AMAL JYOTHI
COLLEGE OF ENGINEERING
KANJIRAPPALLY

AICERA 2021

ANNUAL INTERNATIONAL CONFERENCE on
EMERGING RESEARCH AREAS

ICAN 2021

International Online Conference on
ADVANCED NANOMATERIALS

14-16
DEC
2021

GDAŃSK UNIVERSITY
OF TECHNOLOGY

PROCEEDINGS

ISBN No. 978-93-5593-132-0

Organized by

Centre for Nanoscience and Technology
and Department of Basic Sciences,
Amal Jyothi College of Engineering

in partnership with

Department of Energy Materials,
Mahatma Gandhi University &
Faculty of Chemistry,
Gdańsk University of Technology, Poland

www.aicera.in

AICERA 2021

International Online Conference on Advanced Nano Materials

(ICAN 2021)

CONFERENCE PROCEEDINGS

Organized by

Amal Jyothi College of Engineering, Kanjirappally

Koovappally P.O, Kottayam

Mahatma Gandhi University,
P.D Hills P.O, Kottayam
Kerala, India

&

Gdansk University of Technology

Poland

Fr.Dr.Mathew Paikatt
Manager, AJCE

MESSAGE FROM THE MANAGER

"We keep moving forward, opening new doors and doing new things because we are curious and curiosity keeps leading us down new paths', an inspirational quote by Walt Disney presents the value of innovation. That is exactly true that our thirst to explore new findings, makes the world, what it is today. We need that sense of curiosity as the world has so much to explore. International conferences are excellent platforms for innovative explorations.

AICERA [Annual International Conference on Emerging Research Arears] hosted by Amal Jyothi College of Engineering, serves as an international platform for meeting researchers from around the world, widen professional contact and create new opportunities, including establishing new collaborations.This years' AICERA as E conference in view of pandemic scenario will be held from Dec 14-16, 2021 is focussing on Advanced Nanomaterials (ICAN 2021) and that will explore new avenues in nanomaterials research and development

The aim of the ICAN-2021 is to promote quality research and real-world impact in an atmosphere of true international cooperation between scientists and engineers by bringing together the world class researchers, international communities and industrial heads to discuss the latest developments and innovations in the fields of Nanotechnology and Nanomaterials**.** Our aim is also to uncover imaginative research on Nanoscience and Nano technology.

We sincerely hope that ICAN 2021 will give all delegates the chance to exchange the experience, build a friendship and future cooperation. I hope that all participants will enjoy the conference and establish good links for future research. Surrounded by un-beating opportunities and grand challenges, we are cognizant of the great privilege that nature has afforded us, and we are blessed with being able to experience this as our priceless part of career. On behalf of the Management of Amal Jyothi College of Engineering I wish all the participants a fruitful and delightsome experience during these days. I wish the event all success.

Dr.Z. V.Lakaparampil
Principal, AJCE
Conference Chair

MESSAGE FROM THE PRINCIPAL

Annual International Conference on Emerging Research Areas (AICERA-2021), **is** an established event hosted by Amal Jyothi College of Engineering Kanjirappally, attracting global attention on sharing, exchanging and exploring new avenues of International Conference on Advanced Nanomaterials (ICAN) as its 2021 edition.

ICAN 2021 is an International platform which brings together a group of investigators who are at the forefront in the field of Nanotechnology. The conference covers wide areas of nanotechnology and its applications. This will contribute cross-disciplinary benefit to the researchers in the field. Conference includes plenary lectures and invited talks by eminent personalities from around the world in addition to contributed papers as oral presentations. Our goal personally is to open a forum to facilitate the exchange of knowledge and experience and to invigorate the field with young scientists, researchers, Nano designers and nanoengineers, business entrepreneurs and specialists in the regulatory affairs. The Conference would secure the attracted participation from many of established leaders as well to open a green light for concentrating focus on generating solutions to the field's challenges. This would propose ways to encourage investment in innovation and stimulate the adoption of upgraded engineering to secure the national and international stability around the world.

We sincerely hope that ICAN-2021 serves as an international platform for meeting researchers from around the world, widen professional contact and create new opportunities, including establishing new collaborations.

We wish you all a fruitful scientific session during the conference.

Dr. Soney C George
Dean Research
Organizing Chair

FOREWORD

Nano-technology is gripping the diverse fields and providing excellent outcomes for various potential applications. Therefore, it should be considered as the need of today to combine different ideas of researchers working in different domains to develop cost-effective and reliable technology for day to day life.Nanotechnology, the manipulation of matter at the atomic and molecular scale to create materials with extraordinarily novel and unusual properties, is a rapidly escalating domain of research with huge potential to revolutionize the world and our lives. It holds the promise to answer some of the world's most immediate concerns in energy, electronics, agriculture, environment, information technology and medicine. Particularly, the last few years have witnessed ardent expansion of nanoscience and nanotechnology offering massive opportunities. It is highly interdisciplinary, encompassing all the domains of science and technology.

International Conference on Advanced Nanomaterials (ICAN-2021) is aimed to provide a platform for researchers, scientists and Industrialists across the globe to exchange, discuss the state-of-the-art research and development and identify the future demands and needs in the field of Nanoscience and Nanotechnology. This year conference focuses on many areas through Plenary Lectures, Invited Talks and Oral Presentations. This conference will be suitable for renowned researchers, young scientists, engineers from industries and other keen professionals (R&D) and manufacturers in this particular area.

Young researchers will have the challenge of being rated competitively and this conference would give 'Young researcher award 2021' to the researcher who has widened the scope and range of research activities in the field of nanomaterials. This award encourages researchers of this field from various parts of the world by issuing award to his/her research based on papers published in any of the reputed Journals or conferences, patents and funded projects and social contributions.

This conference will be an ideal platform for researchers to present their works, develop new interfaces, bench mark their works, exchange their views and widen the scope and range of research activity through dynamic networking. With its scientific sessions, all delegates are provided assurance to explore the latest technologies and breakthroughs that are specific to one's area of work.

Convener

ICAN2021

AICREA Committees

Organizing Committee

H.E. Mar Jose Pulickal, Bishop, Diocese of Kanjirappally, Patron
Fr. Dr. Mathew Paikatt, Manager , AJCE
Dr. Z V Lakaparampil, Principal , AJCE
Prof. Tomy Joseph, Registrar, AJCE
Dr. Jacob Philip, Dean Academic , AJCE
Fr.Dr.James Elanjipuram, Dean Basic Skills and Welfare, AJCE
Dr.Lisa Mathew, HoD, Basic Sciences, AJCE

International Advisory Committee

Prof. Hendrik Heinz, University of Colorado, USA
Prof. Ashok Mulchandani, University of California, USA
Prof. Jozef T. Haponiuk, Gdansk University of Technology, Poland
Prof.Jacques Lacoste, Sigma Clermont and Clermont Auvergne University, France
Prof. Benjamin Tawiah, Hongkong Polytechnic University, Hongkong
Dr. Richard Thompson, Durham University, UK
Prof. Joanna Ewa Izdebska, Poland
Prof.Anastasia Penkova, St.Petersburg University, Russia
Dr. Maya Jacob John, CSIR Port Elizabeth , South Africa
Dr. Aji P Mathew, Stockholm University, Sweden
Prof. Sung Soo Kim, Inha University, South Korea
Dr. Mariia Dmitrenko, St.Petersburg University, Russia
Prof. Sydney Ferreira Santos, Center of Engineering, Federal University of ABC, Brazil,
Prof. Ajith Kumar G, University of Texas at San Antonio, USA
Prof. Alain Dufresne, Université Grenoble Alpes, France
Prof.Dr.R.N.Lichtenthaler, University of Heidelburg, Germany
Prof.Yuichi Masubuchi, Department of Materials Physics, Nagoya University, Japan

National Advisory Committee
Prof. Dr. Sabu Thomas, Mahatma Gandhi University, Kerala
Dr. Ajayaghosh, CSIR-NIIST, Thiruvananthapuram, Kerala
Dr. Suryasarathi Bose, IISc,Bangalore
Dr.Kuruvilla Jospeh, IIST, Thiruvananthapuram, Kerala
Dr. G Unnikrishanan, NIT, Calicut, Kerala
Dr.Siby Varghese, Rubber Board, Kerala
Dr.Nandakumar Kalarikkal, IIUCNN, Mahatma Gandhi University, Kerala
Dr.Stanly Jacob.K, CMET, Kerala
Dr.Joice SophiaPonraj, Centre for Advanced Materials, Coimbatore
Dr.M.K Pandey, DRDO, New Delhi
Dr.Susy Varghese, IIT Madras
Dr.Honey John, Cohin University of Science and Technology, Kerala

Local organizing committee

Programme Committee
Ms.RinoLaly Jose
Dr. Deepa H Nair
Ms. Jany Jose
Ms. Sreelakshmi Rajeevan
Mr.Sarath P S
Ms.Jisha Babu
Ms. Nikhi Maraia Raju

Communication and Invitation Committee
Ms. Jincy Sebastian
Ms.Aida Abraham

Registration Committee
Dr. AbinManoj
Ms. Linu Tess Antony
Ms. Nimmy Chacko
Ms. Ashitha S
Ms.Reenu Sara Jacob
Ms. Lissa Chacko

Publicity Committee
Dr. Jasmine Mathew
Ms.Rose Jacob
Dr.Sijumon V A

Finance Committee
Ms. Lisa Rani Alex
Mr. Sreekanth R

Online Support Committee
Mr.Nobin Thomas
Ms. Neethu M Scaria
Ms. M Bunitha Mary
Ms.Amala Vincent
Mr.Harry Jose

Food Committee
Dr. Jaimon Yohannan
Ms. Deepamole S
Ms.Deepalakshmi D
Dr.Bibin Mathew
Ms. Jain Joseph

TECHNICAL PROGRAMME SCHEDULE OF ICAN2021

1st Day of the Conference (14th December 2021)			
	9.30-10.00	**INAUGURATION AND INAUGURAL ADDRESS**	
		Welcome Speech	**Principal**
		Presidential Address	**Manager**
		Inaugural Address	**Prof. Hendrik Heinz**
		Keynote address	**Prof. Sabu Thomas**
		Felicitations	**Prof. Jozef T Haponiuk**
		Vote of thanks	**Dr. Soney C George**
		Announcement of young research award	**Dr. Lisa Mathew**
International Conference Hall			
SESSION 1: BLENDS AND COMPOSITES **Chairperson: Prof. Józef T. Haponiuk**			
PL-1	**10.00-10.30**	**Prof. Hendrik Heinz** **Department of Chemical and Biological Engineering, University of Colorado-Boulder, Boulder, CO 80309, USA** Molecular Recognition and Assembly of Biomaterials: Computational and Data Science Tools for Property Predictions	
PL-2	**10.30-11.00**	**Prof. Sabu Thomas** **Vice Chancellor, Mahatma Gandhi University, Priyadarshini Hills P.O. Kottayam, Kerala, India -686 560** Circular Economy: New Opportunities in Sustainable Nano Materials and Polymer Bio-Nanocomposites	
Tea Break (11.00-11.10) **Chairperson: Dr. Sreekala M S**			
IL-1	**11.10-11.30**	**Dr. Jayalatha Gopalakrishnan G.** **Associate Professor, Dept. of Polymer Science & Rubber Technology** **Cochin University of Science & Technology (CUSAT)** **Kochi-22** Dielectric Properties of Epoxy/Conducting Filler Nanocomposites	
IL-2	**11.30-11.50**	**Dr. Deepa. K. Baby** **Assistant Professor Department of Basic science and Humanities Rajagiri School of Engineering and Technology, Rajagiri Valley, Kakkanad, Kochi 682 039 Kerala, India**	

		Nanostructured Epoxy Thermoset with Chitosan-Graft Polystyrene Copolymer: Improvement in Mechanical Properties
IL-3	**11.50-12.10**	**Dr. Sivakala S** **Assistant Professor, Dept of Chemistry, Sree Narayana College, Chempazhanthy, Trivandrum** Electrically Conductive Organic-Inorganic hybrid nanocomposites: New Perspectives and Future Scopes
PL-3	**12.10-12.40**	**Prof. Sebastijan Kovačič** **National Institute of Chemistry, Hajdrihova 19, SI-1001 Ljubljana, Slovenia** Functional Nanocomposite Foams Produced by Polymerization of Nanoparticle
IL-4	**12.40-13.00**	**Dr. Bhagwan F. Jogi** **Professor, Department of Mechanical Engineering,** **Dr. Babasaheb Ambedkar Technological University, Lonere - 402103 India** Influence of Multiwall Carbon Nanotubes and Styrene Acrylic Acid on Morphology and Thermal properties relationship of 80/20 PA6/ABS Blends
Lunch Break (13.00-13.30) **Chairperson: Prof. Sebastijan Kovačič and Dr. Pramod Gautam**		
PL-4	**13.30-14.00**	**Prof. Józef T. Haponiuk** **Gdansk University of Technology, Faculty of Chemistry, Narutowicza 11/12 St, 80-233 Gdansk, Poland** Evaluation of the Effects of Using Nanofillers in the Elastomer Technology
PL-5	**14.00-14.30**	**Prof. Yuichi Masubuchi** **Professor, Department of Materials Physics, Nagoya University, Japan** Multi-chain modeling of entangled polymers
PL-6	**14.30-14.50**	**Prof. Mariia Dmitrenko** **St. Petersburg State University, 7/9 Universitetskaya nab., St. Petersburg 199034, Russia** Development and investigation of pervaporation mixed matrix membranes based on polyphenylene oxide modified with graphene oxide
PL-7	**14.50-15.20**	**Dr. A.A. Hovhannisyan** **The Scientific Technological Center of Organic and Pharmaceutical Chemistry NAS RA, 26, Azatutyan Ave., 0014, Yerevan, Armenia** Possibilities of synthesis monodisperse nanoparticles of latex
PL-8	**15.20-15.50**	**Dr. Azeez Abdullah Barzinjy** **Department of Physics Education, Faculty of Education, Tishk International University, Erbil, Kurdistan Region, Iraq** Green Synthesis of Nanoparticles: From Preparation to Applications
IL-5	**15.50-16.10**	**Dr. Mothi Krishna Mohan** **Department of Sciences & Humanities, School of Engineering and Technology, CHRIST (Deemed to be University)**

		Visible light impelled organic transformation of 9-(N,N-dimethyl aminomethyl)anthracene on M-rGO-TIO2-N composite; experimental and theoretical results.
IL -6	**16.10-16.30**	**Dr. Sreekala M. S.** **Postgraduate & Research Department of Chemistry, Sree Sankara College, Kalady, Kerala, India – 683574.** Properties of bio-nanocomposites - Starch a potential replacement for synthetic polymer
IL-7	**16.30-16.50**	**Dr. Uzma Ayaz** **Department of Plant Breeding and Molecular Genetics, University of Poonch Rawalakot, Pakistan.** Investigation of genetic divergence in local sunflower hybrids and inbred lines by applying morphological markers
IL-8	**16.50-17.10**	**Dr. Vijai K. Rai** **Assistant Professor, Department of Chemistry,** **Guru Ghasidas Vishwavidyalaya (Central University), Bilaspur, C.G.** Design and Development of Visible-Light Photocatalytic Nanomaterials
SIL-1	**17.10-17.25**	**Sarath P S** **Amal Jyothi College of Engineering, Kanjirappally, Kottayam.** Effect of carbon materials on the mechanical, thermal and tribological properties of Silicone rubber Nanocomposites.

2nd Day of the Conference (15th December 2021)

International Conference Hall

SESSION 2: BIOLOGICAL AND BIOMEDICAL APPLICATIONS
Chairperson: Dr. Jayalatha Gopalakrishnan and Dr. Hanna Maria

PL-9	**9.00-9.30**	**Prof. Benjamin Tawiah** **KNUST, Kumasi, Ghana (U.S)** Fire safety at the molecular scale with 2D transition metal Carbides
PL-10	**9.30-10.00**	**Dr. S. Balasubramanian** **Department of Inorganic Chemistry, Guindy Campus, University of Madras, Chennai-600025** Enhanced Delivery of Curcumin for Effective treatment of Breast Cancer
PL -11	**10.00-10.30**	**Prof. Anastasia Penkova** **St. Petersburg State University, 7/9 Universitetskaya nab. St. Petersburg 199034, Russia** Polymer Matrix Nanocomposites for Membrane Technology

IL -9	**10.30-10.50**	**Dr. Manash Barthakur** **Department of Zoology, Pub Kamrup College, Baihata Chariali, Kamrup, Assam Pin 781381, India** Nanoparticles to prevent protein misfolding neurodegenerative disorders
IL-10	**10.50-11.10**	**Dr. Tapanendu Kamilya** **Department of Physics, Narajole Raj College, West Bengal, India, Pin-721211** Protein-Nanoparticle Interaction: Corona Formation & Biocompatibility
SIL-2	**11.10-11.25**	**Divya Goel** **Research Scholar, Chemistry Department, DTU, Delhi** Studies on bioactivity of Folic acid templated bio-glass nanoparticles for bone regeneration
SIL-3	**11.25-11.40**	**Kavitha R** **AP & RS Department of Chemistry, Stella Maris College (Autonomous), Chennai-600086.** Photocatalytic degradation of Carcinogenic Benzo(a)pyrene by nanoceria – A Mechanistic Approach
Tea Break (11.40-12.00) **Chairperson: Dr. Manash Barthakur and Dr. S. Balasubramanian**		
PL-12	**12.00-12.30**	**Prof. Richard L Thompson** **Department of Chemistry, Durham University, Mountjoy Site, South Road, Durham, DH1 3LE, UK** A Close Look at the Payne Effect: Sterically Stabilised Silica Nanocomposites, Rheology and Neutron Scattering
IL-11	**12.30-12.50**	**Joyshree Maji** **Department of Physics, Asansol Engineering College, Asansol, India.** Enzymatic assay of pathogens treated with Fe doped MgO nanoparticles.
IL-12	**12.50-13.10**	**Dr. Ganga. G** **Sree ayyappa college, Eramallikara, Chengannur, Alappuzha** Role of microbes in nanoparticle synthesis
IL-13	**13.10-13.30**	**Dr. Rehan Khan,** **Scientist-C** **Institute of Nano Science and Technology (INST)**

		An Autonomous Institute of Department of Science and Technology, Government of India, Mohali-160062 (Punjab) Nanoformulation for the management of experimental Rheumatoid Arthritis: A Combination Therapeutic strategy
Lunch Break (13.30-14.00)		
SESSION 3: CERAMICS AND ALLOYS **Chairperson: Prof. Richard L Thompson and Dr. Rehan Khan**		
IL-14	**14.00-14.20**	**Dr. Pramod Gautam** **Associate Professor, 3rd floor, room No-3040, Teaching Block, Department of Biochemistry. All India Institute of Medical Sciences, New Delhi-110 029, India** Metal nanoparticles and their significance in cancer research: Pros and Cons
IL-15	**14.20-14.40**	**Dr. Manish Kumar** **Randhawa School of Engineering, Indian Institute of Technology, Mandi, H.P. -175005** Electrospun α-Fe2O3/PAN nanofibers mat: A multifunctional and efficient platform in wastewater treatment
IL-16	**14.40-15.00**	**Dr. Malobi Seth** **CSIR-Central Glass and Ceramic Research Institute, 196 Raja S.C. Mullick Road, Jadavpur, Kolkata – 700032, West Bengal, India.** Organic-inorganic nanocomposite based multifunctional coatings with tunable wettability
IL-17	**15.00-15.20**	**Dr. Neetu Chopra** **Associate Professor, PG Department of Physics, Kanya Maha Vidyalaya, Jalandhar (Punjab)** Effect of rare earth concentration on structural, optical and radiative properties of TeO2-B2O3-ZnO glasses and glass ceramics
IL-18	**15.20-15.40**	**Dr. P K Mandal** **Department of Metallurgical and Materials Engineering, Amal Jyothi College of Engineering, Kanjirappally-686518, Kerala, India** Nanoparticles promote outstanding strength and fracture toughness of novel Al-Zn-Mg-Sc alloys after FSP
SESSION 4: SENSOR **Chairperson: Sunil D. Kulkarni and Dr. Deepa K Baby**		
IL-19	**15.40-16.00**	**Dr Manorama Singh** **Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur**

		Bio-functionalized reduced graphene oxide-based nanocomposite for electrochemical detection of Cadmium ion
IL-20	**16.00-16.20**	**Dr. J. Kumar** **Director - AIC-AU Incubation Foundation, Crystal Growth Centre, Anna University** Internet of Things (IoT) enabled biosensor formilk quality evaluation
IL-21	**16.20-16.40**	**Alok Prasad Das** **Department of Life Sciences, Rama Devi Women's University, Bhubaneswar, India** Indigenous biosensors for instant detection of bacterial endotoxin Effect of Heat Treatment on Spectroscopic, Structural and Electrical Properties of Rare Earth Doped TeO_2-B_2O_3-Zno Glasses
IL-22	**16.40-17.00**	**Dr. Mary Teresita V** **Assistant Professor, Dept. of Chemistry, Stella Maris College (Autonomous), Chennai-86** Humidity Sensing Properties of Nanocrystalline Lanthanum Barium Ferrites
PL-13	**17.00-17.30**	**Luis Paulo Mour ao dos Santos** **Graduate Program of Materials Science and Engineering Federal University of Cear´a, Brazil** Electrodeposition: a powerful tool for preparation Nanomaterials

3rd Day of the Conference (16th December 2021)
International Conference Hall

SESSION 5: ENERGY STORAGE

Chairperson: Dr. Ramesh Kumar Bibiyan and Dr. Subhendu Bhandari

IL-23	**9.30-9.50**	**Dr. Anjali Paravannoor** **Department of Chemistry, Swami Anandatheertha Campus, Kannur University, Payyannur** A green and Sustainable synthesis of Si nanostructures sourced from Areca nuthusk for Li ion battery applications. –
IL-24	**9.50-10.10**	**Dr. Vivek Verma** **Department of Physics, Hindu College, University of Delhi, Delhi-110007, India** Production of electrical energy by dissociation of adsorbed water on porous oxides
IL-25	**10.10-10.30**	**Dr. Manish Kumar**

