Key note speakers

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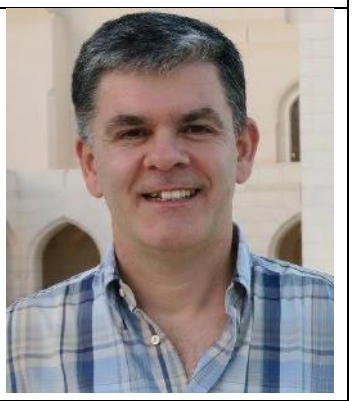
Vice Director CICECO-Aveiro Institute of Materials University of Aveiro 3810-193 Aveiro, Portugal Tel. +351234401507, e-mail: jcoutinho@ua.pt	

João A. P. Coutinho is a Professor in the Department of Chemistry at the University of Aveiro, Portugal and vice-director of CICECO, one of the leading European laboratories in material science. He leads a multidisciplinary research team that focuses on the development of green solvents and novel separation processes for bio refinery and circular economy. Currently he strives to apply bio based solvents, DES and ionic liquids to these processes and attempts to understand better about their physical-chemical behavior. He supervised over 50 MSc, 20 PhD thesis and 15 Post-Doctoral Fellows, authored over 500-referred papers (h-factor 70, ca. 18000 citations) and 5 patents.

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Title of the Talk: Ionic liquids and water

João A. P. Coutinho

CICECO – Aveiro Institute of Materials, Department of Chemistry, University of Aveiro,

Abstract: Ionic liquids, even those deemed hydrophobic, in general are very hygroscopic compounds. Being salts they love water and it is quite difficult to keep them dry, what constitutes a major challenge when measuring their thermo physical properties or phase equilibria, let alone using them in industrial processes. The challenge can be overcome if instead of trying to oppose their water-loving nature one uses it to advantage. Although many authors started by looking suspiciously at aqueous solutions of ionic liquids, claiming that they would be just a solution of ions like any other salt solution today is well established that in a very large concentration range ionic liquids in aqueous solutions retain the nanostructure that characterizes and differentiates them from other solvents, conferring water new properties and a much stronger solvation ability.

In our group we have been looking into the particular relationship of ionic liquids and water, and how to control their mutual solubilities using other salts, or how to use the ionic liquids to modulate the solubility of poorly or highly soluble compounds in water. The understanding of the molecular mechanisms behind the solvation of a variety of compounds in aqueous solutions of ionic liquids allowed us to design a variety of

Aqueous Biphasic Systems (ABS) that we have been proposing for extraction and separation processes of biomolecules.
In this lecture we will address some of the most recent and innovative results of our research, showing how an understanding of the fundamentals can lead to the design of novel multiphasic systems [1], reversible systems controlled by temperature or pH [2], and acidic ABS where the ionic liquids are water soluble but immiscible in concentrated acids [3]. These unconventional IL-ABS are proving to be very flexible and suitable for a wide range of applications besides the conventional purification of biomolecules. Examples of applications of these novel systems covering separations, biphasic reactions, and metal extractions are presented and discussed.

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DOI: **10.1039/C7GC02262J**
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DOI: **10.1002/anie.201711068**

Prof. Pushpito Kumar Ghosh

K. V. Mariwala-J. B. Joshi Distinguished Professor
Institute of Chemical Technology (ICT), Mumbai
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Dr. Pushpito K. Ghosh obtained his B. Sc., M. Sc. and PhD degrees in Chemistry from St. Stephen's College, Delhi, IIT Kanpur and Princeton University, respectively. He is presently the K. V. Mariwala-J. B. Joshi Distinguished Professor of Chemical Engineering at the Institute of Chemical Technology, Mumbai. He was the Director of CSIR-Central Salt & Marine Chemicals Research Institute, Bhavnagar for 15 years and prior to that he served for 13 years at senior levels in ICI, both in India and in UK. He also served briefly at the University of Hyderabad and IIT Bombay. Dr. Ghosh is the Chairman of Department of Science & Technology's Water Technology Initiative and member of several other national level committees. This year he reached the landmark of 50 US

patents granted to him and his co-inventors. These span a wide range of inventions in diverse areas of chemical science and technology. Several technologies arising out of the inventions have been commercialized and some have featured prominently in reputed journals – including Nature – and in the popular media. He has also published a large number of papers dealing with basic and applied research in reputed journals. Indian Chemical Council and the Indian Desalination Association have bestowed on him their Lifetime Achievement Awards. He is a Fellow of the Indian Academy of Sciences.

