measurement techniques. My current research areas are aligned towards investigating cobaltate-nickelate battery materials and double perovskite thermoelectric materials for harvesting clean energy.



PARESH H. SALAME

M.Sc.; Ph.D.
Assistant Professor

Publications (peer reviewed) so far: 06

Conference proceedings/papers: 03

Seminars/Lectures/Orations delivered : 02

h-Index : 04

Citations : 57

Subjects taught :

- Introduction to Ceramics
- Polymers-I
- Analytical Techniques
- Physical Methods of Analysis
- M.Sc.-I (Lab),
- B. Tech-II (Lab)

Research interests:

Secondary Batteries, Multiferroics, Electro-ceramics

Research publications:

Conference proceeding-01

Books-01

Sponsored projects :

Government - 02

Details of sponsored projects – Government and Private

Government Agencies: 02

Sponsor	DST-SERB
Title	Nanostructured NASICON, Eldfellite and layered oxides as potential cathode materials for Na-ion batteries
Duration	03 Years
Total amount	27,09,043 /-
Principal Investigator	Dr. Paresch H. Salame
Research Fellows	00

Sponsor	UGC
Title	Layered Lanthanide Perovskites, and Mixed Transition Metal Oxide based nanostructured electrode materials for Supercapacitor application
Duration	02 Years
Total amount	10,00,000 /-
Principal Investigator	Dr. Paresch H. Salame
Research Fellows	00

Book chapter:

No.	Author(s)	Title of the chapter	Editor	Publisher	Place	Year	Page
1	Paresh H. Salame; Jayant Kolte	Role of lanthanide substitution on suitable sites in enhancing the properties of various electroceramics	V. B. Pawade	Elsevier		2019	

Seminars/ Lectures/ Conferences/ Symposia/ Workshops/ Summer or Winter Training Schools attended/Oral OR Poster Presentations:

- DAE Solid state symposium (Hisar Haryana)
- Workshop on energy storage devices for solar cells at IIT Bombay
- Workshop at IPE Hyderabad on accountability at government institutes.

Details of Post-graduate/Ph.D. students who passed out (name, course, title of project) :

Name	Course	Title
Minakshi Devkar	M.Sc.	Electrode materials for Sodium ion batteries



DR. ARCHANA S. KALEKAR

MSc., PhD., PDF
Assistant Professor

Fellowships/ Memberships of Professional Bodies :

Admission Committee

Highlights of research work done and its impart:

Solar energy based devices:

Solar cells, Hydrogen generation, Photocatalysis for water purification

Hydrogen as a green energy has been envisioned for the future use of mankind. The abundant source of hydrogen is water and the electrocatalytic decomposition of water is the way forward. Sunlight can be used for water splitting and much research interest has been shown in past few years to decompose water using visible light. The use of several semiconductor materials are widely studied and is part of our research. The synthesis and fabrication of highly efficient nano materials as a water splitting material is to be carried out. Such materials can also be effectively used for the degradation of several types of dyes which are toxic to environment.

The abundance of solar energy reaching the earth's surface is putting huge pressure on utilizing the solar energy for energy production. The solar cells are effective for their conversion but the efficiency of such devices are limited. The limitations is mostly due to the materials

used in solar cells and therefore its an important to search for more promising materials for fabrication of solar cells. The synthesis and fabrication of nanostructures and enhancing efficiency is our prime goal which needs a huge research work for the same.

Chemical synthesis of Nanomaterial:

Chemical growth of nanomaterials is highly attracted in recent days due to low cost procedure and desired control on properties of growing material. We have been consistently working with different thin film deposition techniques such as chemical bath deposition (CBD), Electro-deposition, hydrothermal, Spray pyrolysis, Pulsed laser deposition (PLD), Chemical vapor deposition(CVD), reflux, Successive ionic layer adsorption and reaction (SILAR), method etc. These thin films are further used for different applications such as Solar cells, photocatalysts, super capacitors, batteries etc.

Supercapacitors:

Transition metal dichalcogenides (TMDs) based electrode material synthesis by hydrothermal method, development of high energy density supercapacitors. Our research focus on the TMDs are layered inorganic materials comprised of transition

metals (M) and chalcogens (X: S, Se, Te). Supercapacitors are known to possess very high power density but it's energy density is limited. Hence along with the charge storage we also focus on enhancing the energy density of supercapacitors.