		Experimental Research Laboratory, Department of Physics, ARSD College, University of Delhi, New Delhi, India-110021 Lead-free perovskite materials for Solar Cell applications
IL-26	**10.30-10.50**	**Dr. Deepthi Jayan** **Rajagiri School of Engineering & Technology (Autonomous), Kochi** First Principle DFT Estimation of Structural, Mechanical and Optoelectronic Properties of Sc_4C_3 MXene for Photovoltaic Applications
IL-27	**10.50-11.10**	**Dr. M. Bhagiyalakshmi** **Department of Chemistry, Central University of Kerala, India** MXene polymer nanocomposites for energy and energy storage application
Tea Break (11.10-11.20) **Chairperson: Dr. Anjali Paravannoor and Dr. Manish Kumar**		
IL-28	**11.20-11.40**	**Dr. Joice Sophia Ponraja** **Tyndall National Institute, University College Cork, Lee Maltings Complex, Dyke Parade, Cork T12R5CP, Ireland** **Centre for Advanced Materials, Aaivalayam-Dynamic Integrated Research Academy and Corporations (DIRAC), Coimbatore 641046, India.** 2D-materialsbased photonic devices for near-infrared and mid-infrared ultrafast photonics
SIL-4	**11.40-11.55**	**Sreelakshmi Rajeevan** **Research Scholar** **Amal Jyothi College of Engineering, Kanjirappally, Kottayam.** Tuning of the electrochemical properties of rGO electrodes by optimizing the binder concentration.
SESSION 6: ELECTRONICS **Chairperson: Dr. M. Bhagiyalakshmi and Dr. Hira Joshi**		
IL -29	**11.55-12.15**	**Dr. Ann Rose Abraham** **Department of Physics, Sacred Heart College (Autonomous), Thevara, Kochi, Kerala- 682013, India** Engineered functional multiferroic hybrid nanosystems for memory device applications
IL-30	**12.15-12.35**	**Dr. Hira Joshi** **Gargi College, University of Delhi-110049** Plasmonics in semiconductor nanostructures

IL-31	**12.35-13.00**	**Mayank Chakraverty** **ams AG, Hyderabad, India** Magnetic Tunnel Junctions and Magneto-resistive Random Access Memories
Lunch Break (13.00-13.30) **Chairperson: Dr. Vivek Verma and Dr. Ann Rose Abraham**		
IL-32	**13.30-13.50**	**Dr. Subhendu Bhandari** **Department of Plastic and Polymer Engineering, Maharashtra Institute of Technology, Aurangabad, India-431010** Comparative analysis of electrical characteristics of nanostructured polyaniline synthesized by using the combinations of maleic acid and oxalic acid
IL-33	**13.50-14.10**	**Dr. Sunil D. Kulkarni** **Department of Chemistry, Sir Parashurambhau College, Tilak Road, Pune, India 411 030** Formation of Liesegang Patterns via Reaction-Diffusion and Their Recognition by Pattern Image Analysis Techniques
SIL-5	**14.10-14.25**	**Chinnumol Xavier** **Baselius College, Kottayam** Synthesis and photoluminescence analysis of terbium activated calcium tungstate Phosphor
SIL-6	**14.25-14.40**	**Divya R S** Amal Jyothi College of Engineering, Kanjirappally, Kottayam. **Performance analysis of semiconductor based nanosensors**
SIL-7	**14.40-14.55**	**Bhavya Bhadran** **Guest faculty, Research & Post Graduate Department of Chemistry, St. Thomas College, Pala, Kottayam, Kerala, India** Influence of an intercalated microstructure on the mechanical and dynamic mechanical properties of NBR/organoclay nanocomposites
SESSION 7 **Chairperson: Dr. J. Kumar and Dr. Ganga G**		

Pl-14	**15.00-15.30**	**Dr. Maya Jacob John** **CSIR, Centre for Nanostructures and Advanced Materials, Chemicals Cluster, Pretoria** Bio-based composite materials for sustainable development
IL-34	**15.30-15.50**	**Dr. Ramesh Kumar Bibiyan** **Assistant Professor, Department of Physics,Guru Jambheshwar University of Science & Technology, Hisar, India** Investigation of Platinum (Pt) Thin Films of Different Thicknesses using Ion Beam Irradiation
SIL-8	**15.50-16.05**	**Siji Mary** **Bishop Moore College, Mavelikara** Development of intelligent starch/chitin nanocomposite films by the immobilization of Butterfly pea flower anthocyanin with improved thermal and mechanical properties
CLOSING CEREMONY		

ORAL PRESENTATION

Day 1 (14-12-2021)

INTERNATIONAL CONFERENCE HALL- 2 **Chairpersons: Dr. Hanna Maria, Dr. Thomasukutty Jose and Dr. Sharika T Nair**		
OL-1	**2.00-2.10**	**Teena P Varghese** **Research Scholar, Dept of PS & RT, CUSAT** Synthesis and characterization of green epoxy resin from Odal seed oil
OL-2	**2.10-2.20**	**P. Varatharajan** **Department of Physics, B.S. Abdur Rahman Crescent Institute of Science & Technology, Vandalur, Chennai-600 048, India** Green Synthesis of Highly Fluorescent Carbon Dots from Vitex Negundo Leaf extract and their White Light Emitting Diode Application
OL-3	**2.20-2.30**	**G. Meenu Pragathi** **Research Scholar & AP Department of Nanoscience and Technology, Alagappa University, Karaikudi 630003, Tamil Nadu, India** Single-step synthesis of copper oxide nanoparticles using Terminalia arjuna bark extract and their antibacterial application
OL-4	**2.30-2.40**	**FR. K. X. Antu** **Department of Botany, Alagappa University, Karaikudi - 630 003. Tamil Nadu, India**. Green synthesis of palladium nanoparticles using Zingiberzerumbet rhizome extract and their biological application
OL-5	**2.40-2.50**	**Steffi Joseph** **AJCE, Kanirappally, Kerala** Production and optimization of biodiesel from fish oil and cashew nut shell oil
OL-6	**2.50-3.00**	**Chetna Chauhan** Nirma University, India Synthesis and Characterization of calcium hexaferrite synthesized in presence of Azadirachta indica and Murraya koenigi leaves extract.
OL-7	**3.00-3.10**	**Gauri Bandal** **MES Abasaheb Garware College, India** Microwave Assisted Synthesis of Cobalt oxide Nanoparticles for Effective Adsorptive Coupled Photocatalytic Degradation of Methylene blue
OL-8	**3.10-3.20**	**Ajit Mondal** **Raiganj Polytechnic, Uttar Dinajpur- 733134, West Bengal, India & Department of Mechanical Engineering, Jadavpur University, Kolkata-700032, West Bengal, India**

		Investigation of Electrical Conductivity of Fe-V2O5-CdO-ZnO Glass Nanocomposites
OL-9	**3.20-3.30**	**Dattatraya Kshirsagar** **Amrutvahini College of Engineering, Sangmner, Dist - Ahemadnagar, Maharashtra (India)** An overview of Biodegradable Hybrid Nanomaterial for Engineering and industrial Application with Recent Advances
OL-10	**3.30-3.40**	**Jija Thomas** **Research & Post Graduate Department of Chemistry, St Mary's College, Sulthan Bathery, Wayanad, Kerala, India.** Synergistic Effect of Natural Hybrid Fillers on the Properties of Poly (vinyl alcohol)
OL-11	**3.40-3.50**	**Jagriti Gupta** **School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110067, India**. Quantification of the binding interaction between Chitosan and MPA-CdSe QDs for the development of biocompatible theranostic nanoprobe: An Electrochemical approach
OL-12	**3.50-4.00**	**Bhagwan F. Jogi** **Department of Mechanical Engineering, Dr. Babasaheb Ambedkar Technological University, Lonere-402103 Raigad, Maharashtra, India.** Some Mechanical Studies on Poly-Tetra-fluoro-ethylene (PTFE) filled compound
OL-13	**4.00-4.10**	**Sandra Ann Jacob** **Department of Chemical Engineering, Amal Jyothi College of Engineering, Kanjirapally-686518, Kerala, India** Heterogeneous Fenton Catalyst for Removal of Malachite Green
OL-14	**4.10-4.20**	**Alphonsa Thomas** **Department of Basic Sciences and Humanities, Rajagiri School of Engineering & Technology, Kochi –India** A process of using photocatalytic reactors to remove pharmaceutical compounds from wastewater
OL-15	**4.20-4.30**	**Lakshmipriya Ravindran** [b]Postgraduate & Research Department of Chemistry, Sree Sankara College, Kalady, Nano-silica coated flax fabric/Phenol-formaldehyde hybrid composites – mechanical, thermal, water sorption and morphological behaviour

ORAL PRESENTATION **Day 2 (15-12-2021)** **INTERNATIONAL CONFERENCE HALL- 2** **Chairpersons: Dr. Hanna Maria, Dr. Thomasukutty Jose and Dr. Sharika T Nair**		
OL-16	**2.00-2.10**	**Sethu Lakshmi M.B** **N.S.S Hindu College, Changanacherry** Graphene oxide-cellulose nanocomposite membranes with improved permeation properties
OL-17	**2.10-2.20**	**B Philip Greeshma** **Bishop Moore College Mavelikara** Microwave assisted synthesis and characterization of carbon dots from urea and glycerol
OL-18	**2.20-2.30**	**Aleena Ann Mathew** **Centre for Nanoscience and Nanotechnology, Amal Jyothi College of Engineering, Kanjirappally, Kottayam.** A review on recent studies of carbon dots from natural sources
OL-19	**2.30-2.40**	**Swapna V.P,** **Research & Post Graduate Department of Chemistry, St. Joseph's College (Autonomous), Devagiri, Calicut, Kerala- 673 008, India.** Effect of Cage Structured Polyhedral Oligomeric Silsesquioxane on the Permeation Properties and Stability of poly (vinyl alcohol)-poly (ethylene oxide) blend membranes
OL-20	**2.40-2.50**	**Rekha Koshy** **Bishop Moore College, Mavelikara** Fabrication and Characterization of chitin nanowhisker reinforced soy protein biodegradable films and aerogels
OL-21	**2.50-3.00**	**Umashankar Das** **Dept. of physics, YBN University, Ranchi-834008** Enriched performance of OLEDs based on hybrid organic-inorganic nanocomposites: A review
OL-22	**3.00-3.10**	**Dana Jose** **St.George's College, Aruvithura** A review on perovskite solar cell technology
OL-23	**3.10-3.20**	**Kiran Takale** **Department of Chemistry, Sir Parashurambhau College, Pune** Self-Assembled Pattern Formation of 2D Transition Metal Chalcogenide System of Cu8HQ in the Agar Gel

OL-24	**3.20-3.30**	**A.V. Dinendra** **Department of Mechanical Engineering, Coimbatore Institute of Technology, India** Characterization and in-vitro investigation of Tridax and Turmeric Blended PVA/ PEG Thin Film
OL-25	**3.30-3.40**	**Vidhya C** **Mar Ivanios College, Thiruvananthapuram** Synthesis of Lead-Free Cs4CuBi2Br12 Layered Double Perovskite Nanocrystals by Hot Injection Method
OL-26	**3.40-3.50**	**Meera B** **Mar Ivanios College, Thiruvananthapuram** PVA nanocomposite hydrogel for highly efficient solar driven water evaporation and desalination
OL-27	**3.50-4.00**	**Mathu Devaraj** **Mar Thoma college, Thiruvalla** Recent progress in metal oxide/carbon nanostructure-based composite for SIBS
OL -28	**4.00-4.10**	**Sreekanth R** **M.Tech Student** **Amal Jyothi Engineering College, Kerala** **Tribological performance of PVDF/GO-MoS_2 composite film**
OL-29	**4.10-4.20**	**Prasad C. Walimbe** **Post-graduate and Research Center, Department of Chemistry, Sir Parashurambhau College, Pune, India 411 030.** Spatio-temporal Characterization of Self Assembled Periodically Precipitating Ferrous Hydroxide in Agar Gel
OL-30	**4.20-4.30**	**Dana Susan Abraham** ***Department of Chemistry, Central University of Kerala, India*** Electrochemical detection of dopamine using mxene/pani/copper oxide/gce modified electrode

PL - 1

Molecular Recognition and Assembly of Biomaterials: Computational and Data Science Tools for Property Predictions

Prof. Hendrik Heinz

Department of Chemical and Biological Engineering, University of Colorado-Boulder, Boulder, CO 80309, USA

Email: Hendrik.Heinz@colorado.edu

The development of biologically inspired materials typically involves extensive trial-and-error studies. Rational understanding and design using modelling and simulation become increasingly feasible due to more accurate models and affordable computing resources. We will share atomic-level insights into biomaterials properties at the 1 to 1000 nm scale using the Interface force field (IFF), including recognition and assembly of metal, oxide, and biomineral nanostructures mediated by biomolecules and polymers. Examples include nucleation and growth of bone, low dimensional materials, catalysts, hydrogels, and therapeutics. We will then discuss new opportunities using reactive simulations (IFF-R) and data science tools to learn and interpret the information contained in large computational and experimental data sets to accelerate property predictions. We outline the process of generating a feature representation, the translation into reinforcement learning with nodes and edges, and Bayesian-based uncertainty quantification of predicted properties. Requirements for data sets and first applications will be described.

PL – 2

Circular Economy: New Opportunities in Sustainable Nano Materials and Polymer Bio-Nanocomposites

Prof. Sabu Thomas

Vice Chancellor, Mahatma Gandhi University, Priyadarshini Hills P. O.
Kottayam, Kerala, India -686 560

Email: sabuthomas@mgu.ac.in

Green chemistry started for the search of benign methods for the development of nanoparticles from nature and their use in the field of antibacterial, antioxidant, and antitumor applications. Bio wastes are eco-friendly starting materials to produce typical nanoparticles with well-defined chemical composition, size, and morphology. Cellulose, starch, chitin and chitosan are the most abundant biopolymers around the world. All are under the polysaccharides family in which cellulose is one of the important structural components of the primary cell wall of green plants. Cellulose nanoparticles (*fibers, crystals and whiskers*) can be extracted from agrowaste resources such as jute, coir, bamboo, and pineapple leafs, coir etc. Chitin is the second most abundant biopolymer after cellulose, it is a characteristic component of the cell walls of fungi, the exoskeletons of arthropods and nanoparticles of chitin (*fibers, whiskers*) can be extracted from shrimp and crab shells. Chitosan is the derivative of chitin, prepared by the removal of acetyl group from chitin (*Deacetylation*). Starch nano particles can be extracted from tapioca and potato wastes. These nanoparticles can be converted into smart and functional biomaterials by functionalization through chemical modifications (*esterification, etherification, TEMPO oxidation, carboxylation and hydroxylation etc*) due to presence of large amount of hydroxyl group on the surface. The preparation of these nanoparticles includes both series of chemical as well as mechanical treatments; crushing, grinding, alkali, bleaching and acid treatments. Transmission electron microscopy (*TEM*), scanning electron microscopy (*SEM*) and atomic force microscopy (*AFM*) are used to investigate the morphology of nanoscale biopolymers. Fourier transform infra-red spectroscopy (*FTIR*) and x ray diffraction (*XRD*) are being used to study the functional group changes, crystallographic texture of nanoscale biopolymers respectively. Since large quantities of bio wastes are produced annually, further utilization of cellulose, starch and chitins as functionalized materials is very much desired. The cellulose, starch and chitin nano particles are currently obtained as aqueous suspensions which are used as reinforcing additives for high performance environment-friendly biodegradable polymer materials. These nanocomposites are being used as biomedical composites for drug/gene delivery, nano scaffolds in tissue engineering and cosmetic orthodontics. The reinforcing effect of these nanoparticles results from the formation of a percolating network based on hydrogen bonding forces. The incorporation of these nano particles in several bio-based polymers has been discussed. The role of nano particle dispersion, distribution, interfacial adhesion and orientation on the properties of the ecofriendly bio nanocomposites has been carefully evaluated.

PL – 3

Functional Nanocomposite Foams Produced by Polymerization of Nanoparticle-Stabilized Emulsions

Sebastijan Kovačič* and Matjaž Mazaj

National Institute of Chemistry, Hajdrihova 19, SI-1001 Ljubljana, Slovenia;

Email: sebastijan.kovacic@ki.si

Embedding nanoparticles (e.g., Fe_yO_x, ZnO, MOFs, or zeolites) into the polymer matrices is an attractive combination because the resulting nanocomposites retain the shape and flexibility of the polymer supports and exhibit both the function and porosity of (microporous) nanoparticles. Among the methods available for the preparation of polymer matrices, high internal phase emulsion (HIPE) templating and polyHIPEs thereof are particularly intriguing, as their macroporous structure serves as "highways" and allows unobstructed flow to the active (Lewis acid) sites of the nanoparticles. Several examples of nanoparticle1,2 and microporous nanocrystallite-polyHIPE heterostructures are presented.3,4,5 In all cases, the inorganic phase was successfully immobilized in the organic polyHIPE matrix, leaving the sorption/catalyst sites of the nanocomposite foams readily accessible and functional.

PL – 4

Evaluation of the Effects of Using Nanofillers in the Elastomer Technology

Prof. Józef T. Haponiuk

Gdansk University of Technology, Faculty of Chemistry, Polymer Technology Department, Narutowicza 11/12 St., 80-233 Gdańsk, Poland

Email: Jozef.haponiuk@pg.edu.pl

Elastomer nanocomposites are used in applications, where elasticity is an important requirement and enhancements in mechanical, electrical or tribological properties, flammability, gas permeability etc. are necessary to achieve the expected functionality of products, which are diverse technical parts or consumer goods. Enhancements in nanocomposite properties are influenced by the nature and size distribution, aspect ratio, quality of dispersion and interactions with the polymer matrix. The expectations are high but there are many challenges, mainly in achieving proper dispersion of a nanofiller in soft elastomer matrix, especially in the case of thermoplastic elastomers with the typical for segmented copolymers hard and soft domain structure. Different nanosized particles are used in elastomer nanocomposites. These include carbon nanofillers like carbon nanotubes, graphene, graphene oxide, graphite nanoplatelets, further organo-clays, nano-silica, nanocellulose, metallic nano-powders. In the lecture current developments in the field of elastomer nanocomposites and their property improvements will be evaluated and compared on the example of different elastomers and different nanoparticles.

PL – 5

Multi-Chain Modeling of Entangled Polymers

Prof. Yuichi Masubuchi

Department of Materials Physics, Nagoya University, Japan

Email: mas@mp.pse.nagoya-u.ac.jp

Modeling of polymer dynamics is a classical yet still challenging problem. Due to the slow relaxation rate, coarse-graining has been attempted, and the single-chain modeling, such as the tube model, has achieved remarkable success. However, the implementation of multi-chain effects is fundamentally difficult for such an approach. We have constructed a few multi-chain models, which directly calculate the motion of chains with reasonable computation costs. In this talk, the multi-chain slip-link and the multi-chain slip-spring models will be introduced with some applications towards the non-linear viscoelasticity of entangled polymers.

PL – 6

A Close Look at the Payne Effect: Sterically Stabilised Silica Nanocomposites, Rheology and Neutron Scattering

James M. Hart[1], Victoria García-Sakai[2] Bernhard Frick[3], Stephen C. Boothroyd[1], Lian R. Hutchings[1], Nigel Clarke[4] Richard L. Thompson[1].

[1] Department of Chemistry, Durham University, Mountjoy Site, South Road, Durham, DH1 3LE, UK
[2] Science & Technology Facilities Council, ISIS Facility, Rutherford Appleton Laboratory, Didcot, OX11 0QX, UK
[3] Institut Laue-Langevin, 6, rue Jules Horowitz, Grenoble, 38042, France.
[4] Department of Physics and Astronomy, University of Sheffield, Hounsfield Road, Sheffield, UK S3 7RH
Email: r.l.thompson@durham.ac.uk

Stöber silica nanoparticles in polybutadiene nanocomposites cause significantly hindered dynamics (figure 1) in the form of a glassy layer of order 10 nm (figure 2) around the nanoparticle surface. QENS experiments using isotopic labelling and interfacially-active polymers enabled quantification of the glassy layer's thickness, which we relate to the strain softening (Payne effect, figure 3), energy dissipation and the detailed nanostructure of the materials. Although the glassy layer shrinks with increasing temperature above the bulk glass transition (Tg), it remains significant even when the sample is more than 150 K above Tg. This layer can account for the substantial levels of reinforcement and energy dissipation observed in silica filled rubbers beyond values expected from particle volume fraction arguments alone. Because the interfacially-active polymer simultaneously inhibits nanoparticle aggregation and introduces polymer chain ends to the interparticle region, these experiments provide a direct test of whether energy loss in reinforced nanocomposites is attributable to 'glassy bridges' between particles or chain ends. Here, we conclude that the percolation of the glassy layer of hindered polymer dynamics between silica particles contributes significantly to the Payne effect, but can be overcome given sufficient steric stabilization to the nanoparticles.