Title of the talk: Case Studies of Innovations with an Eye on Green Technology

Pushpito K. Ghosh
Department of Chemical Engineering, Institute of Chemical Technology, N. P. Marg, Matunga, Mumbai 400019
(Formerly at the CSIR-Central Salt & Marine Chemicals Research Institute, Bhavnagar)

Abstract: Innovations, by their very nature, can yield asymmetric gains. The author will discuss a few case studies of process innovations which fall in the domain of green technology. Distiller waste of soda ash industry presently has more nuisance value than utility. It will be shown how it was utilized to raise gypsum production three-fold during salt manufacture and to improve the quality of common salt. Sea bittern – the electrolyte-rich mother liquor obtained after crystallization of common salt – was viewed as a source of pent-up osmotic energy. It has been possible to harness that energy for dewatering. The lecture will also discuss an innovation leading to a greener route for the manufacture of a rugged and efficient inter-polymer anion exchange membrane. The green context is that hazardous chloromethylether required for effecting functionalization could be substituted with a more benign reagent through subtle modification of approach. A greener process for the manufacture of agarose from indigenous seaweed will also be touched upon. The new process cuts down on the energy requirement substantially besides bringing down the processing time. A large part of the work was carried out at the CSIR-Central Salt & Marine Chemicals Research Institute, Bhavnagar and all those involved in the research are gratefully acknowledged.

Dr. Sukumar Roy

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Dr. Sukumar Roy, presently working as Senior Deputy General Manager at Bharat Heavy Electricals Limited, Corporate Research & Development, Ceramic Technological Institute, Bangalore. Prior to CTI/Bangalore he was the Head, Insulation Technology Lab & Insulation & Chemical Sciences Lab at the Corp. R&D, BHEL, Hyderabad.

His current research activities include the fields related to i) Nano-filler modified high voltage electrical insulation products, ii) acoustic damping in electrical machines through Nano-additive modified paints, iii) Nano-dielectric materials & dielectric coating technologies, iv) SCR technologies for pollution control in coal-fired power plants, v) Nano-precursor development & large-scale synthesis of nanostructured materials, vi) industrial water filtration technologies etc.

After submitting his Ph.D. thesis from Indian Association for the Cultivation of Science, Jadavpur, Dr. Roy had a short stay at the Central Glass & Ceramic Research Institute in the year 1991, prior joining BHEL's Corporate R&D Division, Bangalore in the year 1992. Dr. Roy had worked at the Max Planck Institute for Metals Research, Stuttgart, Germany in different times during the period 1995 – 2004 dealing synthesis, processing & coating applications of nanostructured materials. He had also worked at the Alfred University, USA in 1993 dealing temperature sensors & capacitors. He also had worked with various interdisciplinary research groups belonging several premier institutions, e.g., IIT/Kharagpur, IISc/Bangalore, NCL/Pune, NMRL/DRDO, Jadavpur University, Karnataka University, CIPET/Bhubaneswar etc., through contract research & collaborations with BHEL.

He is a recipient of several national & international academic awards; notable ones are German Academic Exchange Fellowship, UNIDO Fellowship, Max Planck Institute Research Fellowship, Max Planck Society Fellowship, CSIR Research Fellowship, DST-IACS Scholarship, Merit Scholarship/Govt. of West Bengal etc. Dr Roy has authored/co-authored over 100 articles comprising research papers, industrial patents, research reports & guided several students towards Ph.D. (07), M.Tech (over 40) and B Tech (over 150) curriculum. He is also a member of various societies & committees in his profession & reviews routinely various research articles in international journals in his field. Dr. Roy had delivered over 120 invited lectures in various seminars/conferences in his field in India and abroad.

