

MANGALORE UNIVERSITY



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Government of India
Ministry of Human Resource
Development



MHRD Scheme - Global Initiative on Academic Network (GIAN)

a six day course on

Multifunctional Advanced Nanomaterials and their Applications

03 – 08 December 2018

Organised by

Department of Postgraduate Studies and Research in Chemistry
Mangalore University, Mangalagangothri-574 199, Karnataka, India

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About Mangalore University

Mangalore University was established in 1980 to fulfil the aspirations of the people of undivided Dakshina Kannada and Kodagu districts of Karnataka. The campus of Mangalore University called Mangalagangothri is located about 20 km to the south east of the historic port city of Mangalore. The vision of the University is 'to evolve as a national centre of advanced studies and to cultivate quality human resource'. The mission of the University is to provide excellent academic, physical, administrative, infrastructural and moral ambience. In addition, it aims at excellence in teaching, learning and research and to contribute towards building a socially-sensitive, humane, inclusive society. The University is committed to fulfil the objectives stated in the mission, by providing good infrastructural facilities to develop the University as a national centre in all spheres - teaching, learning, research and governance.

Mangalore University has grown impressively since its inception. Mangalore University is the first University in the country to start Bachelor degree programs in Hotel Management, Fashion Design, Garment Design and Leather Design. It is also the first University to start post-graduate program in Human Consciousness and Yogic Science and one of the first in the country and the first one in the state to start a full-fledged Master's and Doctoral program in Materials Science. The University has taken steps to establish contacts through exchange of scholars with Universities in USA, UK, Finland, Japan, Korea, Taiwan, Norway, Germany and other countries.

Research performance of Mangalore University is evidenced in the award of Rs. 16.6 crores grant by the Department of Science and Technology (DST), under PURSE scheme. The Microtron Centre, developed with the Department of Atomic Energy (DAE) support, is a national facility. The Centre for Application of Radiation and Radioisotope Technologies (CARRT) and Centre for Advanced Research in Environmental Radioactivity (CARER) are research centres which collaborate with a large number of research institutions at regional and national levels. The Ocean and Atmospheric Science and Technology Cell (OASTC), set up in collaboration with Department of Ocean Development (DOD), acts as a nodal centre to promote research in ocean

and atmospheric sciences. Ministry of Human Resource Development (MHRD) in the first phase has identified Mangalore University as one of the beneficiaries of RUSA Grant.

Various surveys and independent research studies have placed Mangalore University in very high positions. H-index of the University in 2018 has been 62 that show the excellent research progress. As per the week education survey the ranking of Mangalore University is 34 among multi-purpose Indian Universities and it secured 14th position among Southern Universities. University has been placed at number 3 in Green metric ranking. Today, true to its vision and mission, Mangalore University stands poised to reach greater heights of excellence in the years to come.

About the Department

The Department of Chemistry was established in 1981 with an intake of 9 students in the Government College, Mangalore. In 1982, the department was shifted to university campus, Mangalagangothri and in 1986 to the present science faculty building. The department started M.Sc. course in Applied Chemistry in the year 1996 and M.Sc. Organic Chemistry course in the year 2007. Presently, the department is running three M.Sc. Courses in Chemistry, Applied Chemistry and Organic Chemistry with a combined intake of about 140 students and PhD programme in Chemistry. As on today the Department has produced over 1400 M.Sc. graduates, 50 M.Phil and over 225 Ph.D. graduates. Presently about 70 Research Scholars are working for their Doctoral Degree.

The Department has also contributed to science significantly by carrying out research and published over 2700 research papers in peer reviewed national and international journals of reputation and presented about 2000 research articles in national and international Conferences. The faculties have received several prestigious fellowships and awards in recognition of their research contributions. They include Alexander von Humbolt Research Fellowship of Germany, JSPS Research Fellowship of Japan, Commonwealth Research Fellowship of U.K., Post-Doctoral Research Fellowships from US Research foundations and Korean Federation of Science & Technology, 'Dr. Kalpana Chawla Young Women Scientist' State Award of Karnataka, 'Best teacher' award of Mangalore University etc.