PL – 7

Possibilities of Synthesis Monodisperse Nanoparticles of Latex

A.A. Hovhannisyan, G.K. Grigoryan, N.H. Grigoryan, A.G. Nadaryan

The Scientific Technological Center of Organic and Pharmaceutical Chemistry NAS RA, 26, Azatutyan Ave., 0014, Yerevan, Armenia

Email: hovarnos@gmail.com

Reproducible synthesis of latexes with a specific particle size is one of the urgent problems of modern polymer chemistry. Monodisperse latexes are especially valuable in immunological diagnostics of a wide variety of diseases. The main method for producing latexes is polymerization in a nano dispersed monomer-water system (emulsion polymerization). However, the regulation of the diameters of the size of latex particles is so far possible only by empirical selection of the components of the emulsion system. This report demonstrates the results of studying the topology of nucleation and formation of latex particles and methods for regulating their sizes when polymerization is carried out in a heterogeneous static monomer - water system. The selectivity of immunodiagnostic latexes depends on the chemical structure of the latex particle surface. The surface of latex particles is covered with layers of emulsifier during emulsion polymerization, and this greatly complicates the possibility of changing its structure. The report presents the results of the synthesis of monodisperse latexes without the use of emulsifiers, which makes it possible to change the chemical composition of the particle surface by changing the nature of the monomer. The report also demonstrates electron microscopic photographs of latexes and indicates ways of regulating their diameters.

PL – 8

Development and investigation of pervaporationmixed matrix membranes based on polyphenylene oxide modified with graphene oxide

M. Dmitrenko, V. Liamin, A. Chepeleva, A. Penkova

St. Petersburg State University, 7/9 Universitetskaya nab., St. Petersburg 199034, Russia

Email: m.dmitrienko@spbu.ru

Traditional separation methods, as a rule, are energy intensive and not environmentally friendly. The actively developing membrane processes, in particular pervaporation, are an alternative to the existing separation methods due to the fact that these methods are environmentally friendly, with compact equipment, waste-free, and low energy consumption. However, the rapid development of membrane technologies and increased requirements for the purity of products in industrial processes require the search and the development of novel highly efficient membrane materials with tailored properties. One of the most promising methods is the modification of well-known polymers with carbon nanoparticles. The aim of this work was to develop novel highly efficient pervaporation mixed matrix membranes based on polyphenylene oxide (PPO) modified with graphene oxide (GO) with tailored characteristics and to study the effect of GO on the membrane separation performance. Structural and physicochemical properties of the developed membranes were investigated by various analysis methods (spectroscopy, microscopy, the measurements of contact angle and swelling, etc.). The transport properties of the obtained PPO-based membranes were evaluated in pervaporation for the regeneration of ethylene glycol from water and methanol. The improvement of the transport properties of the PPO/GO membranes was achieved due to the functionalization of the membrane surface and changes in free volume during the modification process.

PL – 9

Fire Safety at the Molecular Scale With 2D Transition Metal Carbides

Prof. Benjamin Tawiah
Email: benjamin.tawiah@knust.edu.gh, tawiahb@gmail.com

Transition metal carbide and nitrides with graphene-like structures have received tremendous attention across several fields as novel engineering materials since their discovery in 2011. The transition metal carbides are synthesized from their MAX phases to produce a versatile 2D material with amiable physical and chemical properties. MXenes exhibits superior 2D flak-like architecture with rich surface terminating groups, which makes them tunable and easily applicable in high-performance composites and structures. The applications of MXenes span several fields including but not limited to electronics and electricals, thermal insulation and EMI, biomedical and tribological fields. In this presentation, the various methods of MXenes synthesis, including hydrofluoric acid etching to fluorinate-containing acid solution and fluorinate-containing salts will be discussed briefly. Moreover, the diverse methods of surface modification of MXenes, the methods of Mxene polymer fabrication, and the general applications of Mxenes will be touched on briefly. The talk will focus primarily on the emerging applications of MXenes as novel 2D material in enhancing the flame retardant properties of polymer composites (our research work on thermoplastic polyurethane and polystyrene), their flame retardant mechanism, and the effect of MXene weight fraction on the mechanical properties of the resultant polymer nanocomposites.

PL – 10

Enhanced Delivery of Curcumin for Effective treatment of Breast Cancer

S. Malathi[1, 2] and **S, Balasubramanian[1]**

[1]Department of Inorganic Chemistry, Guindy Campus, University of Madras, Chennai-600025
[2]Crystal Growth Centre, Anna University, Chennai-6000

Email: bala2010@yahoo.com

The treatment of cancer with synthetic compounds is often associated with undesirable side-effects, which can be eliminated or minimized by employing naturally occurring compounds which are known for their therapeutic efficacy. Curcumin has been found to be a powerful anti-cancer agent. However, its efficacy is limited by its poor solubility in aqueous medium. We have demonstrated that the bioavailability of curcumin can be increased by incorporating the drug in poly (lactic-co-glycolic) acid [PLGA (60/ 40)] nanoparticles with different capping agents such as Chitosan, Dextran and PEG and emulsifier (Tocopherol Poly (Ethylene Glycol)1000 Succinate: TPGS) with good drug loading and delivery performance. The preparation of nanoparticles derived from PLGA was achieved by emulsion solvent evaporation method and the resultant nanoparticles were characterized by several spectral and microscopic methods. The encapsulation efficiency of curcumin by PLGA NPs with different capping agents such as Chitosan, PEG and Dextran and emulsifier lies in the range of 82% to 89% and the antioxidant activity is found to be 80%. The in vitro anticancer activity of PLGA nanoparticles embedded with curcumin and different capping agents on MCF-7 indicates that they are more effective in arresting cell growth. The cellular uptake of TPGS emulsified dextran capped curcumin encapsulated PLGA NPs is much higher when compared to that of PLGA NPs with other capping agents, emulsifier and free curcumin emulsifier.

PL – 11

Polymer Matrix Nanocomposites for Membrane Technology

Prof. Anastasia Penkova

St. Petersburg State University, 7/9 Universitetskaya nab., St. Petersburg 199034 Russia

Email: a.penkova@spbu.ru

Nowadays, membrane processes play an important role in society due to its unique characteristics such as low power consumption, environmental friendliness and compactness of equipment. The rapid development of membrane technology requires the search for membrane materials with tailored properties. The focus will be done on two membrane processes applied for the separation of liquid mixtures such as ultrafiltration and pervaporation due to their (1) high relevance for practical application and (2) specific difference, both in the driving force and in the membrane structure (non-porous for pervaporation, porous for ultrafiltration). Modern problems of chemical technology determine the relevance and necessity of not only the development of these membrane processes, but also the search for novel membranes with tailored properties. The efficient and promising ways to achieve the tailored properties of polymer materials are the complex application of bulk and surface modifications/functionalization of membranes based on well-known polymers. Transport membrane parameters could be essentially improved by the change of inner and surface properties with its bulk and surface modification, with correct choice of cross-linking agent, and with the development of supported membranes with decreased thickness of selective layer.

To demonstrate the effect of various strategies of membrane modifications on the pervaporation and ultrafiltration membrane characteristics, the modifications of membranes based on well-known polymers such as hydroxyethyl cellulose, polyvinyl alcohol polyphenylene oxide and polyphenylene isophthalamide will be presented. It will be demonstrated that bulk and surface modifications allow to overcome the trade-off between the permeability and selectivity of the polymeric membranes and essentially improve membrane transport characteristics.

PL – 12

Green Synthesis of Nanoparticles: From Preparation to Applications

Azeez Abdullah Barzinjy[1,2*]

[1] Department of Physics, College of Education, Salahaddin University-Erbil, Kurdistan Region, Iraq
[2]Department of Physics Education, Faculty of Education, Tishk International University, Erbil, Kurdistan Region, Iraq

Email: azeez.azeez@su.edu.krd

Nanotechnology is an emerging field of science. The base of nanotechnology is nanoparticles. The size of nanoparticles ranges from 1 to 100 nm. The nanoparticles are classified into different classes such as inorganic nanoparticles, organic nanoparticles, ceramic nanoparticles and carbon base nanoparticles. The inorganic nanoparticles are further classified into metal nanoparticles and metal oxide nanoparticles. Similarly, carbon base nanoparticles classified into Fullerene, Carbon nanotubes, Graphene, Carbon nanofiber and carbon black. Nanoparticles are also classified on the basis of dimension such as zero-dimension, one-dimension, two-dimension and three-dimension nanoparticles. The nanoparticles are synthesized by using two approaches like top-down approach and bottom-up approach. Since the main methods for producing nanoparticles are chemical and physical methods which are often expensive and potentially harmful to both the environment and the user. So, we did our best in our researches to synthesize metallic nanoparticles using plant extracts and stay away from expensive and toxic chemicals at the same time. Therefore, it is with great pride that our research group is considered a pioneer in the region, and many high quality research articles have been published by our group highlighting the necessary needs of the community regarding green synthesis nanomaterials. After synthesizing different types of nanoparticles, using easy, one-pot, inexpensive and green process, from locally grown plant extracts, different characterization techniques have been used to investigate structure, size, morphology, thermal behavior, surface area, surface charge, chemical composition and optical properties of the nanoparticles. After synthesizing and characterization process, the green synthesized nanoparticles were employed in thin film application, gas-sensing, enhancing solar panel efficiency, wastewater treatment, catalytic application, harvesting sunlight for solar thermal generation and many other applications.

PL – 13

Electrodeposition: a powerful tool for preparation nanomaterials

Luis Paulo Mour˜ao dos Santos

Graduate Program of Materials Science and Engineering Federal University of Cear´a, Brazil

Email: santoslpm@metalmat.ufc.br

Over the years the electrodeposition becomes a major technology for mass production of large area protective metallic coatings in the industry, for instance; zinc electroplating and Cu plating in the Damascene process for integrated circuits and magnetic heads. The electrodeposition is an handle-easily, low-cost, and low temperature operating processes, scale-up technique, and could be also an environmentally friendly strategy for preparation advanced materials. In the 1990s years electrodeposition turns up as powerful tool to growing semiconductor materials at large scale, such as II-VI compounds and chalcopyrite, specially in nanometer regime. Controlling experimental parameter, such as concentration of the electroactive species, applied electrode potentials and current density, and bath temperature is possible turning the size, shape, and morphology of the nanostructures. Traditionally, electrodeposition is conducted in aqueous plating solutions, however the narrow electrochemical window that limit the deposition of metals because of hydrogen gas evolution during electrolysis, affecting the quality of coatings, additionally, low thermal stability and evaporation could lead the liberation of toxic vapour during the operation. Thereby, over the 1990s years the based on alkyl-imidazolium Room Temperature Ionic Liquids (RTILs) emerges as an important new class of organic salts which allow the electrodeposition of many materials that was not possible in aqueous electrolytes. The most advantages of RTILs are their low meting point (∼100◦C), very low vapour pressure, broad potential range, high solubility of metal salts, and high thermal stability (>200◦C). Nevertheless, their instability against air and moisture and corrosiveness of solvents have limited their large scale application. Moreover, over the 2000s year the namely Deep Eutectic Solvents (DESs) were developed as alternative RTILs, since they share many physical and chemical properties, however DESs are biodegradable, nontoxic, show superior insensible to presence of water and lower price in comparison to RTILs. Therefore, in this talk Dr. Santos provides a widely explanation how electrodeposition could be successful employed to preparation of advanced nanomaterials using water-based, RTILs, and DESs electrolytes.

PL – 14

BIO-BASED COMPOSITE MATERIALS FOR SUSTAINABLE DEVELOPMENT

Prof. Maya Jacob John

CSIR, Centre for Nanostructures and Advanced Materials, Chemicals Cluster, Pretoria

Email: mjohn@csir.co.za

This presentation focuses on the recent research activities dealing with bio-based materials at the Council for Scientific and Industrial Research (CSIR), South Africa. The activities at CSIR (Polymers and Composites division) cover a broad range of research and development in the field of biocomposites which include design and fabrication, processing, structural analysis and characterization of composite materials. Research programs encompass a wide range of activities from developing bio-based materials for industrial applications to 3D printing of bionanocomposites. Current presentation will focus on the use of natural fibre based composites for various industrial applications such as in the transport sector. Changing environmental regulations and implementation of circular economy, has seen a movement towards replacement of petroleum based materials with bio-based products and emergence of waste residues as a bio-based feedstock. The development of bio-based sandwich panels and laminates for use as secondary structures in transport sector will be presented. Studies related to conversion of post-harvest agrowaste residues to value-added bio-based composite products will also be highlighted.

IL – 1

Dielectric Properties of Epoxy/Conducting Filler Nanocomposites

Dr. Jayalatha Gopalakrishnan

Dept. of Polymer Science and Rubber Technology,
Cochin University of Science & Technology
Kochi 22, Kerala – 682022
Email: gjayalatha@gmail.com

With the rapid development in the electronics industry, especially with the miniaturization of electronic devices, there has been increasing interest in materials with high dielectric permittivity. Polymer-based materials with high dielectric permittivity are promising candidates for applications such as embedded capacitors, gate dielectrics, actuators, EMI shielding etc due to their light weight, good mechanical properties and ease of fabrication. Epoxy is one of the important engineering materials widely used in applications such as coatings, adhesives, electronics, aerospace etc owing to its high tensile strength, modulus and chemical resistance. However, its low dielectric permittivity limits its applications in electronics industry. Though ceramic fillers can enhance the permittivity, higher loadings (> 50 %) are needed which deteriorates the mechanical properties and processing of the final composite. Another approach is to incorporate conducting fillers such as carbon-based fillers (graphene or CNT), conducting polymers (polyaniline, polypyrrole, PEDOT) etc. Conducting polymers (CPs) with nanostructures can enhance the permittivity at loadings of nearly 20 -30 %. Higher loadings can result in high dielectric loss and can worsen the mechanical properties. To alleviate this issue,a combination of conducting polymers and carbon based fillers has been practiced which can effectively enhance the charge transfer.CNTs and graphene has gained significant attention due to their unique properties such as high electrical conductivity and large specific surface area. A combination of CPs with fillers can further prevent the agglomeration of CNTs or graphene when used alone and thereby improve the permittivity and suppress the dielectric loss. The enhancement in permittivity is attributed to the interfacial polarization in which charge carriers are blocked at the inner surface or interfaces between the matrix and filler. Some of the reports on combination of conducting polymers and fillers (CNT, graphene) in epoxy nanocomposites for improving dielectric permittivity will be detailed in the presentation.

IL – 2

Nanostructured Epoxy Thermoset with Chitosan -Graft-Polystyrene Copolymer: Improvement in Mechanical Properties

Dr. Deepa. K. Baby

Assistant Professor Department of Basic science and Humanities Rajagiri School of Engineering and Technology Rajagiri Valley, Kakkanad, Kochi 682 039 Kerala, India

Email: deepakb@rajagiritech.edu.in

Chitosan -graft-Polystyrene copolymer were incorporated in epoxy monomer and found that the mechanical properties especially the tensile properties of the thermoset were improved to a greater extent. The chitosan has the free amino groups and the hydroxyl groups and it can form chemical bonding with the epoxy monomer along with the intermolecular hydrogen bonding during curing reaction. The polystyrene as it is immiscible in the epoxy monomer undergo phase separation and form the nanostructures in the epoxy matrix. Toughening of the epoxy thermoset is possible by the nanostructures so formed. The bonding of chitosan with the epoxy monomer is so strong that it cannot be etched by any organic solvent.

Keywords: Epoxy monomer, (CS-graft-polystyrene), toughening, tensile strength

IL – 3

Electrically Conductive Organic-Inorganic Hybrid Nanocomposites: New Perspectives and Future Scopes

Dr. Sivakala S.

Assistant Professor,
Department of Chemistry Sree Narayana College,
Chempazhanthy, Trivandrum
Email: sivakalasnc@gmail.com

Electrically conductive nanostructured organic-inorganic hybrid composites are receiving lots of attraction in recent years due to its fascinating multifunctional properties such as opto-electronic, thermo mechanical and so forth. They find potential applications in various fields such as actuators, EMI shielding, chemical sensors, energy storage devices, photocatalysis, etc.Tuning the interfacial interactions of organic and inorganic counterparts in the molecular level allows the control of the size, shape, electro-optic band gap and morphology which generates the formation of novel multifunctional materials. Presence of polymer in ECNHCs contributes towards processability, light weight, flexibility, and low cost, whereas the inorganic counterparts can augment optoelectronic, chemical, and thermo-mechanical properties. Organic inorganic hybrid nano composites with electrically conductive polymers to were reported captivating properties and finds electronic applications. Recent reports discuss newer and novel methods of fabrication of such composites with significant enhancement in the properties which offers variety of future applications for the material.

IL – 4

Influence of Multiwall Carbon Nanotubes and Styrene Acrylic Acid on Morphology and Thermal properties relationship of 80/20 PA6/ABS Blends

Dr. Bhagwan F. Jogi

Professor, Department of Mechanical Engineering,
Dr. Babasaheb Ambedkar Technological University, Lonere - 402103 India

Email: bfjogi@dbatu.ac.in

In this paper blends of polyamide-6 (PA6) and acrylonitrile-butadiene-styrene (ABS) and its blends with compatibilizer styrene acrylic acid (SAA), multiwall carbon nanotubes (MWNT) and combination of MWNT and SAA respectively have been investigated. The objectives were to understand the effect of reactive compatibilizer in addition with MWNT on morphology, crystallinity and thermal stability of 80/20 PA6/ABS blends. It was found that compatibilizer SAA, MWNT and combination of MWNT and SAA help to refine the morphology which includes decrease in diameter of the droplets, decrease in inter particle ligament thickness (IPDC) and increase in interfacial area per unit volume (A_i) of dispersed phase (ABS) in PA6 matrix. The correlation of morphology with crystallinity and thermal stability reveal crystallinity and thermal stability of blends will be maximum when the droplet diameter as well as critical inter particle distance must be minimum and interfacial area per unit volume must be maximum.

Keywords: PA6/ABS blends, styrene acrylic acid (SAA), multiwall carbon nanotubes (MWNT), inter particle ligament thickness (IPDC), interfacial area per unit volume (A_i).

IL – 5

Visible Light Impelled Organic Transformation Of 9-(*N, N* Dimethylaminomethyl) Anthracene on M-Rgo-TiO_2-N Composite; Experimental and Theoretical Results

Dr. Mothi Krishna Mohan

Department of Sciences & Humanities, School of Engineering and Technology, Christ (Deemed to be University), Bengaluru, 560074, Karnataka, India.
Email: mothikrishna.mohan@christuniversity.in

The current work reports the modification of reduced graphene oxide/titania composite by metal and non-metal to improve the photo catalytic activity under visible region of the electromagnetic spectra. The M-rGO-TiO_2-N **(M-Metal, N- Nitrogen)** system was prepared by Hummers' method followed by sol-gel/hydrothermal technique. Graphene oxide is a perfect platform to disperse robust semiconductor systems. Coupling of reduced graphene oxide (rGO) with TiO_2 helps to modify the charge separation and redox properties effectively. Addition of small quantities of metal at the interface can further improve the photo activity of the system and the methodology adopted is called interfacial composition engineering. The structure and morphology of the prepared system was studied by X-ray powder diffraction (XRD) and scanning electron microscopy (SEM), respectively. X-ray photoelectron spectroscopy (XPS) results demonstrated the interstitial doping of nitrogen into titania, +2 oxidation states of copper at the interface and different types of carbon species present in the system. Light response of the system was analyzed experimentally and theoretically by using Ultraviolet/visible diffuse reflectance spectroscopy (UV-DRS) and Density functional theory (DFT) calculations, respectively. The photo catalytic activity of the system was checked in the organic transformation of some polycyclic aromatic hydrocarbons (PAHs). On reaction, tertiary amine appended anthracene and its phenyl derivative yielded anthraquinone with almost 90% as the major product. Photo-oxidation of phenyl protected derivative of 9-*NN*-dimethyalaminomethyl anthracene yielded a very stable intermediate, 9-hydroxy 9-phenyl anthrone over a short span of time. All the products were separated by silica column chromatography using 70:30 hexane/dichloromethane as the mobile phase. The separated compounds were characterized by ^{1}HNMR and melting point measurements. Theoretical investigations on the structure of the catalytic system and the reaction products were studied in detail by using DFT calculations.

Keywords: Photo-oxidation; Anthracenemethanamine; M-rGO-TiO_2-N; Interfacial Engineering; Density functional theory

IL – 6

Properties of Bio-nanocomposites - Starch A Potential Replacement for Synthetic Polymer

Dr. Sreekala M. S.

Postgraduate & Research
Department of Chemistry,
Sree Sankara College, Kalady,
Kerala, India – 683574.
Email: sreekalams@yahoo.co.in

To solve the problems generated by plastics waste, many researchers are going on for the substitution of petroleum-based products with bio-based materials, which are completely "Green" in nature. The endeavour of this work is to make use of pine apple waste fibers as potential nano scale reinforcement on a green agro-based polymer matrix. The effect of PALF-CNF inclusion on the mechanical, transport, viscoelastic characteristics, thermal, barrier, optical, surface, permeability, anti-bacterial and biodegradation of nanocomposite was studied in detail. The barrier properties increased significantly due to the dispersion and fine adhesion of nanofibers in the starch matrix. Evaluation of constrained region shows that CNF had a tendency towards glycerol rich starch phase since the composite exhibit two relaxation phenomenon as evident by tan delta curve.Addition of cellulose nanofibers shifted the initial decomposition temperature towards higher temperature side. Starch films were prepared by crosslinking with a bio-based disaccharide derivative sucrose dialdehyde to improve the properties. After crosslinking with oxidised sucrose (OS), additional bonds are formed by crosslinking between aldehyde group of OS and hydroxyl group of TPS, resulting the formation of more stable acetal/hemiacetal group and thereby increase the melting peak. This may be also due to the formation of more compact and well-defined structure. Samples with higher crosslinker content and nano-reinforcement found to be more resistant against bacterial pathogens.