Title of the talk

Prof. Chen-Hao Wang (王丞浩)	
Director of Technology Transfer Center, R&D office Professor, Department of Materials Science and Engineering National Taiwan University of Science and Technology, Taipei, Taiwan. (Office) +886-2-27303715 (Fax) +886-2-27376544 e-mail: chwang@mail.ntust.edu.tw or chwangzr@gmail.com	

Dr. Chen-Hao Wang is the Associate Professor in Department of Materials Science and Engineering at National Taiwan University of Science and Technology. His research is currently focused on fuel cell, supercapacitor, redox flow battery and photocatalyst. He has received more than ten times awards of thesis competition since 2010. In2015, hereceived theJunior Research Investigators Award from Ministry of Science and Technology; he alsoreceived theYoungScholarAwardfromNational Taiwan University of Science and Technology at the same year. In 2016, he granted the Young Scholar Award from Taiwan Association for Coating and Thin Film Technology. He has published over 50+SCI papers in peer-reviewed journals which mostly were published in the high-impact journals, such as *Energy Environ. Sci.*, *Adv. Funct. Mater.*, *Nanoscale*, *J. Mater. Chem.*, *J. Power Sources* and so on, and has granted 8 patents from USA and Taiwan.

Current position:

2017/08 – current Professor, Department of Materials Science and Engineering, National Taiwan University of Science and Technology

2015/08 – current Director, Technology Transfer Center, R&D office,National Taiwan University of Science and Technology

Professional Experience

2017/11– 2019/10 Director, Board of Directors, The Electrochemical Society of Taiwan

2016/02 – 2020/01 Director, Board of Directors,Taiwan Associate of Coating and Technology

2014/02 – 2016/01 Alternate Supervisor,Board of Directors,Taiwan Associate of Coating and Technology

2014/02 – 2017/08 Assocaite Professor, Department of Materials Science and Engineering, National Taiwan University of Science and Technology

2014/01 – 2014/02 Visiting Scholar, Argonne National Laboratory, USA

2012/07 – 2012/09 Visiting Scholar, Argonne National Laboratory, USA

2010/08 – 2014/01 Assistant Professor, Department of Materials Science and Engineering, National Taiwan University of Science and Technology

Education Background

2002/9 – 2007/8 Ph.D., Department of Materials Science and Engineering, National Tsing Hua University, Hsinchu, Taiwan

1997/9 – 1999/6 MS, Department of Chemical Engineering, National Taiwan University, Taipei. Taiwan

1993/9 – 1997/6 BS, Department of Chemical Engineering, National Taiwan University, Taipei. Taiwan

Fields of Expertise

1. Electrochemistry; 2. Nanotechnology; 3. Fuel cell; 4. Carbon material

Title of the talk: Synthesis of Non-Precious Metal Catalysts via Cobalt-based Precursors Applied in Oxygen Reduction Reaction in Alkaline Media

Kai-Ching Wang,Huan-Ping Jhong,Cheng-Hao Wu,Hsin-Chih Huang,Chen-Hao Wang*
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In these works, there are several kinds of cobalt precursors used to synthesize transition metal dichalcogenide (TMD) and metal organic frameworks (MOFs) as the non-precious metal catalysts for oxygen reduction reaction (ORR) in alkaline media[1]. The ORR results revealthatN-$CoSe_2$/C, ZIF-67(Fe-N) andZIF-67(S) catalysts perform improved activity and compete with Pt-/C catalyst.

The N-doped $CoSe_2$/C (N-$CoSe_2$/C) is synthesized by the ratio of cobalt precursor and surfactant in hydrothermal method. There are two reasons which indicate the ORR activity for the N-$CoSe_2$/C by using X-ray absorption spectra (XAS) and X-ray photoelectron spectroscopy. One is the peak located at 396.3eV from NEXAFS N K-edge, which correspond to Co-N bond. The other reason is attributed to the higher amount of structure $[N(CH_3)_4]_2[Co(SeCN)_4]$ from XPS analysis so that it can promote the electron transfer[2, 3].