The faculty members are actively engaged in research in Frontier Areas of Chemistry and Interdisciplinary Areas. Research Project Grants of about Rs. 2 Crores have been sanctioned to the department by UGC, DST, DAE, NPCIL, KSCST, BRNS etc. The department has also entered into MOU with Industries and R&D organizations such as Nuclear Power Corporation of India, Kaiga, Rallis Agrochemical Research Station, Bangalore and Strides Arcolab, Mangalore.

The department is Supported with UGC- SAP (I Phase- Rs. 37 Lakhs & II Phase- Rs. 75 Lakhs) and DST-FIST (I Phase -Rs. 42 Lakhs) Grants. The Department conducted 3 International Conferences, 10 workshops and several lecture series. The Department has revised / updated M. Sc. course contents 8 times, almost once in every four years and is recently updated in 2016. The students graduating from our department have been recognized for their academic excellence in industries, professional and academic institutions in India and Abroad. Several premier chemical industries and R & D centres recruit our students through campus Selection. Several students have cleared GATE/SLET/NET examinations. Several Alumni of the Department have occupied prestigious in industries and academic institutions. The Department has great potential for expansion, particularly because of large scale investment in Greater Mangalore on Chemical Industries like Petrochemical Company, Pharmaceutical and Speciality Chemical Industries, Thermal Plant, BASF etc.

Course Overview

Advanced nanomaterials have been receiving a lot of attention in the recent years owing to their fundamental scientific importance and excellent structure, electronic and textural characteristics which find them attractive for various industrial applications covering sensing, catalysis, adsorption-separation, energy storage and conversion and biotechnology. This course is an introduction to nanomaterials, providing both undergraduate and post graduate students an updated overview on the preparation and the fascinating properties of various nanomaterials and their key potential applications. This course also introduces a wide range of characterization tools (such as diffraction, microscopy & spectroscopy) that will help the students not only to understand the structure of the materials but also give them enough understanding of controlling the properties of the materials for specific applications. This course will present a review of the state of the art of materials with different functional elements, structures, morphology and porosity and provide details on structure-property relationships with the possibility of providing behaviour not seen in coarser scale structures. In addition certain new classes of materials may also be produced at this size level, for example, nanoporous materials including carbons, nitrides, biomolecules and polymers, carbon nanotubes, graphene, carbon nanodots, carbon nitrides, Nano diamonds, quantum dots, and a variety of colloidal structures. In this course, it is also planned to cover the applications of these advanced nanostructures in various applications ranging from existing commercial nanomaterials to the future generation of energy and conversion devices to carbon capture and conversion.

Course Objectives

The primary objectives of the course are as follows:

- i) Exposing the students to the basic and fundamentals of the novel advanced synthesis of nanomaterials and the availability of range of advanced technologies for their preparation.
- ii) Providing the enough information required for the successful preparation of novel advanced nanostructures with the highest quality with the specific properties and their modification through chemical or physical approach to achieve tunable properties.
- iii) Building the knowledge on understanding of the structure and properties of the materials through various advanced highly sophisticated tools
- iv) Providing enough information for the successful transformation of basic and applied nanomaterials research into real world products.
- v) Supporting the students to understand and expand the application possibilities of the advanced nanostructures for different applications
- vi) Identifying the possible opportunities of the nanomaterials in product development and enhancement with the aim of supporting the society and the economy of the country.