IL – 7

Investigation of genetic divergence in local sunflower hybrids and inbred lines by applying morphological markers

Dr. Uzma Ayaz

Department of Plant Breeding and Molecular Genetics,
University of Poonch Rawalakot, Pakistan
Email: uzma_ayaz89@hotmail.com

Knowledge of genetic diversity is the basic requisite for any plant breeding program. Seventeen sunflower hybrids and fifteen inbred lines including ten Cytoplasm male sterile lines and five restorer lines were evaluated at the experimental area of National Agriculture Research centre, Islamabad, Pakistan during autumn-2011. The objective of study was to investigate the genetic diversity, categorize the proficient cross combiners and approximate characters association among sunflower hybrids and inbred lines. Data was estimated on i.e. flower initiation days, full flowering days, full developmental days, height of plant, disk diameter, stem thickness, leaves per plant, hundred achenes weight, achenes yield and oil content percentage. The maximum achenes yield was contributed by Hysun-33 2119 kg ha-1. Followed by SMH-0924 and SMH-0925, SMH-1028 and SMH-0926 were suggested as potential significant hybrids for future breeding plans to incorporate maximum achenes yield and oil content percentage. The CMS-11, CMS-25 and CMS-10 were long statured with vigorous stem and all the restorers were early maturing recommended for including in hybridization program to generate high heterotic factions. Cluster diagram based on Euclidean dissimilarity matrix grouped hybrids as well as inbred lines in four groups. The group I and IV consist of four whereas group II and group III have three and five hybrids respectively. All the restores were clustered in III and IV and CMS in I and II groups respectively. According to principle component analysis the first two components contribute 64% and 89% in total variation in hybrids as well as in inbred lines respectively.

Key words: Sunflower, Helianthus annuus L, Genetic diversity, Cluster analysis, Principle component analysis.

IL – 8

Design and Development of Visible-Light Photocatalytic Nanomaterials

Dr. Vijai K. Rai

Assistant Professor, Department of Chemistry,
Guru Ghasidas Vishwavidyalaya (Central University), Bilaspur, C.G.
Email: vijaikrai@hotmail.com

A catalyst of renewable origin would be in accordance with green chemistry principle. The polymeric graphitic carbon nitride (g-C_3N_4) has interested earth abundant elements, which could be obtained by pyrolysis of nitrogen-rich containing precursors, *viz.*, urea, thiourea, cyanamide, dicyandiamide, trithiocyanuric acid, melamine, triazine and heptazine derivatives. Though, g-C_3N_4 finds application as photocatalyst, its photocatalytic behavior is limited because of low efficiency, mainly due to rapid charge recombination. To overcome this problem, several strategies have been developed including doping of metal/non-metal in the cavity of g-C_3N_4. Metal-doped g-C_3N_4, especially Co@g-C_3N_4 shows extremely high catalytic activity for organic reactions along with its reusability. To design and develop new catalytic routes for chemical transformations with high activity and selectivity, which is benign to the environment would be most welcome. Due to eco-compatibility, easy availability, safe handling and everlasting abundance as non-conventional energy source for activation of reactions, visible light-induced synthetic strategies, especially photoredox catalysis, have emerged as state-of-art alternative of traditional conventional synthetic methods to advance the green chemistry program. Photoredox catalysis triggers the photo excitation of substrate through single-electron transfer (SET) mechanism and nowadays it has been widely used in organic synthesis. Thus, inexpensive visible light photocatalytic organic transformations have attracted much attention of synthetic chemists in these environmentally cautious days.

IL – 9

Nanoparticles to prevent protein misfolding neurodegenerative disorders

Dr. Manash Barthakur

Department of Zoology, Pub Kamrup College
Baihata Chariali, Kamrup, Assam Pin 781381, India
Email ID: researchpkc@gmail.com

Protein synthesis and folding are normal and continuous processes of a cell. Different protein folding regulators and chaperons are involved for the proper folding of protein to form tertiary structures. Sometimes, protein misfolding takes place inside the cells and misfolded proteins either aggregate or transform to oligomeric form. The misfolded protein may escape from the normal degradation process and accumulate in the different organ systems. One of the neurodegenerative disorders that occur due to protein misfolding is Alzheimer's disease where misfolded protein causes the formation of the amyloid-beta sheath. The oligomeric form of amyloid-beta is toxic to the nerve cell and causes neurodegeneration. The development of nanotechnology and the application of nanoparticles to control different biological processes of a cell open a new field to apply nanotechnology to correct protein misfolding disorder. Due to biologically compatible sizes and surface-to-volume ratio with tuneable surface and core properties, nanoparticles can be an option to control different protein misfolding disorders. As the proteins are charged molecules so nanoparticles with tunable surface charge can help in the modulation of protein charge and also prevention of aggregate formation. Nanoparticles having surface charge can prevent the oligomeric beta formation or help in the degradation of amyloid-beta and thus may protect the brain from the toxic effect of the misfolded protein. Nanoparticles inside the living system unite with proteins and form a dynamic nanoparticle-protein (NP-P) corona. This protein nanoparticle corona may change the bio-reactivity of the nano-particles and may induce conformational changes of misfolded protein [1]. Some nanoparticles have chaperone-like characteristics and got much interest for protein misfolding disorders. Nanoparticles are able to conjugate with biospecific molecules in a process called functionalization. Nanoparticles with chaperone-like activity require a careful design of their surface functionalization to favor interactions with misfolded proteins for modulation to block toxic aggregate formation and promote the clearance of aggregates [2]. Besides, nanoparticle amyloid-beta oligomer conjugate can be cleared by phagocytic cells present in the blood. Microglia also plays a major role in the clearance of nanoparticles amyloid-beta oligomer conjugate from the brain tissue [3]. Amyloid inhibition characteristics were also observed among the nanomaterials like polyoxometalates. This type of nanomaterial may be an alternative therapeutic option for protein misfolding neural disorders like Alzheimer,s disease[4]. More research in this field is required to develop new therapeutic and diagnostic methods for the treatment and diagnosis of this neural disorder.

IL – 10

Protein-Nanoparticle Interaction: Corona Formation & Biocompatibility

Dr. Tapanendu Kamilya

Department of Physics, Narajole Raj College, West Bengal, India, Pin-721211

Email: phytk@narajolerajcollege.ac.in

Nowadays, the world is more or less deficient exclusive of the innovative word **"*Nano*"**. The material particles having dimension are in range of 1-100 nm are naturally known as nanomaterials or nanoparticles that have enormous applications from the everyday essential materials to sensing as well as targeted drug delivery. After entering into biological fluid through semi open interfaces from the atmosphere, the bare nanoparticles interacts with blood plasma proteins owing to their high surface activity and a biological layer of protein covers the surface of nanoparticles which is typically termed as "*Nanoparticle-Protein Corona*". There are two types of corona occurs- "*Soft Corona*" and "*Hard Corona*". The formation of protein corona is a multifaceted process that involves the complex kinetics as well as dynamics between the two interacting entities. The protein molecules become unfolded as well as lose their biological activity and functionality caused by interactions with bare nanoparticles. Therefore, the biocompatibility is the principal issue behind the application of nanoparticles. Subsequently, our key challenge is to recognize the different aspects of nanoparticles-protein interactions as well as corona formation, moreover, the synthesis biocompatible nanoparticles for future applications in the bio-medical field of research and targeted drug delivery. Our study focuses on the investigation of dynamics of complex interaction as well as corona formation among the nanoparticles and protein molecules by the support of spectroscopic as well as microscopic techniques. Ultimately, we shall draw our attention on the production of safe and biocompatible nanoparticles which have immense future prospects in biomedical field of research and targeted drug delivery.

IL – 11

Enzymatic assay of pathogens treated with Fe doped MgO nanoparticles

Joyshree Maji[1*], Soumen Basu[2], Sanjeev Pandey[3]

[1*] Department of Physics, Asansol Engineering College, Asansol, India.
[2]Department of Physics, National Institute of Technology, Durgapur, India.
[3] Department of Botany, Banwarilal Bhalotia College, Asansol, India.

Email address1*: nanoedutech@gmail.com

Nanomaterials are seduced to exhibit antibacterial activity in recent and upcoming research. [1]. In this work we have studied the antibacterial properties of Fe doped MgO nanoparticles with average crystalline size of 4 nm for both gram positive and gram-negative pathogens and enzymatic assay of the pathogens treated with Fe doped MgO nanoparticles. Nanomaterials exhibit antibacterial activity in recent and upcoming research. The inorganic nanoparticles are more effective to show their antibacterial activity [2]. The application of metal oxide nanoparticles also led to very up and coming antibacterial activity, thus monitoring bacterial infections often present after surgery to remove or replace organs and tissues [3]. The antibacterial phenomenon was observed by different technique: MIC technique, Live count (LC) method and Agar cup technique. TEM study of the treated microbes exhibit a morphological deformation with decreased cell wall disruption and changing in enzyme level. From the study of enzymatic assay towards the pathogens treated with Fe doped MgO nanoparticles, it reveals that with increasing concentration of Fe doped MgO, antibacterial activity also increases and the level of enzyme, Superoxide dismutase (SOD) increases within the microbes. Drug delivery systems based on the use of nanomaterials also show enhanced biodistribution of the drug [4] . Fe doped MgO nanomaterials could be used as antibacterial agent after completion of successful in vivo trials.

IL – 12

Role of Microbes in Nanoparticle Synthesis

Dr. Ganga. G

Assistant Professor in Microbiology
Sree Ayyappa College Eramallikara, Chengannur Alappuzha
Email: drgangaimb@gmail.com

Microbial metal reduction can help with metal contamination and waste treatment. Bacteria have the ability to mobilise and immobilise metals, and bacteria that can reduce metal ions can precipitate metals on a nanoscale scale. Biosynthesis of nanoparticles (NPs) using bacteria is becoming a popular research issue in green nanotechnology around the world, with a variety of biological entities being employed in NP synthesis on a regular basis, offering an appealing alternative to standard chemical and physical procedures. The optimization of the processes can lead to the synthesis of NPs with acceptable morphologies and sizes in a quick and clean manner. The manufacture of nanometer-size particles of various morphologies, sizes, and monodispersed is an important topic of nanoscience study. In this context, there is a rising need to design NP synthesis experimental techniques that are reliable, nontoxic, clean, eco-friendly, and green. Metal contamination and waste treatment can be aided by microbial metal reduction. Bacteria have the power to mobilise and immobilise metals, and bacteria that can decrease metal ions have the ability to precipitate metals at the nanoscale scale. Biosynthesis of nanoparticles (NPs) utilising bacteria has arisen as a fast-growing study topic in green nanotechnology around the world, with diverse biological entities being used in NP synthesis on a regular basis, providing an attractive option to traditional chemical and physical processes. The optimization of the processes can lead to the rapid and clean synthesis of NPs with appropriate morphologies and sizes. The make a reflection on the current state and future prospects of green synthesised/biobased nanoparticle their possibilities and prospects are being discussed here.

Key words: Microorganisms, green synthesis, Nanoparticles, Applications

IL – 13

Nanoformulation for the management of experimental Rheumatoid Arthritis: A Combination Therapeutic strategy

Rehan Khan and Anas Ahmad

Institute of Nano Science and Technology (INST)
An Autonomous Institute of Department of Science and Technology
Government of India, Phase-X, Sector-64
Mohali-160062 (Punjab)

Email: rehankhan@inst.ac.in

Rheumatoid arthritis (RA) is an autoimmune disorder affecting about 1% of global population and if left unmanaged, may progress to serious disablement. Its pathogenesis implicates synoviocyteshyperproliferation, angiogenesis, formation of pannus, along with cartilage and bone degradation, which causes damage and disability. In spite of significant advancements in treatment paradigms, limitations like enhanced drug metabolism and high clearance leads to low bioavailability of anti-rheumatic drugs. In present study, core-shell nanocarriers were formulated for co-delivery of glycyrrhizic acid (GA) and budesonide for treatment of RA. GA-loaded inner nanoparticles of gelatin core were coated with budesonide loaded aminocellulose-grafted polycaprolactone (PCL-AC). Nanoparticles decreased joint swelling and erythema in rats and appreciably reduced bone erosion, indicated by X-ray analysis. NPs also reduced bone destruction, restored heath of the synovium, and normalized the bone and cartilage histoarchitecture along with minimizing infiltration of inflammatory cells. These results established that core-shell nanoparticles impart better therapeutic efficacy in comparison to naïve forms of drugs and this is due to sustained release of GA and budesonide from nanoparticles as well as inhibition of inflammation biomarkers by core-shell nanoparticles.

Keywords: - Rheumatoid Arthritis, Nanoformulation, Combination therapeutic strategy

IL – 14

Metal Nanoparticles and their Significance in Cancer Research: Pros and Cons

Dr. Pramod Gautam

Department of Biochemistry,
All India Institute of Medical Sciences,
3rd floor, room No-3040, Teaching Block,
New Delhi-110 029, India
Email: pramodgautam_13@yahoo.com

Cancer is one of the leading life-threatening diseases with 19.3 million new cases and almost 10 million death in 2020, worldwide. Due to the lack of early diagnosis, and effective treatment, majority of the patients have been diagnosed at advanced stages and experience relapse, hence an effective diagnostic tool and therapeutic approach that could help to diagnose and treat cancer at early stages are required. In recent years, nanoparticles (NPs) based therapeutic and diagnostic approaches have shown significant potential to ameliorate cancer therapy. Metal nanoparticles (NPs) (1–100 nm) possess unique properties like surface-to-volume ratio, enhanced electrical conductivity, superparamagnetic behavior, spectral shift of optical absorption, and unique fluorescence properties. Because of their small size, nanoparticles can readily interact with biomolecules both at surface and inside cells, yielding better signals and target specificity for diagnostics and therapeutics. The most commonly employed noble metals are Au, Ag, Zn, Cu, and Pd, which carried a great revolution in cancer biology in the modern era. The potential therapeutic application of noble metal NPs represents an attractive platform for cancer therapy in a wide variety of targets and clinical settings including Tumor targeting, Gene silencing, Hyperthermia, Drug delivery, and Radiotherapy. For specific tumor targeting, NPs can be easily functionalized with a wide variety of biological moieties, such as mAb, peptides, and/or DNA/RNA to specifically target extracellular and intracellular receptors or pathways. AuNPs have the ability as intracellular delivery vehicles for antisense oligonucleotides and therapeutic siRNA by protecting RNAses and providing selective targeting. The photothermal properties of NPs (AuNPs, AgNPs) have been used in hyperthermia therapy against cancer. Additionally, NPs like AuNPs have already been used as vehicles for the delivery of anticancer drugs, such as paclitaxel and cisplatin. The X-ray irradiation of NPs (Au, Ag, Pt) set up the release of their cytotoxic action and can act as dose enhancers and/or generate radicals that damage cancer cells and have been proposed as potential radiosensitizers. Along with their therapeutic efficacy, metal NPs can be used for the simultaneous actuation and tracking agents for *in vivo* cancer imaging: those presenting a significant absorbance and scattering in the NIR region, or as contrast agents for computed tomography (CT), magnetic resonance imaging (MRI), optical coherence tomography (OCT), and photoacoustic imaging (PAI). Despite promising preclinical results, NPs failed to show therapeutic effects during clinical trials due to their inadequate therapeutic effect, lack of selectivity, the absence of blood marker, unforeseen adverse effects, and antagonistic biological effect. Collectively, the advancement of nanobiotechnology and clinically viable formulations of NPs might significantly boost its potency and prove more active in cancer research.

IL – 15

Electrospun α-Fe_2O_3/PAN nanofibers mat: A multifunctional and efficient platform in wastewater treatment

Manish Kumar, and Jaspreet Kaur

Randhawa School of Engineering, Indian Institute of Technology, Mandi, H.P. -175005

Email: mkumar2@arsd.du.ac.in

The last decade has witnessed remarkable development in the discovery of key materials and their drastically different properties at nano scale. Nano scale particles have given scientists new tool to understand and take advantages of phenomena that occurs naturally when metals and particles are organized at nano scale. With the help of nanotechnology, it is possible to increase the capabilities of electronics devices and reduce their size, power consumptions and weight also. Cutting-edge technologies for water purification are the gateway for wastewater treatment. Heavy metals, organic dyes, and medicinal drug pollutions present in water bodies severely affect human health upon consumption. Therefore, a great need to develop an efficient and self-powered membranebased platform that helps eliminate heavy metals, organic dyes, and medicinal drugs towards wastewater treatment management. In the present work, I demonstrate a novel Electrospun nanofibers mat which can decolor the solution after filtration efficiently even at higher concentrations. In the light of exploring the multimodality of nanofibers mat, the present work also advanced the usage of nanofibers mat in the adsorption of heavy metals. Further we performed electrochemical sensing of drugs in wastewater treatment. This offers the potential for low cost highly sensitive and efficent membrane for wastewater treatment and remeadation.

Keywords – Electrospinning, Wastewater treatment, Electrochemical sensing, Nanofibers based membrane

IL – 16

Organic-inorganic nanocomposite based multifunctional coatings with tunable wettability

Malobi Seth and Sunirmal Jana

Specialty Glass Division, CSIR-Central Glass and Ceramic Research Institute, 196 Raja S.C. Mullick Road, Jadavpur, Kolkata – 700032, West Bengal, India.

Email: sjana@cgcri.res.in

Wetting property in the living systems is always an interesting area of research in the field of both basic and applied science. The property of a solid surface can be divided into four basic categories – (a) superhydrophilic (water-loving), (b) superhydrophobic (water-repelling), (c) superoleophilic (oil-loving) and (d) superoleophobic (oil-repelling). It is to be noted that the growing interests have resulted in extensive research in mimicking the wetting property of natural living systems by recreating micro and nanostructures as well as composition of natural surfaces. A superhydrophobic/superoleophobic surface is characterized by static water/oil contact angle, ≥150° and sliding angle, ≤10°. A superhydrophilic/superoleophilic surface is characterized by static contact angle, ≤10°. Various wetting properties of a substrate can be utilized towards achieving multifunctional properties for diverse applications such as oil-water separation, self-cleaning, antimicrobial activity, controlled drug release, UV protection, antifouling, anti-corrosion, anti-icing, prevention of liquid food wastage and so on. Based on the above, multifunctional coatings with tunable wettability have been fabricated on cotton fabric utilizing organic-inorganic hybrids of transition metal (Ni, Cu, Zn) oxides/hydroxides. Hierarchical nanosheets of α-$Ni(OH)_2$ and marigold-like nanostructures of β-$Ni(OH)_2$ have been insitu fabricated on cotton fabric followed by modification with hexadecyltrimethoxysilane (HDTMS) for the development of superoleophilic/superhydrophobic coatings. The coated fabrics are found to possess self-cleaning and antimicrobial properties towards gram positive (S. aureus) and gram negative (E. coli) bacteria as well as fungi (C. albicans). These are also suitable for oil (light and heavy oil)-water separation with 99% separation efficiency. On the other hand, Ag-ZnO-chitosan nanocomposite has also been deposited on cotton fabric with excellent antimicrobial activities which have potential application in medical textiles. Upon modification with polydimethosiloxane, the fabric has gained superhydrophobicity towards anti-staining and self-cleaning applications. In addition, hollow cylindrical tube-like structures of Ag-Cu_2O have been deposited on cotton fabric in a green pathway having superhydrophilicity/underwater superoleophobicity. The coated fabric has further been modified with HDTMS to obtain superoleophilicity/ superhydrophobicity. Owing to the switchable wettability, the fabrics have been effectively used for separation of oil-water mixtures with high reusability. Moreover, the superhydrophobicity prolongs the antimicrobial activity of the coating up to 90 days. All the coated cotton fabrics show outstanding mechanical and chemical robustness as well as laundering durability. Thus, the facile coating fabrication technique can be up scaled for commercial exploitation.

Keywords: Surface modification, organic-inorganic hybrid, tunable wettability, oil-water separation, self-cleaning, antimicrobial activity, hierarchical surface structure

IL – 17

Effect of Rare Earth Concentration on Structural, Optical and Radiative Properties of TeO_2-B_2O_3-ZnO Glasses and Glass Ceramics

Dr. Neetu Chopra

PG Department of Physics,
Kanya Maha Vidyalaya, Jalandhar (Punjab)

Email: neetuverma75@yahoo.co.in

Glasses are very exotic materials from science and technology outlook because of their widespread applications in the field of architecture, photonic devices, medicine etc. It is a non-crystalline material showing a glass transition behavior. Their properties like transparency, chemical inertness, electrical and thermal properties, biocompatibility, compositional variability etc. are exploited in plentiful of applications. In the quest of preparing novel functional materials, amalgamation of properties of two materials plays crucial roles. The increase in understanding of glass science has made it possible to improve its properties by controlled crystallization. Such materials have properties of glasses (transparency etc.) as well as ceramics (optical activity, mechanical strength etc), and are known as glass ceramics. In these materials as nano/ micro sized crystallites are grown in the glassy matrix which leads to prominent effect on their functional properties. Accordingly with an appropriate processing (particle size, microstructure etc) a number of novel glass ceramics are now available for number of exotic applications. In this talk, I shall highlight the effect of heat treatment on various properties of glasses related to optical fibres, optical components, host for laser emitter, windshields etc. In particular my talk will be focused on the effect of heat treatment on the thermal, optical, structural, spectroscopic and electrical properties of rare earth doped zinc borotellurite glasses.

Keywords:- Tellurite glasses, Glass ceramics, Radiative properties

IL – 18

Nanoparticles promote outstanding strength and fracture toughness of novel Al-Zn-Mg-Sc alloys after FSP

[1] P K Mandal, [2]Mathew K K and [1]John Felix Kumar

[1]Department of Metallurgical and Materials Engineering, Amal Jyothi College of Engineering, Kanjirappally-686518, Kerala, India.

[2] Department of Mechanical Engineering, Amal Jyothi College of Engineering, Kanjirappally-686518, Kerala, India.