Moreover, ZIF-67, a kind of cobalt-based MOFs, is a potential material for ORR in alkaline media and famous for its tunable particle size[4]. In here, the big and small-sizedZIF-67 had been synthesized. For the big one, combined with iron precursor, ZIF-67(Fe-N) catalyst shows the properties of high surface area and porous structure by BET measurement. And the functional nitrogen structures found by XPS also play an important role in the ORR.

On the other hand, the small one, ZIF-67(S), has fabulous conductivity, high graphitization degree and more active sites can enhance the ORR activity significantly in alkaline media.

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[2] J. Jia, J. Wu, J. Dong, P. Zhou, S. Wu, J. Lin, Cobalt selenide/tin selenide hybrid used as a high efficient counter electrode for dye-sensitized solar cells, Journal of Materials Science: Materials in Electronics, 26 (2015) 10102-10108. DOI: 10.1007/s10854-015-3694-8

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Prof. Bhisma K. Patel	
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Invited Talks

Prof. Ramesh Gardas	
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Research Interests

- Fluid Phase Equilibria
- Chemical Thermodynamics
- Ionic Liquids
- Property predictions throgh Group Contribution Methods, QSPR, and Correlating Equations

Publications

- List of Publications
- Alternate List ofPublications

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Title of the talk: Ionic Liquids as Additives for Enhancing the Extraction, Absorption and Dissolution Processes

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Abstract**:** Solvents are major contributors and high on the list of environmental damage chemicals, mainly because of their large usage and high volatility. The widespread use of volatile organic compounds (VOCs) in many industrial chemical processes is an issue of great environmental concern. It is an extremely important task to search of potentially green and environment friendly alternatives for VOCs. At least a partial solution to this problem may offer by a novel class of molten salts referred to as ionic liquids (having melting point, generally, below boiling point of water), as they possess unique combination of particular properties, unlike molecular liquids, namely negligible vapour pressure (~ 10^{-11} to 10^{-10} bar at room temperature), wide thermal window (~ -50 °C to +250 °C), wide electrochemical window (~ ±3 Volt vs. NHE), non-flammability, high ionic conductivity and a highly solvating capacity for organic, inorganic and organometallic compounds. This unique combination of particular properties leads them to be exploited as “green solvents” and giving them increasing attention in academic and industrial research. The research areas on ionic liquids are growing very rapidly and the potential application are numerous, mainly due to the fact that simple changes in the cation and anion combinations or the nature of the moieties attached to each ion allow the physical properties of ionic liquids such as hydrophobicity, viscosity, density, coordinating ability, ion selectivity, and chemical and electrochemical stability to be tailored for specific applications. Proposed talk will include the introduction of green solvents, ionic liquids, general applications of ionic liquids and understanding unique thermophysical properties of novel ionic liquids [1-4] for metal ion extraction [5], solar refrigeration system [6], dissolution of tank bottom sludge [7-9] and dissolution and stability of biomolecules [10]. Further, the effects of thermophysical properties of ionic liquids on these applications and current research trends on ionic liquids as green solvents for the technological applications will be discussed.

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Prof. P Venkatesu

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Dr. Pannuru Venkatesu was awarded Ph D in 1995 at Sri Venkateswara University, Department of Chemistry, Tirupati, Andhra Pradesh, India. At present he is a Associate Professor in the Department of Chemistry, University of Delhi, Delhi, Indai. His research is focused on the thermodynamics of protein folding/unfolding in the presence of ionic liquids, osmolytes and the behaviour of polymer chain or ionic liquid in coexisting liquid phases. An author of 159 articles in scientific reputed journals and 50 presentations at the international conferences. In 2006, Fast Track Young Scientist was awarded by Department of Science and Technology (DST), New Delhi, India. In 2011, he received Dr. Arvind Kumar Memorial Award by Indian Council of Chemists, India and in 2013, he received Professor Suresh C. Ameta award by Indian Chemical Society, India. Very recently, he received Professor S. S. Katiyar Endowment Lecture award (2016-2017) from the Indian Science Congress Association, India. Bronze Medal – 2017 received from Chemical research Society of India (CRSI), Bangalore,

Dr. Venkatesu is Member of the Editorial Board of the Journal of Molecular Liquids, Member of the Advisory Board of the Journal of Chemical Thermodynamics and Member of the Editorial Board of International Journal of Chemistry.