Teaching Faculty with allotment of Lectures and Tutorials

Prof. Ajayan Vinu (AV)

Course Duration: 03rd December 2018 to 08th December 2018

Class	Date	Contents
1	Day 1 (2 hrs)	<ul style="list-style-type: none"> An overview of nanomaterials Recent Advances in Nanomaterials
2	Day 2 (2 hrs)	<ul style="list-style-type: none"> Synthesis of advanced nanostructures with different functional elements Different Synthesis Strategies for the Advanced Nanomaterials – Top Down and Bottom Up Processes
3	Day 3 (2 hrs)	<ul style="list-style-type: none"> Introduction to Sophisticated Characterization Tools for the Advanced Nanostructures Structural Characterization at the Nanoscale
4	Day 4 (2 hrs)	<ul style="list-style-type: none"> Advanced Carbon Nanostructures: carbon nanotubes, carbon nanodots, graphenes, and nanodiamonds The World of Advanced Nanoceramics including Nitrides and Oxides Advances in the Nanoporous Materials
5	Day 5 (2 hrs)	<ul style="list-style-type: none"> Nanomaterials for Catalysis Energy and Environmental Applications of Advanced Nano(porous) Materials Advanced Nanomaterials for Biomedical Applications including Nano-bio Sensors and Drug Delivery
6	Day 6 (2 hrs)	Research seminar / Examinations
Total	12 hours	

Participant evaluation is based on attendance and a final test.

Lecture Schedule:

Day 1 (03rd Dec 2018):

Lecture 1 & 2: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): AV

- An overview of nanomaterials
- Recent Advances in Nanomaterials

Day 2: (04th Dec 2018):

Lecture 3 & 4: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): AV

- Synthesis of advanced nanostructures with different functional elements
- Different Synthesis Strategies for the Advanced Nanomaterials – Top Down and Bottom Up Processes

Day 3: (05th Dec 2018):

Lecture 5 & 6: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): AV

- Introduction to Sophisticated Characterization Tools for the Advanced Nanostructures
- Structural Characterization at the Nanoscale

Day 4: (06th Dec 2018):

Lecture 7 & 8: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): AV

- Advanced Carbon Nanostructures: carbon nanotubes, carbon nanodots, graphenes, and nanodiamonds
- The World of Advanced Nanoceramics including Nitrides and Oxides. Advances in the Nanoporous Materials

Day 5: (07th Dec 2018):

Lecture 9 & 10: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): AV

- Nanomaterials for Catalysis
- Energy and Environmental Applications of Advanced Nano(porous) Materials
- Advanced Nanomaterials for Biomedical Applications including Nano-bio Sensors and Drug Delivery

Day 6: (08th Dec 2018):

Lecture 11 & 12: 10.30am to 11.30am & 11.45am to 12.45pm (2 hrs): TW

Tutorials: Research Seminar and Evaluation

Who can attend?:

- *The course is directed at engineers, executives, and scientists who require a thorough grounding in the benefits of nanomaterials and related technology. These are applicable to a wide range of industrial scenarios.*
- *The course provides an ideal opportunity to review the scope and applicability of the currently available and emerging nano-structured materials. This course is opened to students at all levels (MSc/MTech/PhD) and Faculty, Guest faculties from reputed academic institutions and technical institutions.*
- *While the course is open to all, a scientific or engineering education to degree level, or a higher education qualification in physics or chemistry is desirable.*

Number of participants for the course will be limited to fifty.

Fees:

<i>Executives, Scientists and Researchers from manufacturing, service and government organizations including R&D laboratories</i>	<i>Rs. 2000/-</i>
<i>Faculty, Guest faculties from reputed academic institutions and technical institutions</i>	<i>Rs. 1500/-</i>
<i>Student at all levels (MSc/MTech/PhD)</i>	<i>Rs. 1000/-</i>
<i>International participants</i>	<i>250 USD</i>

Note: The participants will be provided with accommodation on payment basis.