E-mail: pkmmet@yahoo.in

Effect of minor scandium addition on microstructure and mechanical properties of novel Al-Zn-Mg-Sc alloys (7xxx) are thoroughly examined and broadly applied in aerospace, automobile, and military industries due to their excellent specific strength and mechanical properties. Many scientific evidences cite that the Sc (scandium) is a potential grain refiner in aluminium alloys by melting route. Notable age-hardening properties are prevailing due to GP zones and metastable $MgZn_2$ (ή) phases. Nucleation of $Al_3Sc(L1_2)$ nanoparticles in aluminium alloys occurs in matrix efficiently due to small lattice mismatch (~1.5%), which enhances grain refinement, increase strength, anti-recrystallization effects. These nanoparticles reveal tougher Zener drag to prevent movement of dislocations and subgrain boundaries during annealing treatments. The FSP is a fairly semi-solid technique to promote grain size to a nanocrystalline level. During DP-FSP (double passes friction stir processing) several parameters have been identified such as alloy chemistry, heat input, tool design, and impurities matter of fact for high strength and fracture toughness and altogether optimal Sc contents (0.2 to 0.4 wt.%) of FSPed aluminium alloys. In this task, the optimum fracture toughness (K_{IC}) has achieved at low heat input (9.0 or 1.36 kJ/mm) of 38.30 MPa$\sqrt{m}$, strength of 287.90 MPa, and ductility of 4.77%, respectively. Although, several characterizations were used to perform through optical microscopy (OM), FESEM, TEM, SEM with EDS fractography analysis, hardness, tensile testing and fracture toughness analysis. The TEM and SEM fractography analysis revealed ample information for nanoparticles (~33-87 nm) dispersive action enhance mechanical properties of FSPed aluminium alloys.

Key words: Low heat input, $Al_3Sc(L1_2)$ nanoparticles, FSPed, TEM, Strength and fracture toughness (K_{IC}), SEM fractography.

IL – 19

Bio-functionalized reduced graphene oxide-based nanocomposite for electrochemical detection of Cadmium ion

Dr Manorama Singh

Department of Chemistry, Guru Ghasidas Vishwavidyalaya, Bilaspur (C.G.)-495009

Email: manoramabhu@gmail.com

Toxicity of Cadmium (II) is well known and it is considered as non-biodegradable and having carcinogenic nature. Due to its high-water solubility, it easily spreads in environment and thus it bioaccumulates in human and can react with enzymes resulting production of free radicals. It has been found as a human 'Type I' carcinogen. As per WHO guidelines, its upper permissible limit in the drinking water is approx. 0.003-0.005 ppm. Hence, looking to health point of view, it is highly necessary to determine concentration of cadmium in water samples. Electrochemical sensors with modified electrode are favorable over conventional methods because of their simplicity, quick response, portable, cost-effective, high sensitivity. Our research group has reported a construction of an environment friendly SnO_2 nanoparticles@ bio-conjugated reduced graphene oxide' nanocomposite. It was prepared by the amidation reaction between amino-functionalized reduced graphene oxide (H_2N-rGO) and COO- groups of 'L-proline' (an amino acid) followed by its association to SnO2 nanoparticles. Moreover, the fabricated electrode was utilized for the sensitive and selective detection and quantification of cadmium in water sample. Synergism between biofunctionalized rGO and SnO_2 significantly improved the electrocatalysis of Cadmium sensing. Linear calibration range was obtained from 0.001-0.4 ppm and calculated limit of detection was found to be 1×10^{-4} ppm. Lastly, the modified electrode was utilized for real sample analysis using ground water and tap water samples with good recovery outcomes.

IL – 20

Internet of Things (Iot) Enabled Biosensor for Milk Quality Evaluation

Dr. J. Kumar

Crystal Growth Centre, Anna University, Chennai-25.

Email: marsjk@gmail.com

Capacitance is the amount of charge Q stored to the voltage V between the two parallel plates. Some of the enzyme reactions are charge based reaction, which depends on the charge of either substrate or product. The increase in the charge will lead to change the capacitance value with respect to charge concentration. A portable auto range capacitance meter was fabricated with inbuilt cuvette holder for the enzymatic reaction. Capacitance meter measures the charges generated as a function of time and records the data. It measures the capacitance value from therange of pico farad (pF) to microfarad (μF) and records the readings in the order of milliseconds. The data can be simultaneously transferred to a computer, displayed as data points and graph on the end-user interface through IoT. There are 13 common adulterants such as vegetable oil/fat, detergents/caustic soda, hydrogen peroxide, sugar, glucose, urea, starch, maltodextrin, boric acid, ammonium sulphate, nitrates, cellulose and neutralizer. Especially, it is highly impossible to check the quality of such adulterant in the collection point of milk. In our work, the milk samples of raw & processed milk are assessed and optimized their capacitance (static capacitance) values. The capacitance values are found to be precise according their percentage of fat and SNF content in the milk sample. These standardized capacitance values of milk sample will determine the adulteration of milk with a minute.In addition, the enzymatic reactions of lipase and protease can measure the amount of fat and protein content in the milk sample using the capacitance meter. The calculated percentage of fat and protein from the capacitance meter determines the quality of milk either cow or buffalo milk. This rapid measurement of milk adulterationsbased on capacitance with hand held meter can be useful at both the collection point as well as in the quality control section.

IL – 21

Indigenous Biosensors for Instant Detection of Bacterial Endotoxin

Dr. Alok Prasad Das
Department of Life Sciences, Rama Devi Women's University, Bhubaneswar, India
Email: alok1503@gmail.com

Bacterial endotoxins are lipopolysaccharides (LPS) which are released from Gram-negative bacteria and signify one of the most perilousbiologicaltoxins. Severe endotoxin infections coupled with sepsis transmit an elevated mortality rate in spite of proper treatment and intensive care. These necessities the need for a rapid, sensitive and instant biosensor for detection and monitoring of endotoxin levels even in extremely small concentrations. The proposed method of endotoxin quantification is based on the use Chromogenic substrate, which monitors color development of the Horseshoe crab amoebocyte lysate assay in response to endotoxin. Bacterial endotoxin activates a proenzyme in the modified horseshoe crab amebocyte lysate and splits the p-Nitroaniline (pNA) from the colorless substrate, Ac-Ile-Glu-Ala-Arg-pNA. The activation rate is proportional to the sample endotoxin concentration. After stopping the reaction, the released pNA is photometrically measured at 405 nm. The developed color intensity is proportional to the amount of endotoxin present in the sample and can be calculated using a standard curve Microscopic investigation was carried out to observe the motility of the amebocyte cells, their attachment with the *E.coli*and their response to bacterial endotoxin by the help of phase contrast microscope. Our proposed strategy can be adapted to facilitate bacterial endotoxin detection in biological specimens with 0.02EU/ml.Due to its portability, suitability and low cost, the chromogenic sensor is ideally suited for wide-spread use in endotoxin detection.

Keywords: Bacterial Pathogens; Endotoxin; Detection; Biosensor

IL – 22

Humidity Sensing Properties of Nanocrystalline Lanthanum Barium Ferrites

Mary Teresita V*, Avila Josephine B*

*****Assistant Professor, Dept. of Chemistry, Stella Maris College (Autonomous), Chennai-86

Email: maryteresita@stellamariscollege.edu.in

Nanocrystalline perovskite $LaBa_xFe_{1-x}O_{3-\delta}$ compounds were prepared in different mole ratios [x=0.0, 0.2, 0.4, 0.6, 0.8, 1.0] by sol-gel method. The synthesized compounds were sintered at 800°C for 5 hours to remove all the impurities present in the compound. The Lanthanum Barium ferrite compounds LaFe–1, LaBaFe–2, LaBaFe–3, LaBaFe–4, LaBaFe–5 and LaBa–6 were studied for their humidity sensing and temperature dependent conductance studies. The order of S_f values of the series of compounds is LaBaFe–5(16987.38±340)> LaBaFe–4(7764.83±235)> LaBaFe–3(3404.92±102)> LaBaFe–2(1243.02±46)> LaBa–6(360.94±12)> LaFe–1(41.66±3)**.** The LaBaFe–5 ($LaBa_{0.8}Fe_{0.2}O_{3-\delta}$) perovskite ceramic oxide showed a highest sensitivity factor of all the lanthanum barium ferrite compounds. Highest sensitivity factor of the compound LaBaFe–5 is also supported by the high BET surface area value of 25.13 m^2/g .The compound shows a well defined grain size with high porosity as depicted by the SEM micrographs of LaBaFe–5. The temperature dependent conductance measurements was carried out for lanthanum barium ferrites , the activation energy of the compounds was determined and the E_a values follow the order LaFe–1(0.146eV)>LaBa–6(0.113eV) >LaBaFe–2(0.057eV) > LaBaFe–3 (0.051eV) > LaBaFe–4 (0.046eV) > LaBaFe–5(0.043eV). LaBaFe–5 the humidity sensing material shows the lower activation energy due to the small polaron conduction dominates in the temperature of investigation. The crystal structure was studied by the x-ray diffraction studies. The XRD pattern of $LaBa_xFe_{1-x}O_{3-\delta}$ compounds confirms the orthorhombic crystalline monophasic type structure of the perovskite . The nanocrystalline nature of the compound is confirmed by calculating the crystallite size using Debye-Scherrer formula. LaBaFe–5 has low crystallite size which enhances the dominant charge carriers in the system and increases the conductivity of the compound. The compound showed good response and recovery time at 5% and 98% RH. Good stability and reproducibility were observed for LaBaFe–4 ($LaBa_{0.8}Fe_{0.2}O_{3-\delta}$). Spectral studies, XRD, TG/DTA, BET and SEM studies supported the humidity sensing property of the compound.

IL – 23

A Green and Sustainable Synthesis of Si Nanostructures Sourced from Arecanut Husk for Li Ion Battery Applications

Dr. Anjali Paravannoor

Department of Chemistry, Swami Anandatheertha Campus, Kannur University, Payyannur.

Email: anjali.nano@gmail.com

The recycling of agricultural/industrial waste materials and utilization of nature-abundant substances to form value added products are two strategically important industrial processes. Considering the recent interest in silicon nanostructures as an electrode material for Li ion batteries, efforts are underway in synthesising Si nanomaterials from agricultural waste like rice husk and sugarcane bagasse with optimal structure and porosity. Taking inspiration from these recent literatures we synthesized porous Si nanostructures from arecanut husk, an abundant agricultural by-product in India. Following a modified magnesiothermic reduction method with varied synthesis parameters including leaching conditions, temperature and time, Si and Si/C nanostructures were synthesized with size ranging from nanodots to a very unique continuous porous nanostructure. The synthesized structures could effectively withstand the huge volume change associated with Si. The nanostructures could exhibit capacity values up to 2798mAhg^{-1}and a long cycle life, stable up to300 cycles with 81% retention.

IL – 24

Production of electrical energy by dissociation of adsorbed water on porous oxides

Dr. Vivek Verma

Department of Physics, Hindu College,
University of Delhi, Delhi-110007, India
Email: vivekverma@hinducollege.ac.in

Porous ceramic materials are widely used in both research and commercial fields for many applications. It is known that oxide based porous ceramic humidity sensors give the better response than polymer-based sensors due to their extensive properties like high tensile strength, good thermal capacity, and high environmental and chemical stability [1, 2]. The advantage of a porous oxide ceramic is that water molecules and vapor can simply pass through the pore openings and capillary condensation takes place in the capillary porous structures which were produced between the grains in ceramics [8], resulted in more effective surface area. Humidity sensors based on the porous ceramics are working on the principle of water adsorption on surface followed by dissociation. Water can be adsorbed in two forms on the surface of oxides; (a) chemical adsorption in the form of hydroxyl groups (chemisorption) and (b) physical adsorption (physisorption). On the basis of the working principle of porous oxide humidity sensors, a device was proposed which can produce electricity known by hydroelectric cell (HEC) [3, 4]. So, HEC is one of the sources of green electrical energy which uses only few drops of water to produce electricity without any harmful effects to the environment [5]. The pictorial presentation of chemical reactions, which take place due to adsorption and dissociation at defect sites and HEC, are shown in Figure 1. It is observed that the current generated in 15 mol% Li doped SnO2 HEC reduced to 11 mA from 71 mA in 2 hrs. Decrease in current may be attributed to concentration loss and oxidation of zinc electrode. There is a big challenge to rectify these two problems for more efficient HECs. The voltage for all the samples remains in the range 0.92 V to 0.75 V for 2 hrs since it dependents on the reaction potential of external electrodes only. Obtained hydroelectric current, voltage values in Li doped samples is more sustainable than earlier reports for SnO_2, Al_2O_3, ZnO, TiO_2, MgO and SiO_2 samples.

IL – 25

Lead-Free Perovskite Materials for Solar Cell Applications

Dr. Manish Kumar

Experimental Research Laboratory, Department of Physics, ARSD College, University of Delhi, New Delhi, India-110021

Email: mkumar2@arsd.du.ac.in

Solar Cell technology is in the high demand now days for whole world due to its green energy nature. The status of this technology is also greatly appreciated due to the facile solution processability, simplicity of large-scale manufacturing and ultra-low-cost production of perovskite based thin film solar cells. There are numerous methods of perovskite growth such as sequential deposition, doctor blading, slot die coating and spray coating have been used after some computational simulation to achieve the greatest appropriate morphology vital for highly efficient, low cost and stable perovskite solar cells. In this talk, we have attentive on the latest developments made in the studies of lead-free perovskites via experimentally and computational simulation.

Keywords — Lead-free perovskite; Perovskite Solar Cell; Photovoltaic

IL – 26

First Principle DFT Estimation of Structural, Mechanical and Optoelectronic Properties of Sc_4C_3 MXene for Photovoltaic Applications

Deepthi Jayan K[a, b] and Ragin Ramdas M[a]

Rajagiri School of Engineering & Technology,
Rajagiri Valley, Kakkanad, Kochi, Kerala, 682039, India
Email: deepthij@rajagiritech.edu.in

MXenes are a viable choice for charge transport layers and electrode materials in emerging photovoltaic technologies such as perovskite solar cells (PSCs), owing to their exceptional carrier transport and energy storage capabilities. The purpose of this study is to explore the various structural and optoelectronic properties of a twodimensional MXene, Sc4C3 employing the principles of density functional theory (DFT). This study uses PBEsol GGA as the exchange correlation functional, which is specifically applied for solids, for estimating the optoelectronic properties of the material under study using a DFT tool, WIEN2k. The optimized lattice constant of the material and the volume for which the energy is minimum are estimated as 13.66 bohr and 2548.66 bohr3 respectively. The bulk modulus and its pressure derivative are estimated as 100 GPa and 5 respectively. The estimation of elastic properties from the structure file generated after executing the SCF cycle using the Elastic 1.0 tool provides the bulk modulus and shear modulus as 115 GPa and 71 GPa respectively, revealing that the material is resistant to deformation and hence can retain its structural stability upto a huge value of applied deformation. The Poisson's ratio of the material is estimated as 0.25. The analysis of electronic properties and band structure indicates that Sc4C3 MXene has a direct bandgap of 0.747 eV at the Γ point, and hence can be considered as a narrow bandgap semiconductor material. The study shows that the material possesses optimal light absorption properties with an absorption coefficient of 7.6×103 cm-1 , indicating that it can be employed as a light absorber material for solar cells in combination with other conventional light absorber materials. The dielectric permittivity of the material is estimated as 19.02, which is suitable for photovoltaic applications. The material also possesses a refractive index of 4.42. Keywords Density functional theory; MXene, optoelectronic properties; elastic properties; perovskite solar cells.

IL – 27

MXene Polymer Nanocomposites for Energy and Energy Storage Application

Dr. M. Bhagiyalakshmi

[a]Department of Chemistry, Central University of Kerala,India

Email: bhagiyalakshmi@cukerala.ac.in

In recent times, MXene based heterostructures materials have proved their candidature as potential electrocatalysts in energy and energy storage systems. MXenes are a class of transition metal carbides, nitrides, and carbonitrides, derived from MAX phases precursors by etching the A atom layers with appropriate reagents such as HF. M in the MAX phase refers to transition metal elements (such as Sc, Ti, Zr, Hf, V, Nb, Ta, and Cr), A refers to the main-group element (predominantly IIIA or IVA) X is carbon or nitrogen. The general formula of MXene is $M_{n+1}X_nT_x$, where 'M' and 'X' have the same meaning as in the MAX phase, and 'T' represents the surface functional groups (–F, –OH, and =O) which arise during the etching process. MXene possesses intrinsically good conductivity, and MXene based nanocomposites derived from MXene along with metal oxides and metal chalcogenides depicted enhanced intrinsic conductivity, current density, and fast proton transfer. Further, MXenes and MXene based materials can be used as an efficient filler in polymeric nanocomposite membranes in PEMFC. The proton conductivity, mechanical strength, durability, and corrosion resistance of polymer nanocomposites are enhanced using MXene as filler in polymer nanocomposite Membranes. This talk will focus on the use of MXene based polymer nanocomposites as electrode materials for energy storage applications. Sulfonated poly (styrene-ethylene/butylene-3styrene), Polybenzimidazole, and PEI are used as Polymer matrix along with MXene to obtain MXene polymer nanocomposite. Techniques for the fabrication of working electrodes and their performance towards energy storage applications will be discussed in brief.

IL – 28

2D-Materialsbased Photonic Devices for Near-Infrared and Mid-Infrared Ultrafast Photonics

Joice Sophia Ponraj[a,b#], Han Zhang[c], Sathish Chander Dhanabalan[b]

[a]Tyndall National Institute, University College Cork, Lee Maltings Complex, Dyke Parade, Cork T12R5CP, Ireland

[b]Centre for Advanced Materials, Aaivalayam-Dynamic Integrated Research Academy and Corporations (DIRAC), Coimbatore 641046, India

[c]Institute of Microscale Optoelectronics, Collaborative Innovation Centre for Optoelectronic Science & Technology, Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Physics and Optoelectronic Engineering, Shenzhen Key Laboratory of Micro-Nano Photonic Information Technology, Guangdong Laboratory of Artificial Intelligence and Digital Economy (SZ), Shenzhen University, Shenzhen 518060, P.R. China.

Email: joice.ponraj@tyndall.ie

The monoelements from group III to group V have beenwidely attracted toward the fabrications and applications overthe past decade due to their simple composition and excellentphotoelectric properties, such as graphene, borophene,silicene, germanene, phosphorene, antimonene, etc.However, it remains a challenging whether the mono-elementsof group VI can form stable 2D monolayer structure.The strong nonlinear optical (NLO) properties of 2D nanoflakes in the broadband range with open-aperture Z-scan technique to explore the performance of 2D GeP microfiber photonic devices (GMPDs) in near-infrared (near-IR) and mid-infrared (mid-IR) ultrafast photonics. Our results suggest that employing the GMPD as an optical device in an erbium-doped fiber laser (EDFL) systemresult in ultrashort pulses and roguewaves (RWs) at 1.55 μm. Likewise, by the incorporation of GMPD into a thulium-doped fiber laser (TDFL) system, stable ultrashort pulse operation is also achieved at 2.0 μm. We expect these findings to be an excellent GMPD that can be applied in mode-locked fiber lasers to open new avenues for its development and application in ultrafast photonics.

IL – 29

E*ngineered Functional Multiferroic Hybrid Nanosystems* for Memory Device Applications

Ann Rose Abraham[a], B. Raneesh[b], Tesfa Kiros Woldu, Sabu Thomas[c,d] and Nandakumar Kalarikkal [e,f]

[a]Department of Physics, Sacred Heart College (Autonomous), Thevara, Kochi, Kerala-682013, India
[b]Department of Physics, Catholicate College, Pathanamthitta, Kerala-689 645, India
[c]School of Nanoscience and Nanotechnology, Mahatma Gandhi University, Kottayam, Kerala-686560, India
[d]School of Energy Materials, Mahatma Gandhi University, Kerala-686560, India
[e]School of Pure and Applied Physics, Mahatma Gandhi University, Kottayam, Kerala-686560, India
[f]International and Inter University Centre for Nanoscience and Nanotechnology, Mahatma Gandhi University, Kerala-686560, India

Email: nkkalarikkal@mgu.ac.in

Development of interface engineered AB_2O_4@ABO_3 hybrid multiferroic core-shell geometric nanostructures are of great interest due to their potential applications in data storage devices and sensors**.** We herein report the development of an engineered hybrid multiferroic core–shell nanostructure with tuned magnetic core sizes and a ferroelectric shell. The phase, crystal structure and morphology of these composites have been investigated using X-ray diffraction (XRD), scanning and transmission electron microscopy (SEM and TEM) and confocal Raman spectroscopy. Raman spectroscopy is efficiently utilized to manifest the multiferroism in the core-shell samples. The outcome of the experiments indicates an energy efficient move towards the control of E-field by magnetic field, which demonstrate enormous prospective for novel low power electronic, magnonic and spintronic devices. The dielectric, magnetic, ferroelectric and magneto-electric coupling performance in interface engineered core-shell architectured room temperature multiferroic nanostructures for high density magnetic data storage applications. The multiferroicity induced by excellent coupling amongst the ferroelectric and magnetostrictive phases at the core-shell interface unlocks wide prospects for device downscaling and information storage applications. Thus, we show that remarkable controlled enhancements in the dielectric, magnetic properties, magneto-electric coupling and optical nonlinearities is feasible by meticulous design and engineering of a hybrid multiferroic structure with tuned magnetic core sizes. The far-reaching impacts of the findings offer opportunities for developing miniaturized multifunctional magnetic data storage and memory devices which facilitate switching fundamental scientific discoveries into spintronics device technologies that benefit society.