Publications (peer reviewed) so far: 31

Conference proceedings/papers : 3

Seminars/Lectures/Orations delivered : 1

h-Index : 13

Citations : 513

Subjects taught:

Material Sciences, Material Synthesis, Color physics

Research interests :

Photocatalysis for water purification and hydrogen generation, Solar Cell, Energy Storage Device

Research students :

Ph.D.(Sc) – 1(PI), 1(Co-PI)

M.Sc - 1

Research publications:

International- 5

Books- 1

Sponsored projects :

Government - 1 (TEQIP-III)

Professional Activities:

Admission Committee

Research Projects

Ph.D. (Science)

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Maurya O.C.	Institute of Science Mumbai	Photoelectrocatalysis	Dr. Archana Kalekar

Postdoctoral/Ph.D. students' research projects :

No.	Research Scholar	Previous Institution	Project	Supervisor
1	Mr. Oshnik C Maurya	Institute of Science Mumbai	Photoelectrocatalysis study of semiconductor nanostructure	Dr. Archana Kalekar
2	Khaladkar Somnath R.	Pune University	Synthesis and study material for energy Storage Device	Co-guide: Dr. Archana Kalekar

Details of sponsored projects – Government and Private

Government Agencies:

Sponsor	TEQIP-III
Title	Photoelectrocatalytic degradation of dyes
Duration	1 year
Total amount	-
Principal Investigator	Dr Archana S Kalekar
Research Fellows	Oshnik C Maurya

Publications:

No.	Title and authors	Journal	Vol. No.	Pages	Year
1	Fabrication of Cu ₂ (Zn _x Mg _{1-x}) SnS ₄ thin films by pulsed laser deposition technique for solar cell applications; GL Agawane, SA Vanalakar, AS Kamble, AV Moholkar, JH Kim	Materials Science in Semiconductor Processing	76	50-54	2018
2	Fractal granular BiVO ₄ Microspheres as high performance anode material for Li-ion battery; Deepak R Patil, Sagar D Jadhav, AishwaryaMungale, Archana S Kalekar, Deepak P Dubal	Materials Letters	252	235-238	2019
3	Fabrication of nanogranular TiO ₂ thin films by SILAR technique: Application for NO ₂ gas sensor; VithobaLaxmanPatil, SharadraoAnandaraoVanalakar, Sambhaji S Shendage, Sarita P Patil, Archana S Kamble, NL Tarwal, Kiran K Sharma, JinHyeok Kim, Pramod S Patil	Inorganic and Nano-Metal Chemistry	49	191-197	2019

4	Chemically Synthesized Hierarchical Flower like ZnO Microstructures; VL Patil, SA Vanalakar, SA Vhanalakar, AS Kamble, TD Dongale, DN Kurhe, PP Kamble, SP Patil, SS Shendage, PS Patil, JH Kim	Zeitschrift für Physikalische Chemie	233	1183-1200	2019
5	Hydrothermal synthesis of nanoporous lead selenide thin films: photoelectrochemical and resistive switching memory applications; Tejasvinee S. Bhat • Archana S. Kalekar Dhanaji S. Dalavi. Chetan C. Revadeka Atul C. Khot Tukaram D. Dongale Pramod S. Patil	Journal of Materials Science: Materials in Electronics https://doi.org/10.1007/s10854-019-02122-1	-	-	2019

Book and book chapters :

No.	Author(s)	Title	Publisher	Place	Year
1	R.R. Deshmukh, A.S. Kalekar, S.R. Khaladkar, O.C. Maurya	Versatile 1-D nanostructures for green energy conversion and storage devices	Springer		2019

Profile:

Dr. Archana Kalekar obtained her Ph.D. at Shivaji University Kolhapur India in 2014 under the guidance of Prof. Pramod Patil. She held postdoctoral position (2014–2016) at Chonnam national university, south korea with Prof. Kim Jin Hyeok. Then she was assistant professor at G.M.D. Arts, B. W. Commerce and science college Sinnar, India (2016-2018). Currently she is working as assistant professor at department of physics Institute of chemical technology Mumbai. Her research interest includes synthesis of quantum dots, 1-D and hierarchical nanostructures of semiconducting materials by chemical techniques and their application in solar cells, photo-catalysis and charge storage devices.