Detailed CV of Experts:**Prof. Ajayan Vinu**

Prof. Vinu is currently working as a Global Innovation Chair Professor and Director of Global Innovative Center for Advanced Nanomaterials at the University of Newcastle. Prior to this, Prof. Vinu was also working as a Full Professor of Nanomaterials, at the Future Industries Institute, University of South Australia, Mawson Lakes, Australia from 2015 to 2017. His previous employment was as a Full Professor and ARC Future Fellow at the University of Queensland, Brisbane, Australia during September 2011-2015. Before moving to Australia, he had been working as a senior researcher at the National Institute for Materials Science (NIMS), Tsukuba, Japan since 2006 after he had successfully completed two years of the ICYS fellowship at the same institute and a few years of research at the Technical University of Kaiserslautern (TUK), Germany. Although Prof. Vinu registered his PhD at Anna University, he performed most of his PhD work at the TUK, Germany (2000-2003). During these 17 years of research, Prof. Vinu has made a significant contribution in the field of nanoporous materials and their application in sensing, energy storage, fuel cells, adsorption and separation, and catalysis.

The quality of his research has been recognised with several international awards including Scopus Young Researcher Award 2014, Friedrich Wilhelm Bessel award by the Humboldt Society (2010), JSPS Senior Invitational Fellow for the year 2014, Australian Future Fellowship (Professorial Level) for the year 2010, Indian Society for Chemists and Biologists award for excellence for the year 2010, Catalysis Society of India Young Scientist award for the year 2010, Chemical Society of Japan Award for the Young Scientist for the year 2008, Laureate of Khwarizmi International Award 2008, Asian Excellent Lectureship Award, and ICYS fellowship. Prof. Vinu is honoured with the Fellow of Royal Society of Chemistry, FRSC (UK), Fellow of Royal Australian Chemical Institute (FRACI), Fellow of World Academy of Ceramics (FWAC) and Foreign Fellow of Maharashtra Academy of Sciences, FFMAS.

His contribution in the field of nanoporous materials is also clearly reflected by his international ranking by Science Watch as one of the top 15 researchers in the field and has led to ca. 350 papers in high impact factor journals with ca. 15,900 citations and a H-index of 64. His research has been published in top journals like Angew. Chemie, Nano Letters, J. Am. Chem. Soc., Adv. Mater, Adv. Funct., Mater. Chem., Eur. J., Chem. Mater., etc. with an average of 850 citations per year. At least 40 of his papers have been cited more than 100 times (18 papers have been

cited more than 200 times) and 80 papers have been cited more than 50 times. The innovative nature and commercial potential of his research is evidenced by 30 national and international patents.

He has also been invited to write several chapters by renowned publishers including Wiley, Elsevier and American Scientific. He is the Editor of Science of Advanced Materials and Australian Editor of Journal of Nanoscience and Nanotechnology and recently. He has been recently appointed as the Editorial Board Member of Scientific Reports, a Nature Publishing Group and Chemical Record, a Wiley Journal for three years. Professor Vinu is also in the Editorial board of several journals namely Materials Today Nano, Emergent Materials, Journal of Nano Science and Nanotechnology, Current Science, etc. He has been invited to deliver presentations at numerous international conferences, workshops and seminars and chaired sessions of several international conferences. Prof. Vinu has visited institutes in more than 40 countries to deliver lectures and gave ca. 215 lectures including 33 plenary and 28 keynote lectures at international conferences as well as ca. 165 invited talks. He was also offered honorary professor position from leading universities including Hokkaido University, Japan, Yonsei University, South Korea, Kyungpook National University, South Korea, Fudan University, China, Jilin University, China, Mangalore University, India, and Anna University, India, and Adjunct Principal Researcher from Korean Research Institute for Chemical technology, Daejeon, South Korea.