IL – 30

Plasmonics in Semiconductor Nanostructures

Dr. Hira Joshi

Department of physics, Gargi College, University of Delhi

Email: hirajoshi123@gmail.com

Localised surface plasmon resonance (LSPRS), are collective oscillations of conduction electrons and are seen as optical signatures ofany nanoscalecollection of charge carriers.Noble metals(gold, silver) and polyvalent (indium, aluminium) metals, degenerate semiconductors, doped oxides and semimetals, as well as grapheme show this resonance phenomenon in different regimes of electromagnetic spectra.Indeed, at optical and near-IR frequencies, most studies of plasmonic effects have been performed using metals. However, in degenerate semiconductors and graphene, the density of free carriers can be so high that they start to act in the far-IR and terahertz ranges. Transparent conducting oxides, such as metal-doped ZnO and indium-tin oxide, as well as semimetals (silicides and germanides) also have applications for near-IR plasmonics and plasmonicphotovoltaics. Light-matter interactions in metal-semiconductor structures) defines electromagnetic effects inducing magnification of optical absorption and optical emission in a semiconductor due to enhancement of both the optical field and the density of electromagnetic modes in the vicinity of a metal object. As fingerprints of a charge carrier collection, LSPRs of semiconductors are emerging as optical probes of processes that involve carrier dynamics, including various chemical process and reactions such as photocatalysis. There ishuge opportunity for single particle studies in the case of plasmonic semiconductor nanocrystals,especially for quantum sensing and electro-optic switching. We have studied here plasmonics of semiconductor nanostructures using Mie's formalism for spherical nanoparticles in static regime theoretically. Various optical constants of semiconductors are studied and analysed. Extinction coefficient which is sum of scattering and absorption is analysed. Resonant wavelength which depends on various factors such as size ,shape, composition and external medium can be tuned accordingly.

IL – 31

Magnetic Tunnel Junctions and Magnetoresistive Random Access Memories

Dr. Mayank Chakraverty

ams AG, Hyderabad, India

Magnetic Tunnel Junctions (MTJs) are tiny structures made up of two ferromagnetic thin films with a tunnel barrier (insulator) in between the two metals. These nanoscale ferromagnets in the MTJs exhibit magnetoresistance, which is the property by virtue of which the resistance of the material changes when it is exposed to an external magnetic field. In a ferromagnetic material, an electric current consists of two partial currents, each with either spin-up or spin-down electrons. Electrons from one ferromagnetic layer can tunnel through to reach the other metal layer when a bias voltage is applied across the MTJ and the tunnel current depends upon the relative orientation of magnetization of the two ferromagnetic layers. This phenomenon is called Spin Dependent Tunneling (SDT) or Spin-polarized Tunneling. SDT can be understood in terms of the spin split, i.e., spin up and spin down density of states (DOSs) of the ferromagnetic materials. In this tunneling process in which electron spin is conserved, the tunneling conductance depends on whether the magnetizations of the two ferromagnetic electrodes are parallel or antiparallel with respect to each other. The MTJs can be used to store binary data in the relative magnetization of the ferromagnetic layers and can effectively be used as nonvolatile memories - Magnetoresistive Random Access Memory (MRAM). MRAMs can have different configurations – Magnetic Field Write, Spin Injection or Spin Torque Transfer (or STT) and Temperature Assisted Switching (TAS) MRAMs. MTJ-based MRAMs are suited to low power, high speed applications since they can be scaled down to a much greater extent to attain a feature size that is much smaller than DRAMs and other existing memory technologies, they do not need to be periodically refreshed like DRAMs, they are nonvolatile, very small in size, much faster than modern day memories, consumes much less power, and operates faster than other memory technologies.

IL – 32

Comparative Analysis of Electrical Characteristics of Nanostructured Polyaniline Synthesized by Using the Combinations of Maleic Acid And Oxalic Acid

Subhendu Bhandari[1], Vijaylekshmi Vijayan[2], Deepak Prajapati[1], Geetanjali Tiwari[1], Sanket Juekar[1]

1 Department of Plastic and Polymer Engineering, Maharashtra Institute of Technology, Aurangabad, India-431010

2 Rubber Technology Centre, Indian Institute of Technology Kharagpur, India-721302

Email: subhenduonly@gmail.com

Intrinsically conducting polymers have diversified applications owing to its wide range of electrical conductivity. Strong as well as weak acids may be used for tuning electrical characteristics of conducting polymers. Polyaniline (PAni) is an important member of the family which can be synthesized in different methods. In this work PAni was synthesized via solvent-free mechanochemical route. Two bicarboxylic acids, maleic acid (MO) and oxalic acid (OA) were used individually as well as in combinations of different molar ratios. Successful formation of PAni was confirmed from FTIR analysis. SEM analysis revealed nanostructures of synthesized PAni. AC conductivity and dielectric characteristics were analyzed at room temperature which revealed synergistic improvement of conductivity for the PAni synthesized while using dopant combination in suitable proportion in contrast to the individually doped samples. Further comparative analysis of electrical conductivity as well as dielectric characteristics of the PAni samples synthesized by using dopant combinations were performed with varying temperature to have insight into the electrical performances.

Keywords:- Conducting polymer, Dopant combination, Electrical conductivity, Maleic acid, oxalic acid, polyaniline.

IL – 33

Formation of Liesegang Patterns via Reaction-Diffusion and Their Recognition by Pattern Image Analysis Techniques

Dr. Sunil D. Kulkarni

Department of Chemistry, Sir Parashurambhau College, Tilak Road, Pune, India 411 030

Email: sunildkulkarni@gmail.com

Periodic deposition of precipitate in the form of bands was discovered a century ago. The patterns are formed when two water-soluble reactants react with each other in a hydrogel medium leading to the formation of the precipitate which deposits as a band in a 1D setup and as concentric circles in a 2D setup. Much of the studies on this spectacular process were mainly focused on the mechanism and their spatiotemporal analysis and simulations. However, recently it had been demonstrated that the reaction-diffusion (RD) framework could be a facile route for the synthesis of monodispersed nano- and microparticles. The RD has obvious advantages for material synthesis over corresponding wet synthesis as the morphology of the particles can simply be controlled by adjusting the concentrations of the reacting species and eliminating the need for use of solvents, surfactants, etc. making it an easy, cost effect and green process. Research of our group in this field mainly focusses on the formation of Liesegang pattern and their recognition by using advanced image analysis techniques and finally applying these materials for various fields such as photocatalysis, energy storage, etc. In the present talk, our work on the first two areas is emphasized. The pattens formation can be easily manipulated by applying chemical and physical stress on the system. We demonstrated that, the periodicity in the patterns can be altered by varying the ionic strength of the reaction conditions by using $Co(OH)_2$ precipitate which were formed by using NaOH and CoCl2 as outer and the inner electrolyte respectively. We observed that as the ionic strength increases, the periodicity of the bands vanishes and the continuous precipitate is formed. This fact can be explained on the basis of ‘salting out’ effect. We have made an interesting observation in the periodically precipitating system of AgBr where ‘revert banding’ was observed. Revert banding is a situation in which the distance between two successive bands decreases instead of normal banding where the inter-band distance increases with diffusion axis. The formation of revert bands can be explained on the basis of coagulation-flocculation using the celebrated DLVO theory. While studying the Liesegang bands of AgCl by employing 2D experimental setup we observed varying particle sizes of the precipitate. This observation was attributed to difference in the supersaturation value while diffusion. It was observed that, if the supersaturation values are high, particle sizes are small and for lower supersaturation values, the particle sizes are bigger. Generally, the band boundaries are difficult to locate as the precipitates are extremely diffused, in order to overcome this; we have developed an image analysis technique for the accurate band location.

IL – 34

Investigation of Platinum (Pt) Thin Films of Different Thicknesses Using Ion Beam Irradiation

Dr. Ramesh Kumar

[1]Department of Physics, Guru Jambheswar University of Science & Technology, Hisar-125001, Haryana, India.

Email: rameshkumar.bibiyan@gmail.com

The platinum (Pt) thin films of different thicknesses such as ~2-6 nmdeposited on silicon substrates. These thin films have been performed under the irradiation of low energy Kr^+ ions. The grown Pt thin films of various thicknesseson the Si substrates are irradiated with 100 keV Kr^+ ions. We have studied the effect of ion fluence on nanostructuring of the platinum (Pt) thin films. After irradiation, we have analyzed the surface modification using atomic force microscopy (AFM), which indicates that higher ion fluence and larger thickness of Pt thin films are dominate parameters for nanostructures formation.

Keywords: Atomic Force Microscopy (AFM), Argon plasma, Micro-architecture, Ion–surface interaction, Surface roughness.

SIL – 1

Effect of carbon materials on the mechanical, thermal, and tribological properties of Silicone rubber Nanocomposites.

Sarath P. S[a,b], Jozef T Haponiuk[b], Prof. Sabu Thomas[c], and Soney C. George[a]

[a]Amal Jyothi College of Engineering, Kanjirappally, Kottayam, Kerala, India
[b]Department of Polymer Technology, Chemical Faculty, G. Narutowicza Str. 11/12, Gdansk University of Technology, 80-233 Gdansk, Poland.
[c]International and Inter University Centre for Nanoscience and Nanotechnology, Mahatma Gandhi University, Kottayam, Kerala, India.

Sarathps005@gmail.com

Abstract

Silicone rubber is an inorganic polymer that has been widely used in different areas such as seals, adhesives, medical, aviation, automobile, and aviation industries, etc. But their poor mechanical and conductive (thermal and electrical) properties limit their industrial application; To overcome these shortcomings, various fillers are used. Carbonaceous fillers (Graphite, Exfoliated graphite, Reduced graphene oxide, and functionalized graphene oxide) are adopted to reinforce silicone rubber to achieve desirable rubber-like properties. They were since polymer nanocomposites exhibit lightweight, high strength, thermal stability, anti-wear, and solvent resistance. Tribological properties and surface characteristics of silicone rubber /carbon materials composites were investigated as a function of applied load, sliding velocity (1–5 m/s), and temperature. Morphological analysis of the composites helps to understand the interfacial interaction between the filler and the rubber matrix and wear mechanism. An enhancement in the mechanical, tribological, and dielectric properties was observed with filler loading and better performance. The presence of carbonaceous material between the friction surfaces reduced the area contact between the material and hard metal surface by forming lubricant film. Some of the reports on combining carbonaceous fillers in silicone rubber nanocomposites for improving mechanical, thermal, and tribological properties will be detailed in the presentation.

SIL – 2

Studies on Bioactivity of Folic Acid Template Bioglass Nanoparticles for Bone Regeneration

Divya Goel and Deenan Santhiya

Delhi Technological University

goel.divya17@gmail.com

A change in outlook from tissue substitute to tissue regeneration is the need of great importance. The extraordinary bone alternative biocompatible bio-resources like bioactive glass substances are acknowledged for their inborn bone recovery capacity through disintegration of particles into the organic liquid. It is typically assessed through in-vitro assessment by means of inundation in SBF and subsequent hydroxy-carbonate-apatite arrangement, a biological part of the bone. Folic acid templated bioactive glass nanoparticles produced by bioinspired method were synthesized and characterized. The characteristic changes before and after soaking in simulated body fluid (SBF) for In Vitro bioactivity evaluation was observed. After immersing in SBF for different intervals of time i.e. 2, 7 and 15 days, dipped samples were examined for the formation of hydroxyapatite on their surface. The XRD pattern for SBF soaked samples reveals the shift from amorphous to crystalline phase with increase in interaction time of the FABG sample surface and SBF was in accordance with literature. When compared to simple bioactive glass particles, better bioactivity was attained in folic acid templated bioactive glass nanoparticles through formation of hydroxyapatite layer on the surface, which was confirmed through characterization techniques like X-Ray Diffraction (XRD), Scanning electron microscopy (SEM), and Fourier transform infrared (FTIR) analysis. Also, Porosity gives better bioactivity thusly higher cell multiplication in contrast with the non-permeable material. Moreover, ordered arrangement of pores further enhances the bioactivity of the material.

Keywords: - Bioactivity studies, Bioactive glass nanoparticles, Bone regeneration.

SIL – 3

Photocatalytic Degradation of Carcinogenic Benzo(A)Pyrene by Nanoceria – A Mechanistic Approach

Kavitha R[#], Revathy Rajagopal*

* Department of Chemistry, Stella Maris College (Autonomous), Chennai-600086.

[#]Research Scholar, Department of Chemistry, Stella Maris College (Autonomous), Chennai-600086& Faculty, Department of Chemistry, Madras Christian College (Autonomous), Chennai-600059.

Email: revathyrajagopal@stellamariscollege.edu.in

Benzo(a)pyrene (BaP), a group I carcinogen, is known to contaminate water, soil and environment through both natural and anthropogenic sources. Consequently, materials that are employed toeliminateBaP are in high demand.Nanoparticles have recently been employed in the elimination of numerous contaminants due to their high surface to volume ratio.Nano ceria is a very adaptable molecule with a wide range of applications due to its unique qualities such as huge surface area, strong catalytic activity, oxygen transfer ability, and outstanding redox activity at the nanoscale level.The current work aims to probe the mechanistic routes of Benzo(a)pyrene degradation undernormal sunlight light by sol-gel route synthesized nanoceria as photocatalyst. The degraded metabolites of BaP were extracted from the solution and analyzed by GCMS. The synthesised CeO_2were characterized using X-ray powder diffraction, SEM EDAX, FTIR, and diffused reflectancetechniques. The nanoceria degraded BaP solution revealed the presence of environmentally benign low-molecular weight compounds such as benzoic acid, O-Cresol, O-Xylene, β-Naphthol, Phthalic acid, Malealdehyde, Allyl alcohol, Cyclobutadienyl, Cyclopentadienyl cation, Diacetylene, DHP (Dihydro pyran) etc.Theexploration, lead to identifying about forty degradation metabolites of BaP.A complete pathway for the degradation was predicted using GCMS data. Thus, nanoceria was found to be an efficient photocatalyst in the degradation of BaP in visible light at RT and neutral pH.

Keywords: Nanoceria, Photocatalyst, BaP, DHP, GCMS, Environment-benign

SIL – 4

Tuning of the electrochemical properties of rGO electrodes by optimizing the binder concentration

Sreelakshmi Rajeevan [1,2], Sam John[3] and Soney George[1*]

[1]Center for Nanoscience and Technology, Amal Jyothi Engineering College, Koovapally P O, Kerala - 686518, India

[2]APJ Abdul Kalam Technological University, CET Campus, Thiruvananthapuram, Kerala - 695016, India

[3]St. Berchmans college, Changanassery, Kerala – 686101, India

*Email: soneygeo@gmail.com

Graphene is one of the most known conductive materials used in the fabrication of electrochemical devices. The retention of conductivity, porosity and specific surface area of graphene as such in the supercapacitor electrode is always been a great task due to the utilization of binder. Binders play a crucial role in the electrochemical performance of electrodes by providing compact arrangements to the electrodes. In this work, we tried to enhance the electrochemical properties of graphene electrodes by varying the concentration of polyvinylidene fluoride (PVDF). PVDF is one of the most known binders used in the fabrication of supercapacitor electrodes. The crystallinity of the PVDF/rGO electrodes was analysed using XRD. The electrochemical properties of PVDF/rGO electrodes were studied using cyclic voltammetry, galvanostatic charging-discharging test and electrochemical impedance spectroscopy. The result of the electrochemical studies showed that PVDF/rGO electrode with the lowest concentration of PVDF such as PvG2 possess high specific capacitance compared to other electrodes.

SIL – 5

Synthesis and photoluminescence analysis of terbium activated calcium tungstate Phosphor

Chinnumol Xavier[1], Sreelakshmi S[1], Aparna Thankappan[1] *, Dinu Alexander[2], Thomas Varughese[2]

[1]Post Graduate Department of Physics and Research Centre, Baselius College, Kottayam, Kerala, India 686001

[2]Nano Science Research Centre, Nirmala College, Muvattupuzha Kerala, India 686 661

Email: *aparnathankappan06@gmail.com

Deployment of luminescence material in optoelectronic applications purely depends on their luminescence properties and particle size distribution. In this paper we have focussed to synthesize and characterize terbium activated calcium tungstate phosphor nanocrystals by chemical co-precipitation method. We have analysed the size and luminescence behaviour by using X-ray powder diffraction, photoluminescence and Colorimetric analysis. The good UV excitability and luminescence recommend this material for optoelectronic device applications.

SIL – 6

Influence of an intercalated microstructure on the mechanical and dynamic mechanical properties of NBR/organoclay nanocomposites

Bhavya Bhadran

Research & Post Graduate Department of Chemistry, St. Thomas College, Pala, Kottayam, Kerala, India.

E-mail: bhvya001@gmail.com

The principal objective of the work is to explore the impact of intercalated microstructures on distinctive properties of Nitrile rubber/organoclay nanocomposites prepared by mill mixing. The cure characteristics of the compounds were analyzed. The temperature and frequency-dependent dynamic mechanical properties of the composites were also investigated. The microstructure of the composites was studied using XRD and TEM. Attempts were also done to compare the tensile properties of organoclay modified clay composites with unmodified clay composites.

Keywords: Nitrile rubber; Nanoclay; Intercalated structure

SIL – 7

Performance Analysis of Semiconductor Based Nanosensors

Divya R S

Department of Electronics,
Amal Jyothi College of Engineering, Kanjirapally-686518, Kerala, India
Email: rsdivya@amaljyothi.ac.in

As the part of automation sensors plays an important role in every field in terms of its sensitivity, reduced size, low cost, reliable operation, insitu analysis. To further improve its performance semiconductor based nano sensors have been developed in so many applications like health care monitoring systems,energy harvesting, automotive sensors for safety due to their stable electrical mechanical and optical properties.Wide variety of nanostructured materials have been developed to design nano sensorswhich includes carbon nanotubes, thin films, metal and metal oxide nanoparticles, polymer, and biomaterials. Therefore,Sensors with nanomaterials and nanocomposites are perfect candidates to replace conventional, heavy, and costly traditional sensing equipment. This paper focuses a comprehensive review on how the performance can be improved upon the application of different types of nanomaterialsand nanocomposites on semiconductor based nano sensors used for the sensing applications.

SIL – 8

Development of intelligent starch/chitin nanocomposite films by the immobilisation of Butterfly pea flower anthocyanin with improved thermal and mechanical properties

Siji Mary[1], Seno Jose[1], Laly A Pothan[2] and Rekha Rose Koshy[1]

[1]Bishop Moore College, Mavelikara
[2]Department of Chemistry, CMS College, Kottayam, Kerala, India
E-mail: lapothen@gmail.com, sijikmary2010@gmail.com

Novel pH sensitive, intelligent films were developed by immobilising the anthocyanin pigment present in the Butterfly Pea flower Extract (BPE) and addition of nanochitin (CHN) as the nanofiller in the starch (S) matrix to detect adulteration of fresh fish with formalin and ammonia. The films (S, S/BPE, S/CHN and S/BPE/CHN) were fabricated by the method of solution casting. The effect of anthocyanin present in the BPE and CHN was studied. The addition of CHN in a concentration of 10 weight % resulted in the enhancement of thermal and mechanical properties of pH indicator films. Owing to the presence of anthocyanin pigment the films could change its color to change in pH. The developed starch based intelligent films displayed wide color differences from bright red to green over the 1–12 pH range, which was clearly discriminated by the naked eye. Our results suggested that S/BPE/CHN films could be used as intelligent pH indicator films for the detection of formalin and ammonia in the fish sample.

Keywords: Thermoplastic Starch, Chitin Nano Whisker, Butterfly Pea Flower

OL-1

Synthesis and Characterization of green epoxy resin from Odal seed oil

Teena P. Varghese[a,c], Jayalatha Gopalakrishnan [a,b*]

[a]Department of Polymer Science & Rubber Technology, CUSAT, Kochi-22, India[b]Interuniversity Centre for Nanomaterials and Devices, CUSAT, Kochi-22, India [c]Department of Chemistry, St.Peter's College, Kolenchery

**Corresponding author: gjayalatha@gmail.com*

Abstract

Odal seed oil (OSO) is a potential source for the preparation of green-epoxy system. The oil has nearly 57 % of unsaturation which was epoxidized using *in situ* generated per acetic acid in presence of an acidic ion exchange resin as catalyst. The reaction was performed at 50 ^{o}C for different time periods. It was found that the iodine value decreased substantially for EOSO-8 to a value of 42 g/100g of oil compared to OSO (92.7 g/100g of oil) indicating the reductionin unsaturation. The oxirane value increased to 2.9 g/100g for a reaction time of 8 hours (EOSO-8). FTIR spectroscopy revealed the formation of epoxy rings. NMR studies confirmedthat a degree of epoxidation of around 45% was achieved for 8 hours of reaction (EOSO-8).

OL-2

Green Synthesis of Highly Fluorescent Carbon Dots from Vitex Negundo Leafextract and their White Light Emitting Diode Application

P. Varatharajan[a], M. Maruthupandi[b], I.B. Shameem Banu[a]*, and N. Vasimalai[b]*

[a] Department of Physics, B.S. Abdur Rahman Crescent Institute of Science & Technology, Vandalur,Chennai-600 048, India.

[b] Department of Chemistry, B.S. Abdur Rahman Crescent Institute of Science & Technology, Vandalur,Chennai-600 048, India.

*Corresponding Authors: shameembanu@crescent.education

vasimalai@crescent.education

Abstract

Carbon dots are highly fluorescent carbon nanoparticles. It has properties like water solubility biocompatibility, high quantum yield and low photobleaching. Because of their fascinating physical and chemical properties, it is extensively used in several fields including sensor, electronics, light emitting diode (LED), supercapacitor, bio-imaging, solar cell etc., Among several applications, carbon dots in LED application is novel today. Phosphorous, semiconductor quantum dots and organic dyes are used for fabricating White LED (WLED). But these materials are toxic and taking long synthesis time. But, carbon dots are the alternative promising material to replace other colour converting layer materials for fabricating WLEDs. These days, the synthesis of carbon dots from plants and wastematerials are received huge attention . The synthesized VN-CDs particles size was calculated to be 3.5 nm using HR-TEM image. The VN-CDs dots show excitation dependent fluorescence and it exhibits the emission maximum at 340 nm. The quantum yield (QY) of the green emissive VN-CDs was calculated to be 27%. The intensity ratio of I_D/I_G was calculated from the Raman spectrum; the obtained high-intensity ratio value revealed that the presence of surface defects in the surface of VN-CDs. Finally, VN-CDs was successfully applied for the preparation of WLED.

OL-3

Single-Step Synthesis of Copper Oxide Nanoparticles Using *Terminalia Arjuna* Bark Extract and their Antibacterial Application

G. Meenu Pragathi[1], K. Gopinath[2]*, C. Balalakshmi[1]*

[1] Research Scholar, Department of Nanoscience and Technology, Alagappa University, Karaikudi 630003, Tamil Nadu, India
[2]School of Materials and Energy, Southwest University, Chongqing, P.R. China 400715.
e-mail: samyasribala@gmail.com

Abstract

Nowadays, the single-step synthesis of nanoparticles has become keen attention to nanoscience and technology. The existing research explored easy, sturdy, inexpensive, and green techniques to synthesize NPs. The present work synthesized copper nanoparticles (CuO NPs) using *Terminalia arjuna* bark extract by the co-precipitation method. The synthesized as-prepared sample was calcined at 500 °C, and this calcined sample was characterized by UV-vis, FT-IR, XRD, Raman, and TEM analyses. UV-vis absorption peak observed at 311 nm and bandgap value at 3.11 eV. The FTIR spectrum of bark extract showed several active bands related to various phytocompounds, promoting the nucleation process. Synthesized CuO NPs spectrum shows bands at 611, 500 & 426 cm^{-1} corresponds to the Cu-O stretching vibration, which confirms the formation of CuO NPs. XRD result revealed the high crystallinity nature with a single-phase monoclinic crystalline structure.The Raman active peaks at 269, 311, and 595 $cm^{-1}$are related to the B^1_g and B^2_g modes and confirmed monoclinic phase.The TEM image of CuO NPs showed a rod shape with a length of 700 –1300 nm. The synthesized CuO NPs tested against Gram-negative (*Staphylococcus aureus*) and Gram-positive (*Escherichia coli*) bacterial strains. The antibacterial effect revealed an increase with the increase in the concentration of CuO NPs, and also depended on the size, shape, surface charge, stability, and aspect ratio. However, CuO NPs can be used for photothermal therapy, biomedical, antibacterial coating, paint, dye-sensitized solar cell fabrication.

OL-4

Green synthesis of palladium nanoparticles using *Zingiberzerumbet* rhizome extract and their biological application

K.X.Antu[1], K.Gopinath[2], A.Arumugam[1*]

[1] Department of Botany,Alagappa University, Karaikudi - 630 003. Tamil Nadu, India.

[2] School of Materials and Energy, Southwest University, Chongqing, P.R. China 400715.

e-mail: arumugama@alagappauniversity.ac.in

Abstract

Nanotechnology is an innovative technology in the field of science and engineering. It has multifaced with tiny particles constructed in the range of 1~ 100 nm and a high surface and volume ratio. Hence, it is used for various fields electrical, biological, catalyst, and so on. The current study, synthesis of palladium nanoparticles (Pd NPs) using *Zingiberzerumbet* rhizome extract. Synthesized Pd NPs characterized by UV-Vis, FTIR, XRD, and TEM analysis. The UV-Vis absorbance spectra revealed the peak at 282 nm, related to the surface plasmon resonance of Pd NPs. This peak gradually decreased with various time intervals during the reduction process, which confirmed the Pd NPs synthesis. The FTIR results revealed that the rhizome extract spectrum showed several active functional groups. Synthesized Pd NPs spectrum somewhat shifted the functional groups, which related to confirming the reduction process. XRD data showed high crystalline nature with a face-centered cubic structure of synthesized Pd NPs. The topology analysis of TEM images revealed the spherical shape and in between the size from 8-25 nm. Synthesized Pd NPs tested against Gram-positive and Gram-negative bacterial strains. The excellent antibacterial activity showed on Gram-negative bacteria, as compared to Gram-positive bacteria. The cytotoxicity and *in vitro* toxicity experiments were conducted on mitotic cell division test and in vitro toxicity trials against the aquatic crustacean of *Artemianauplii*. Obtained results that Pd NPs promote the chromosomal aberrations and arrest the mitotic cell division. Parallelly, 25~75% mortality showed at *A. nauplii*. This toxicity is determined that the dependent on the concentration and size of the NPs.Forthcoming days,synthesized Pd NPs can be used for catalysis, biomedical, polymer coating, and bioimplant materials.

OL-5

Production and optimization of biodiesel from fish oil and cashew nut shell oil

STEFFI JOSEPH

ABSTRACT

In recent years the interest on biodiesel as an alternative source of petroleumbased fuel is increasing rapidly. Because it is renewable, biodegradable, nontoxic and can solve the energy related problems, mainly reducing the emission of gases which leads to global warming. In the present work, a new and environment friendly process was studied for the production and optimization of biodiesel from fish oil and cashew nut shell oil. Biodiesel is produced through transesterification process between oil and alcohol to form esters and glycerol .The oil is extracted from fish waste using water as the solvent and cashew nut shell oil is obtained by pyrolysis followed by saponification to remove free fatty acids The transesterification was carried out by using methanol and potassium hydroxide as catalyst to convert fat to biodiesel .Optimization of biodiesel is done by changing the various parameters such as methanol : oil ratio ,temperature and catalyst concentration. For cashew nut shell oil we get maximum yield when the methanol: oil ratio is 8:05 at a temperature of 70ºC with a catalyst concentration of 35gm. For fish oil we get maximum yield when the methanol :oil ratio is 8:05 at a temperature of 70ºC.

OL-6

Synthesis and Characterizaiton of Calcium Hexaferrite Synthesized In Presence of Azadirachta Indica and Murrayakoenigi Leaves Extract

ChetnaChauhan[1], RajshreeJotania[2], AbhishekGor[3], and TanujGupta[1]

[1] Nirma University, India

[2]Gujarat University, Ahmedabad

[3]Pandit Deendayal Energy University

chetna.chauhan@nirmauni.ac.in

Abstract

M- type calcium hexaferrite has been prepared in presence of Azadirachta indica (Neem), and Murrayakoenigii (Curry) leaves extracts. Photochemical screening of the leaf extracts showed the presence of carbohydrates, lavonoids, glycosides, phenolic compounds, saponins, tannins, proteins and amino acids. FT-IR analysis confirmed the formation of calcium hexaferrite particles. XRD analysis revealed the formation of hexagonal phase of the synthesized particles. Scanning Electron Microscopy was used to observe surface morphology and shape of the nano particles. Magnetic properties were studied at room temperature using vibrating sample magnetometer. Dielectric measurements were carried out at room temperature in the frequency range 20 KHz to 2 MHz.

OL-7

Microwave Assisted Synthesis of Cobalt Oxide Nanoparticles for Effective Adsorptive Coupled Photocatalytic Degradation of Methylene Blue

Gauri Bandal[1], Varuna Watwe[1], Preeti Kulkarni[1]

1 MES AbsahebGarware College

gak.agc@mespune.in

Abstract

The increase in production of synthetic dyes has led to increase in dye concentration from industrial effluents. There are various methods available in literature for adsorption and degradation of synthetic dyes from wastewater. Nevertheless, pollution of water bodies due to dyes is tenacious, because available methods suffer limitations like a high capital requirement, toxic secondary sludge generation, low efficiency, complex procedures and difficulty in scale-up at industrial scale. Transition metal nanoparticles have been found to be one of the promising photo-catalysts for dye degradation. However, the synthesis procedures are complex and time consuming. In the present work, we propose a uncomplicated home microwave assisted synthesis of cobalt oxide nanoparticles using sodium dodecyl sulfate as surfactant. The synthesized nanoparticles were employed for Methylene blue dye adsorption followed by its degradation in photo-reactor using UV radiation. The batch parameters like pH, weight of nanoparticles, equilibration time, and concentration of dye in solution were optimized. From present work it can be concluded that cobalt oxide nanoparticles synthesized using home microwave can be effectively employed for degradation of Methylene blue dye from wastewater.

OL-8

Investigation of Electrical Conductivity of Fe-V2O5-CdO-ZnO Glass Nanocomposites

Ajit Mondal[1] a) , Anwesha Sengupta[2] , Amit Mallik[3] b) , Debasish Roy[4] , Gautam Kumar Panda[5] and Sanjib Bhattacharya[6]

1Department of Automobile Engineering, Raiganj Polytechnic, Uttar Dinajpur- 733134, West Bengal, India

2Department of Electrical Engineering, MAKAUT, Kolkata-700064, West Bengal, India

3Department of Chemistry, Acharya Jagadish Chandra Bose College, Kolkata-700020, West Bengal, India

4Department of Mechanical Engineering, Jadavpur University, Kolkata-700032, West Bengal, India 5Department of Electrical Engineering, Jalpaiguri Govt. Engg. College, Jalpaiguri-735102, West Bengal, India

6Department of Physics, University of North Bengal, Darjeeling-734013, West Bengal, India

Corresponding Author: a) mondalajit830@gmail.com b) amit.mallik2007@gmail.com c) ddirhrdc@nbu.ac.in

Abstract:

An iron doped glass nanocomposites with the composition of xFe-(1-x)(0.5V2O5-0.4Cdo0.1ZnO) (x= 0.0 and 0.05) was prepared by melt-quenching method to explore the inherent Electrical Conductivity properties. Two glasses were characterized by X-ray diffraction (XRD) and electrical conductivity (AC and DC Connectivity). The analysis of XRD result indicated that various crystal phases i.e. ZnV2O7, CdV2O6, Fe3O4, ZnO and CdO are present in the both the glass. It was also found that the higher activation energy in prepared glass (where x = 0.05). Keywords: Metal matrix nanocomposites, DC Conductivity, Electrical properties

OL-9

An Overview of Biodegradable Hybrid Nanomaterial for Engineering and Industrial Application with Recent Advances

Dattatraya Kshisagar[1], Dr. M A Venkatesh[1]

1 Amrutvahini College of Engineering, Sangmner , Dist - Ahemadnagar , Maharashtra (India)
dattatrayakshirsagar07@gmail.com

Abstract

Hybrid Nanofluid, as a top class cooling fluid, is a colloidal suspension, which enhances the heat transfer, but its stabilization with durability are major of concern for the industrial applications. The aim of this overview is to study recent advances in engineering and industrial application. In this study to present the new class hybrid nano materials using the synthesis of hybrid nanomaterials, preparation hybrid nanomaterials, Factors affecting the performance of hybrid Nanofluid with Potential applications of hybrid Nanofluid to increasing the performances of with their respective application.

OL-10

Synergistic Effect of Natural Hybrid Fillers on the Properties of Poly (Vinyl Alcohol)

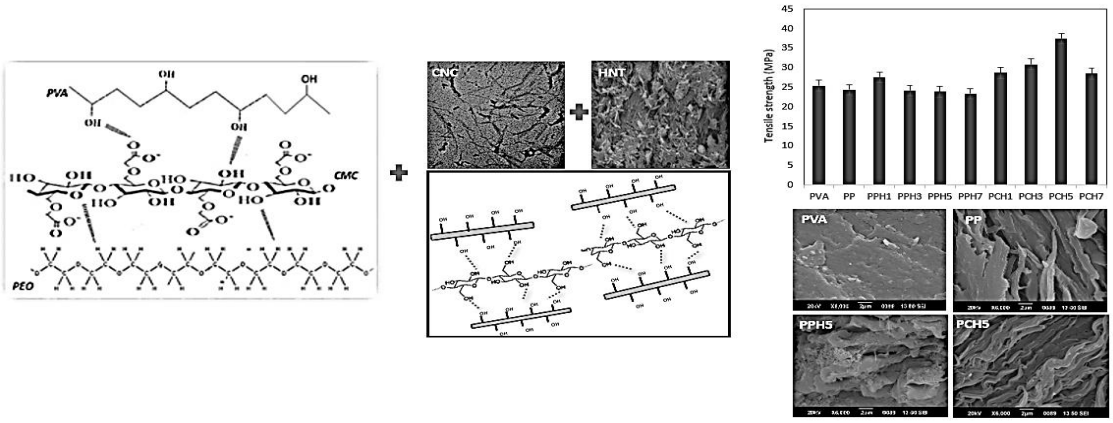
Jija Thomas[1], Ranimol stephen[2]

[1]Research & Post Graduate Department of Chemistry, St Mary's College, Sulthan Bathery, Wayanad, Kerala, India, jija46@gmail.com

[2]Department of Chemistry, St. Joseph's College (Autonomous) Devagiri, Calicut, Kerala, India, ranistephen@gmail.com

Abstract

Nanoparticles with large surface area and high surface reactivity are excellent fillers to enhance functional properties of polymers. Both halloysite nanotubes(HNT) and cellulose nanocrystals (CNC) are such ecofriendly and environmentally benign materials. In this work Cellulose nanocrystals were extracted from pistachio nut shells with 84% crystallinity via acid hydrolysis and characterized with FTIR, XRD, DLS and TEM.Poly vinyl alcohol (PVA)/poly ethylene oxide (PEO) blend nanocomposites were prepared with carboxy methyl cellulose (CMC) as compatibilizer. HNT alone and HNT-CNC hybrid system were used as filler in varying proportions. Films were characterized andinvestigated for their mechanical and barrier properties. Presence of hybrid filler showed remarkable improvement in tensile strength and water barrier properties due the specific interactions occurring between HNT and CNC via their surface hydroxyl groups. Tensile strength was improved to a maximum of 54 % in nanocomposite with 5% HNT-CNC while elongation at break reduced by 17 % for the same. Swelling percentage also reduced by 66 % compared to the blend. Synergic effect of HNT-CNC filler resulted in improved dispersion and better interaction in the matrix leading to better material properties.



OL-11

Quantification of the Binding Interaction between Chitosan and MPA-Cdse Qds for the Development of Biocompatible Theranostic Nanoprobe: An Electrochemical Approach

Jagriti Gupta[1], Jaydeep Bhattacharya[2], Paulraj Rajmani[1]

[1]School of Environmental Sciences, Jawaharlal Nehru University, New Delhi 110067, India

[2]School of Biotechnology, Jawaharlal Nehru University, New Delhi, India – 110067, India

Abstract

Quantum Dots (QDs) with distinct properties have been used in several applications such as bioimaging, drug delivery, biosensing, etc. Still, Cd-based QDs have some drawbacks due to nano-based toxicity. Biopolymeric coating or encapsulation of QDs in biopolymers for designing more biocompatible nanoprobes with biological significance is of great interest. However, the strength and stability of the biopolymeric layer that provides surface protection for the QDs by making a stable interface between QDs and biological entities depend on the binding parameters of biopolymer and QDs. This work focused on studying the interaction of the most abundant biocompatible biopolymer chitosan with water-soluble MPA-CdSe QDs synthesized by hot injection using cyclic voltammetry. Physical characterization of MPA-CdSe QDs was done by UV-visible absorption spectroscopy, fluorescence spectroscopy, TEM, dynamic light scattering (DLS), zeta-potential techniques, and FTIR. The binding parameters, such as the number of binding sites and the binding constant were calculated by cyclic voltammogram. The result was further verified with UV-Vis spectroscopy, fluorescence spectroscopy, FTIR, Zeta, and TEM. To further assess the comparative cytotoxicity of coated and non-coated ones, an MTT assay was performed on an adenocarcinoma human alveolar basal epithelial cell line (A549), and Chinese hamster cell line (V79). Confocal microscopy has been used to explore the property of chitosan-coated MPA-CdSe QDs as a bioimaging agent.

OL-12

Some Mechanical Studies on Poly-Tetra-Fluoro-Ethylene (PTFE) Filled Compound

Bhagwan F. Jogi[1], Vishal Y. Bhise[2], Yogesh S. Patil[3]

Professor [1], PhD Research Scholar[2], M.Tech Student[3]

Department of Mechanical Engineering, Dr. Babasaheb Ambedkar Technological University, Lonere-402103 Raigad, Maharashtra, India

bfjogi@dbatu.ac.in

Abstract

Poly-tetra-fluoro-ethylene (PTFE) has excellent properties and various applications if engineered with suitable fillers like Ceramer, Alumina, Zirconia, Carbon fibre, Glass fibre, Wollastonite, SiO_2, etc. PTFE depicts improvement in its mechanical, electrical and thermal properties in presence of fillers. The mechanical properties of PTFE get deteriorated especially at high temperatures condition above 200°C. Therefore, the properties were enhanced by addition of fillers to PTFE compounds. Further, it is observed that the increase in filler content tends to decrease the tensile strength of PTFE and increases the molecular weight reduction with increased temperature. Further, the creep test had indicated that some of the fillers have very positive impact on increased resistance to compressive creep. It was also observed that addition of PEEK, zirconia and silica improves the dimensional stability at higher temperatures. In this work, it is planned to study the hardness, elongation, tensile strength, and specific gravity to evaluate the mechanical properties of filled polymer. Further, dimensional stability, thermal instability index and deformation under load or creep at 300^0 C temperatures has been carried out to investigate the behavior of PTFE under high temperature application.

OL-13

Heterogeneous Fenton Catalyst for Removal of Malachite Green

Sandra Ann Jacob, Sneha Rapheal, Emilin James, Anesa George, Nikhi Maria Raju - nikhimariaraju@amaljyothi.ac.in Department of Chemical Engineering, Amal Jyothi College of Engineering, Kanjirapally-686518, Kerala, India

ABSTRACT

This work deals with the preparation of a Heterogeneous Fenton catalyst supported on Cocoa Shell Powder for the treatment of dye waste water. Heterogeneous Fenton reaction uses hydroxyl radical for the destruction of organic pollutants in waste water. Due to their strong adsorption capacity and easy separation, the catalyst is efficient in removing organic pollutants such as dyes from waste water. As Fenton process is a subclass of advanced oxidation process, the efficiency can be increased with the help of a support which in this case is Cocoa Shell Powder. This project work deals with the preparation of a Heterogeneous Fenton's catalyst supported on cocoa shell for treatment of waste water. The raw material is dried and ground into fine powder and it is then treated with ferrous sulphate solution to load the iron particles on to the catalyst support via sonication process. Finally, it is centrifuged, filtered and dried in a hot air oven. The catalyst is now used to treat the dye solution. More than 70% of the dye decolourisation was obtained within an hour with normal pH and room temperature. This catalyst is eco-friendly and hence it is used in the secondary treatment of waste water.

OL-14

A PROCESS OF USING PHOCATALYTIC REACTORS TO REMOVE PHARMACEUTICAL COMPOUNDS FROM WASTEWATER

Alphonsa Thomas [a] and V. Kavitha [b]

a Department of Basic Sciences and Humanities, Rajagiri School of Engineering & Technology, Kochi –India.

b Department of Chemistry, Sathyabama Institute of Science & Technology, Chennai – India.

Abstract

The Pharmaceuticals and Personal Care Products and Pharmaceutically active compound in wastewater are complex to take away from the wastewater. This research paper tries to highlights on evaluating and implementing the process of pharmaceutically active compounds with the help of TiO2-P25, graphitic carbon nitride SrTiO3/g-C3N4 (20% g-C3N4, 20CNSTO), photocatalytic materials, a heterojunction of perovskite sodium titanate, wastewater pollutants and graphitic carbon nitride (g-C3N4), by solar irradiation. This paper was finished by gathering wastewater from the residents of Yamuna Vihar located in Northeast Delhi for WWT and some medical related industries. The samples which are collected was observed by a extraction process and proceeded along with liquid HRMS [High-Resolution Mass Spectrometry]. When the gathered samples are identified to be a high concentration of CN and TiO2. These samples are degraded for 1 hour and 30 minutes. During the process, the parameter affects degradation of photocatalytic was the ph acid in water. This efficiency was affected almost by the pH value. Keywords: : Pharmaceuticals and Personal Care Products, Pharmaceutically active compound, WWT, catalyst, degradation, composites.

OL-15

Nano-silica coated flax fabric/Phenol-formaldehyde hybrid composites – mechanical, thermal, water sorption and morphological behaviour

Lakshmipriya Ravindran[a,b], Sreekala M. S[b], S. Anilkumar[a], SabuThomas[c]

[a]Postgraduate & Research Department of Chemistry, N.S.S Hindu College, Changanacherry, Kerala, India - 686102
[b]Postgraduate & Research Department of Chemistry, Sree Sankara College, Kalady, Kerala, India – 683574
[c]School of Chemical Sciences, Mahatma Gandhi University, Priyadarshini Hills P.O, Kottayam, Kerala, India-686560

*Correspondence to [email address]- sreekalams@yahoo.co.in

Abstract

Bio- composite materials have several benefits, in addition to the use of renewables, including minimal impact on the environment, light weight and biodegradability. Here we have isolated nanosilica from rice husk and fabricated woven flax fabric coated with nanosilica-phenol formaldehyde composite with different varying weight percentages of nanosilica. The extraction of nanosilica was confirmed from XRD, TGA and FESEM. Five types of composites (0 wt%, 0.2 wt%, 0.4 wt%, 0.6 wt%, 0.8 wt% nanosilica) prepared keeping constant weight of PF resin and flax fabric. Mechanical, thermal, morphological and water diffusion behaviour of the prepared composites were examined. From the obtained results, tensile strength was obtained maximum for 0.2 wt% nanosilica loading. The FESEM pictures of fracture surfaces demonstrated that the inclusion of nanosilica boosted fibre's interfacial strength, strengthened both fibre and matrix, and improved resin adhesion to fibre, therefore enhancing the composite tensile characteristics. Moreover, the thermal stability and maximum degradation temperature boosted by the addition of nanosilica.. The incorporation of nanosilica leads to decrement in water sorption behaviour. The sorption of 0.4 wt% nanosilica was found to be the lowest. When the three coefficients (Diffusion, Sorption, and Permeation) of PF-flax fabric composites were calculated, it was discovered that they were all lowering when compared to the same composites without nanosilica.