Dr. Mahagundappa R Maddani (Course Coordinator)



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PERSONAL INFORMATION

Born: 1981; Indian

ACADEMIC POSITION

Assistant Professor at Department of Chemistry,
Mangalore University, Mangalagangothri-574199

March 2014 - Present

EDUCATION

Ph.D. *Dept. of Organic Chemistry*, Indian Institute of Science, Bangalore INDIA 2010
M.Sc. *Dept. of Chemistry*, Karnatak University, Dharwad, INDIA 2003

Industrial Experience

Advinus Therapeutics Ltd., Bangalore Oct 2011 – Feb 2014
Designation: Principal Scientist

Aurigene (Accelerating discovery) Ltd., Bangalore, INDIA Jan 2005 – June 2005
Designation: Science Associate

CIPLA Ltd, Bangalore, India June 2003 – Dec 2004
Designation: Synthetic Organic Chemist

Postdoctoral research: June 2010 – May 2011

Research: "Stereoselective synthesis of enantiopure compounds for biological studies"
Institut de Chimie Moléculaire et des Matériaux d'Orsay, University of Paris Sud-XI, France

Advisor: Professor HENRI B. KAGAN

Ph.D Thesis: *“Chemistry of Molybdenum Xanthate ($\text{MoO}_2[\text{Et}_2\text{NCS}_2]_2$): Applications in Organic Synthesis”*

August 2005-June 2010

Department of Organic Chemistry, Indian Institute of Science, Bangalore, INDIA

Supervisors: Dr. K. R. PRABHU and Prof. S. CHANDRASEKARAN

AWARDS & FELLOWSHIPS

- **Lectureship award** from Council of Scientific & Industrial Research (CSIR) in 2009 National Eligibility Test (NET) required for Lectureship in India
- The **Guha Research Medal** (Best thesis award) 2009 – 2010 for the best research 2010 work during Ph.D programme in Organic Chemistry department, IISc. Bangalore

PUBLICATIONS – 7 ; BOOK – 1 Book Chapter ; PATENTS - 2

Prof. Boja Poojary (Course Co-coordinator)

Boja Poojary (born: 15. September 1968) obtained his MSc (1993) from the Mangalore University, and PhD (2000) on “Studies on some Cyclic Peptides and Heterocyclic derivatives of Amino Acids & Peptides” from Mangalore University, India with Dr. S. L. Belagali, Professor, Department of Environmental Chemistry, University of Mysore, Mysore and Dr. B. Shivarama Holla, Department of Chemistry, Mangalore University, Mangalagangothri. He qualified State Level Education Test-Eligibility for Lectureship in Universities and Colleges conducted by Government of Karnataka during 1994-1995. He started teaching profession at Department of Chemistry, Mangalore University, as senior lecturer (2000-2005), as reader (2005-2008), and as Associate Professor (2008-2011). He then promoted as Professor in the year 2011 and he is currently serving as Professor and Chairperson, department of Chemistry, Mangalore University.

Boja Poojary is the author of 116 publications (National and International) and 83 conference proceedings. He has involved actively in various administrative services as coordinator, BOE Chairman, Convener, Director. He also organized several conferences/Workshops/Seminars during last 20 years. He also completed successfully projects funded by UGC, National Agricultural Innovation Project (NAIP) & Indian Council of Agricultural Research (ICAR) under Basic & Strategic Research in the Frontier Areas of Agricultural Sciences, New Delhi.

His research area includes Bioorganic Chemistry and Medicinal Chemistry. His research area is very relevant for the modern days, as scientific community as a whole is thinking of developing good drugs, vaccines, antibodies for deadly diseases like AIDS, which are also showing their ugly head in our country well. The research activities include-Development of new methodologies for the preparation of biologically important Heterocyclic molecules, naturally occurring cyclic peptides and heterocyclics linked with peptides. The structural studies and evaluation of biological potency of the synthesized molecules for their varied activities.

The application of molecular design to the creation of new molecules which may have medical applications, which may exhibit novel reactivity or which may be of interest in the context of molecular electronics, e.g., by forming non-linear optical materials. Development of convergent synthetic pathways of MCRs (Multi Component Reactions-one pot synthesis) in the synthesis of biologically important Heterocyclic molecules as they show advantages over linear or divergent approaches with respect to speed, time, yield and reproducibility.

He has successfully guided 07 PhD candidates and 01 MPhil candidate till date. Currently, 06 candidates are pursuing their PhD degree under his supervision.