OL-16

Graphene Oxide-Cellulose Nanocomposite Membranes with Improved Permeation Properties

Sethu Lakshmi M.B[1], Anilkumar. S[2]

[1,2]N.S.S Hindu College, Changanacherry

Sethulakshmi86@gmail.com

Abstract

Graphene oxides are increasingly being used as a reinforcing phase in polymer systems and there use is a growing area of importance in nanocomposite membrane research. This work deals with the development of cellulose nanocomposite, where in the graphene oxide is incorporated with ethyl cellulose. The morphology of the membrane is studied with SEM, IR and XRD. Surface wettability is analyzed using contact angle measurements. The organic permeation studies demonstrated the potential of the membranes in separation process.

OL-17

MICROWAVE ASSISTED SYNTHESIS AND CHARACTERIZATION OF CARBON DOTS FROM UREA AND GLYCEROL

B Philip Greeshma[a] , K Abha[a] *

Department of Chemistry, Bishop Moore College, Mavelikara-690110, Kerala, India

Now a days, Carbon dots are receiving huge attention in the fields such as health sectors, biomedical, optics, robotics, space industries, electronics and so on due to its low toxicity, chemical inertness, tunable fluorescence, biocompatibility and various physio-chemical properties. In this work, we have successfully synthesized carbon dots based on urea and glycerol (GU-CDs) by a microwave assisted method. The optical and structural properties of the synthesized carbon dots were investigated by UV-Visible spectroscopy, Photoluminescence spectroscopy, Transmission electron microscopy and Dynamic Light Scattering (DLS) method. The antimicrobial study was done through the method of Diffusion Assay. From the UV-Visible spectra, two absorption peaks centered at around 330nm and 400nm, which were ascribed to the π-π * transition of C=N and the n-π * transition of C=O respectively was observed. The optical band gap was also calculated from the Tauc's plot extrapolation and it was found to be 4.46 eV (insulator). From the photoluminescence spectra, it was clear that a significant green emission band at around 520nm was obtained which was attributed by the conjugated sp2 domains in the CDs. Particle size of the GU-CDs was obtained from TEM analysis and it was found to be less than 10nm. From DLS measurements of GU-CDs, the hydrodynamic diameter value of 36nm was obtained which indicates the aggregation of GU-CDs in water. The zeta potential value of -48 mV suggests the surface negative charge of GU-CDs. From the antimicrobial studies it was clear that the synthesized GU-CDs exhibits no significant antimicrobial activity. In this work, an ecofriendly method was adopted for the synthesis of optically stable GU-CDs that shows a green emission band at around 520nm, which can be effectively tuned and utilized for various molecular sensing and imaging applications.

OL-18

A review on recent studies of carbon dots from natural sources

Aleena Ann Mathew* and Soney C George

Centre for Nanoscience and Nanotechnology, Amal Jyothi College of Engineering, Kanjirappally, Kottayam

Carbon dots (CDs) are rising stars of the nanomaterial world, and they possess many fascinating properties. Nowadays, numerous explorations are synthesizing CDs from natural precursors due to their renewability, excellent biocompatibility, and environmentally friendly synthesis. Carbon dots have become a potential material in drug delivery, biosensing, photocatalysis, and bioimaging because of their low toxicity and high biocompatibility. This review discusses the latest advancements in the field of CDs, with a focus on natural precursors.

OL-19

Effect of Cage Structured Polyhedral Oligomericsilsesquioxane on the Permeation Properties and Stability of Poly (Vinyl Alcohol)-Poly (Ethylene Oxide) Blend Membranes

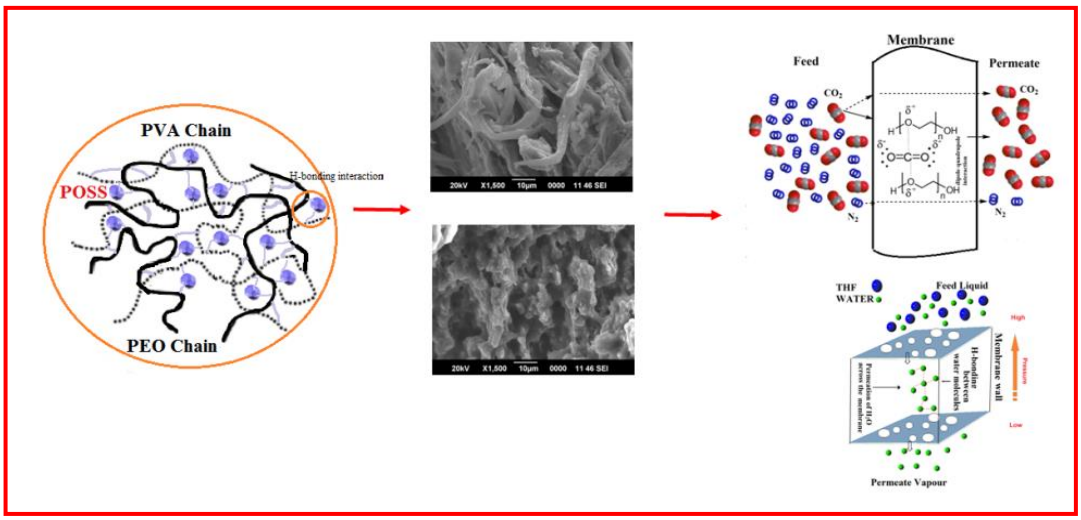
Swapna V.P, Ranimol Stephen*

Research & Post Graduate Department of Chemistry, St. Joseph's College (Autonomous), Devagiri, Calicut, Kerala- 673 008, India

E-mail: vpswapna@gmail.com,ranistephen@gmail.com

Abstract

Mechanically stable novel POSS embedded poly(vinyl alcohol) (PVA)/poly(ethylene oxide)(PEO) blend membranes were prepared by solution blending followed by casting.Addition of carboxy methyl cellulose (CMC) enhanced the interfacial activities of PVA and PEO blends. This chapter deals with the characterisation, mechanical and separation properties of PVA-PEO/POSS membranes. As compared to PVA membrane, PEG-POSS and Octa-TMA-POSS embedded PVA-PEO membranes exhibit 678 and 579% enhancement in Young's modulus as well as 134 and 137% improvement in tensile strength respectively. The presence of ethylene oxide tail on POSS as well as PEO in the blend membrane enhances the CO_2 affinity of the membrane. The presence of hydrophilic functional group on the POSS improves the hydrophilicity of the membrane and produces more binding sites for water molecule in the membrane during the pervaporation separation of THF-water azeotropic mixture.



OL-20

Fabrication and Characterization of chitin nanowhisker reinforced soy protein biodegradable films and aerogels

Rekha Rose Koshy[a],b, Siji K. Marya,[b], Arunima Reghunathan[c] , Seno Jose[d] , Laly A. Pothenb[,e]

[a]Department of Chemistry, Bishop Moore College, Mavelikara-690101, University of Kerala, Kerala, India
[b]Department of Chemistry, CMS College, MG University, Kottayam- 686001, Kerala, India
[c] School of Energy Materials, Mahatma Gandhi University Kottayam, India.
[d]Department of Chemistry, Government College, Kottayam-686013, MG University, Kerala, India
[e] International and Interuniversity Centre for Nanoscience and Nanotechnology, Mahatma Gandhi University Kottayam, India.
Corresponding author email: rekhakoshy2@gmail.com

Abstract

In this work, highly crystalline chitin nanowhisker (CNW) extracted from prawn shell was used as a reinforcing filler in soy protein isolate (SPI) matrix to produce SPI-CNW bionanocomposite films and aerogels. CNW was prepared using steam explosion technique and the authors have patented this work (IN 329388). TEM analysis of CNW showed needle-like morphology with lateral diameters in the range of 10−50 nm. Crystallinity of the prepared CNW was higher than chitin. The CNW displayed strong antibacterial activity against S. aureus, E. coli and P. aeruginosa with ›10mm in diameter of inhibition zone. The extracted CNW was used to prepare biodegradable film with SPI using solution-casting technique and aerogel using freeze drying technique. The prepared nanocomposite film had high mechanical, barrier and thermal properties suitable for packaging applications. The prepared nanocomposite aerogels had highly porous structure and was biocompatibility suitable for biomedical applications.

OL-21

Enriched performance of OLEDs based on hybrid organic-inorganic nanocomposites: A review

R. Kandulna3 *, Rimpi1 , U. Das1 , B. Kachhap2 , N. Singh3 1Department of Physics YBN University, Ranchi 2 University Department of Botany, Ranchi University, Ranchi. 3 University Department of Physics, DSPM University, Ranchi.

*Corresponding author e-mail: rohitkandulna4@gmail.com

ABSTRACT

This paper summarizes recent considerable progress in the several types of polymerbased hybrid nanocomposites, as well as a better understanding of the fundamental principles that govern their optical, electrical, and magnetic properties. Polymer hybrid nanocomposite is created by combining nanoparticles with a conjugate polymer matrix, and this nanocomposite is employed as an active emissive layer between the structures of optoelectronic devices such as OLEDs and OPVs. The PPV (Poly p-phenylene vinylene) with various inorganic fillers materials exhibits outstanding electrical, electrochemical and optical properties, making them attractive for use in OLEDs as different layers. The present communication presents the brief review of OLEDs and its fabrication via various hybrid polymeric nanocomposites. The comparative plots for optical and electrical properties of PPV with various inorganic fillers reflects the better performance of OLEDs.

OL-22

A REVIEW ON PEROVSKITE SOLAR CELL TECHNOLOGY

Dana Jose1 ,Aparna Thankappan2*and Sabu Thomas3

1 St.George's College, Aruvithura

2 Baselius College, Kottayam,

3 Mahatma Gandhi University, Kottayam

*aparnathankappan06@gmail.com

Introduction

An ever increasing energy demand, diminishing energy resources like petroleum products and the deteriorations caused to the environment due to the widespread use of such fossil fuels has made us to think about alternative solutions that are both sustainable and environment friendly. The solar photovoltaic technology is the most promising among the different renewable energy technologies that has emerged out of this necessity due to the unlimited availability of the energy source and its comparatively nonpolluting nature. Solar cells have evolved through different generations since the introduction of the first practical silicon solar cell in 1954 , each characterized by its efficiency, applicability and cost effectiveness. Perovskite solar cells(PSC) belong to the third generation emerging photovoltaic technologies with its efficiency recording a steep increase from below 5% in 2009 to almost 26% in 2020. This is thought to be the most efficient in terms of both cost and power conversion. But what hinders its commercial applicability is its low operational stability and many current researches focus on increasing the life time of perovskite solar cells. This review gives an idea about the importance and applicability of solar photovoltaic technology and stresses on the development of the emerging Perovskite solar cells. The stability and life time issues of PSCs that are to be overcome is presented. The different types of degradation mechanisms which are the root causes of instability are discussed. PSC encapsulation is suggested as a possible solution towards achieving a stable, efficient and affordable solar PV technology.

OL-23

Self-Assembled Pattern Formation of 2D Transition Metal Chalcogenide System of Cu8HQ in the Agar Gel

Kiran D. Takalea and Sunil D. Kulkarnia*

[a]Department of Chemistry, Postgraduate and Research Center, Sir Parashurambhau College, Pune, India 411 030

Abstract:

Self-assembled chemical systems obtained via reaction diffusion (RD) framework have obvious advantages over corresponding solution phase synthesis owing to better control over the size and the shape of the materials. The Liesegang rings are one such RD systems. Although large number of inorganic precipitates form the rings, such studies pertaining to pure organic and metalorganic systems are limited. In the present study, we have employed CuSO4.5H2O and 8- Hydroxyquinoline (8HQ) as outer and inner electrolyte reactants with varying concentration and agar gel as a diffusing medium to obtain the Liesegang patterns of Cu-8HQ. The shapes and the sizes of the particles in the pattern observed through an optical microscope were found to be the function of the reactant concentrations. The image analysis showed that the macroscopic rings were actually the aggregation of the particles1. The macroscopic aggregation was having a butterfly-like shape. The particle size in the inner rings was the smallest which increases successively as one moves to outer rings. The powder XRD patterns showed the sharp peaks indicating the formation of crystalline phase in the gel, however further analysis of the XRD spectrum is being carried out. The SEM images of the particles revealed the formation 2D material of Cu-8HQ, a transition metal chalcogenide. It was observed that every particle to be composed of three layers with the length ranging from a few nm to few microns. The breadth of the 2D material was approximately 10 nm indicating average thickness of each layer in the range of 3-4 nm.

OL-24

Characterization and *in-vitro* investigation of Tridax and Turmeric Blended PVA/ PEG Thin Film

C. Balaji Ayyanar[1], K. Marimuthu[2], B. Gayathri [3], A.V. Dinendra[4*], S.P. Hari[5], A.D. Dharanidharan[6], Arvind Anburathnam[7]

[1,2,4,5,6,7] Department of Mechanical Engineering, Coimbatore Institute of Technology

[3]Department of Chemistry, Coimbatore Institute of Technology

Coimbatore – 641 014, Tamil Nadu, India.

dinendra731@gmail.com

Abstract

Tridax (TP) liquid extracts and Turmericblended Polyvinylalcohol (PVA) – Polyethylene Glycol (PEG) membrane was developed through the synthesis process and carried out characterization study. A morphology and EDX study were conducted and revealed the presence of TP and other different elements ofPVA- PEG -TPmembrane through FESEM. A different functional group present in the membrane was carried out through the FTIR spectrum. XRD analysis was carried out and found the degree of crystallinity and crystalline size. DSC and TGA analysis were carried out and found the melting point and degradation of the membrane. An *in-vitro* wound healing study was carried out and found that wound healing was achieved up to the maximum level. It would be used for wound-dressing in biomedical applications.

Keywords: TP,PVA,PEG, Morphology, EDX, FESEM, FTIR, XRD, DSC, TGA, in-vitro

OL-25

Synthesis of Lead-Free Cs4CuBi2Br12 Layered Double Perovskite Nanocrystals by Hot Injection Method

Vidhya C[1], Dr. Sajith Kurian[1]

1 Mar Ivanios College Thiruvananthapuram

vidhyacbose@gmail.com

Abstract

Lead halide perovskite nanocrystals captured the attention of the scientific community because of their unique optoelectronic properties. But the toxicity of lead and intrinsic instability are the prime concerns preventing their commercialization. Lead-free perovskites and their analogs have been intensively studied as a class of next-generation optoelectronic materials. Recently,various studies show that Pb2+ cations can be substituted by a combination of divalent (Cu,Mn) and trivalent (Bi, Sb, Ln) cations to form a layered double perovskite structure with superior optoelectronic properties. Herein, we report for the first time, the Synthesis of a novel, lead-free, non-toxic Cs4CuBi2Br12 perovskite nanocrystals (NCs) by hot injection method. The prepared samples are characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), transition electron microscopy (TEM), and ultraviolet-visible spectroscopy (UV-Vis) techniques to confirm the formation of Cs4CuBi2Br12 perovskite NCs. The resulting Cs4CuBi2Br12 NCs show layered double perovskite structure which exhibits exfoliation and good stability. This study offers new environmentally friendly layered double perovskite NCs for various applications.

OL-26

PVA Nanocomposite Hydrogel for Highly Efficient Solar Driven Water

Evaporation and Desalination

Meera B

Mar IvaniosCollege , Thiruvananthapuram, Kerala

MeeraBmeerajeevan123@gmail.com

Abstract

In recent years solar driven water evaporation is a promising method for large scale water purification. Here we report the use of PVA based composite hydrogel as a photothermal material capable of generating vapour at a high rate of 6.5 kg/m-2/h-1 under one sun irradiation which is significantly higher than previously reported values. In this study, we have narrowed the capillary channel size of hydrogel to facilitate the transport of water over long distances. The capillary channels sustain an adequate water supply for continuous solar vapor generation at a high rate.

OL-27

RECENT PROGRESS IN METAL OXIDE/CARBON NANOSTRUCTURE-BASED COMPOSITE FOR SIBS

Mathu Devaraj1 * and Ajesh K Zachariah1 1Mar Thoma College, Tiruvalla, Kerala,

India Corresponding Author: ajeshkzachariah@gmail.com

Abstract

Lithium-ion batteries (LIBs) are widely used in rechargeable batteries of cell phones, tablets, laptop, digital cameras and even electric cars. But Lithium resources are limited and mineable lithium last for 65 years according to the present consumption level. Sodium-ion batteries (SIBs) are suitable alternative to LIBs. Sodium and Lithium included in the alkali-metal group of periodic table and also have similar chemical and physical properties. Sodium is the sixth abundant element, constitute 2.6 percent of earth crust (reserves of Lithium only 0.006%). Due to its wide availability, Sodium precursors relatively low cost. The ionic radius of Sodium ion (0.102 nm) is large compared to Lithium (0.76 nm), which leads to low diffusion efficiency and high-volume change during charge/discharge process. Recently, serious research work has been going on to elucidate Sodium storage mechanism in different anode materials. Different kinds of anode materials for SIBs are carbonaceous, alloy materials, organic materials and metal compounds. Develop anode material with good performance, durability, cost-effective and eco-friendly is an attractive and fascinating strategy. This review provides recent advances in metal oxide and carbon nanostructure based composite anode materials for SIBs

OL-28

Spatio-temporal Characterization of Self Assembled Periodically Precipitating Ferrous Hydroxide in Agar Gel

Prasad C. Walimbe[a] and Sunil D. Kulkarni*

[a]Post-graduate and Research Center, Department of Chemistry, Sir Parashurambhau College, Pune, India 411 030

Periodically precipitating sparingly soluble salts in a hydrogel via reaction diffusion (RD) are called the Liesegang bands. The patterns are spectacular, widely studied (experimentally and theoretically) over a century but the mechanism of formation remains implicit1. Recently literature in the RD framework implicates it as a novel and green method for the synthesis of monodispersed nano and microparticles[2] . In the present work, NH_4OH and $FeSO_4$ were employed as the outer and inner electrolytes with agar gel as a diffusing medium to obtain the Liesegang patterns of Fe $(OH)^2$ under the RD framework. The concentrations of outer and inner electrolytes along with the agar gel were optimized to obtain well-distinguished Liesegang patterns in a 1D setup (figure 1). The morphological characterization was done using the pattern images in ImageJ whereas the spatio-temporal characteristics of the patterns were determined using a MATLAB protocol developed in our laboratory[3] . Under the set of given experimental conditions, it was observed that a large number of bands (in the range of 40- 60) were formed within 5 days of the experiments. The spatial analysis indicated the spacing coefficients in the range of 1.01 to 1.06 which were corresponding to regular pattern formation using the generic spacing law. The magnitude spacing coefficients were the monotonically decreasing functions of the concentration of outer electrolyte and follow the modified Matalon-Packter law. The Fe2+ ions in the bands didn't get converted to Fe3+ spontaneously as in the case of the solution phase reaction.

OL-29

Tribological Properties of PVDF/GO-MOS_2 Composite films

Sreekanth R, Sreelakshmi Rajeevan, Sarath P S, Soney C George

Centre for Nanoscience and Technology, Amal Jyothi College of Engineering, Koovappally P O, Kerala, India

Email: sreekanthr@ajce.in

Abstract

The science and engineering of interacting surfaces in relative motion is defined as tribology. It includes the study and application of friction, lubrication, and wear principles. Tribology is a highly interdisciplinary area that encompasses physics, chemistry, materials science, mathematics, biology, and engineering. Because so much energy is lost caused by friction in mechanical components, tribology is very important in today's world. We should reduce the amount of energy squandered in order to reduce energy consumption. Friction at sliding contacts wastes a large amount of energy. The interplay of the surface with the environment forms the tribological surface. A metal interacting with the environment to form oxides, nitrides, or hydroxides is such illustration of this interaction. Surface films could be created by interacting with surroundings other than air. Other than liquid lubricants, solid lubricants such as graphite and polymers are also employed in lubricant applications. PVDF is a polymer with a wide range of industrial uses but weak tribological characteristics. Many researchers are working to improve PVDF's tribological qualities. GO is used as a filler material in some polymer lubricant applications to improve properties, while MoS_2 is a smooth substance. In our project, we are creating a hybrid film using PVDF, GO, and MoS_2 and analysing the improvement in tribological properties as well as the contribution of each filler in the morphological change of the polymer and tribology enhancement.

OL-30

ELECTROCHEMICAL DETECTION OF DOPAMINE USING MXENE/PANI/COPPER OXIDE/GCE MODIFIED ELECTRODE

Dana Susan Abraham[a], Kavya P[a], Margandan Bhagiyalakshmi[a*]

and Mari Vinoba[b]

[a]*Department of Chemistry, Central University of Kerala, India*
[b]*Kuwait Institute for Scientific Research, Kuwait.*

Corresponding author: *mbhagiya@gmail.com*
bhagiyalakshmi@cukerala.ac.in

Abstract:

The neurotransmitter dopamine is imperative, and even a tiny drop in its concentration can produce devastating neurological ailments that make its accurate estimation extremely significant to medical and behavioral science. Electrochemical methods most effectively accomplish dopamine detection. In this study, MXene/PANI/CuO nanocomposite was synthesized to detect Dopamine (DA). A modified electrode was obtained by coating the synthesized nanocomposite on a glassy carbon electrode (GCE). Current responses were recorded for different electrode systems - MXene/PANI/CuO/GCE, MXene/PANI/GCE, and CuO/GCE. The modified MXene/PANI/CuO/GCE electrode demonstrated an excellent catalytic performance toward DA oxidation. The application of synthesized electrodes for the electrochemical sensing of DA was employed through cyclic voltammetry (CV), Differential Pulse Voltammetry (DPV). It also exhibited better sensing for DA with a detection limit of 0.01nM. The material displayed superior conductive performance, low electron transfer resistance, Limit of Detection in the nanomolar range. It has been demonstrated that the MXene/PANI/CuO/GCE sensor can detect trace levels of DA.

Keywords:

Dopamine, MXene, electrochemical sensor, glassy carbon electrode, cyclic voltammetry.

AICERA 2021

ICAN 2021

International Online Conference on

ADVANCED NANOMATERIALS

AMAL JYOTHI
COLLEGE OF ENGINEERING
KANJIRAPPALLY