Title of the talk: Ionic Liquids as future solvents for enhanced stability of proteins against multiple stresses

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Abstract: Ionic liquids (ILs) have evolved as novel solvent systems fulfilling the requirements of biotechnology and bioengineering. In recent years, large numbers of ILs have been synthesized and their effect on protein stability has been illustrated. However, harsh process conditions, such as temperature, pH, and presence of organic solvents, are the major barriers to the effective use of enzymes in biocatalysis. We demonstrate the suitability of ILs as potential media for enzymes, in which remarkable enhanced activity and improved stability of proteins against multiple stresses were obtained. The catalytic activity of the enzyme in presence of ILs was retained against several external stimulus, such as chemical denaturants (H_2O_2 and GuHCl), and temperatures up to 120

°C. The observed enzyme activity is in agreement with its structural stability, as confirmed by UV–Vis, circular dichroism (CD), and Fourier transform infrared (FT-IR) spectroscopies. Finally, it is demonstrated that protein can be successfully recovered from the aqueous solution of ILs and reused without compromising its yield, structural integrity and catalytic activity, thereby overcoming the major limitations in the use of IL-protein systems in biocatalysis.

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- J. Indrani, A. Rani and **P. Venkatesu** *ACS Sustainable Chemistry & Engineering*, **2017**, *5*, 8344-8355.
- B. Meena, A. Kumar and **P. Venkatesu,** *Phys. Chem. Chem. Phys***. 2016,** *18*, 12419-12422.

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Title of the talk: Titania photocatalysis and applications for sustainability

Dr. Kamalesh Prasad	
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Dr. Kamalesh Prasad who is currently a fellow of the Royal Society of Chemistry, Cambridge, UK was born on September 26, 1976. At present he is working as a Principal Scientist and Divisional Head in the Natural Products and green Chemistry Division of Central Salt & Marine Chemicals Research Institute, Bhavnagar, a constituent laboratory under the aegis of CSIR, New Delhi. He is also working as an Associate Professor in the Academy of Scientific and innovative research (AcSIR), a CSIR spinoff for human resource development and training. Dr. Prasad is the recipient of CSIR-Young Scientist Award in 2010 for his significant contribution in the research done on polysaccharides and CSIR-Raman Research Fellowship in 2016. He is also a recipient of CSIR Award for Rural Development (CAIRD Award-2012) as a core team member. His current research interests are bio-mass processing using new solvent systems, polysaccharides and their modification and natural product chemistry. He has published 93 research articles along with 10 book chapters. He is also co-inventor of 14 international patents and he involves in technology development and their know how transfers to entrepreneurs. He has visited graduate school of engineering, Kagoshima University, Japan, University of Leicester, UK and INSA-Lyon, France and University of Aveiro, Portugal as visiting researcher.

Title of the talk: Ionic liquids and deep eutectic solvents as platform solvent systems for product design and separation

Kamalesh Prasad
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Abstract**:** Considering the huge boom in industrial applications for biopolymers and bioactive molecules in various formulations, their efficient processing and extraction from bioresources is of utmost important to enhance their potential for applications. Due to the task specific nature of the ionic liquids (ILs) and deep euectic solvents (DESs), their properties can be suitably tuned to make them appropriate for custom made applications. Some of the conventional extraction proceses for bioactive molecules and biopolymers are associated with multi step protocols, use of volatile organic solvents, impurties in

target molecules etc.,. and in many such extractions the ILs and DESs are proven to be suitable alternatives providing easier extraction prococols, isolation of impurity free target molecules with very high extraction efficiency. Neat ILs, DESs as well as biphasic solvent systems prepared based on them were used to selectively extract bioactive molecules such as alkaloids, terpenoids, alcohols, plant growth hormones, drug molecules from certain bioresources as well as concentration of some of the biomacromolecules when they are present in very low concentration in aqueous media. Biomacromolecules such as protein, polysaccharides, nucleic acids were efficiently processed and extracted using such solvent systems. Although, till today ionic liquids (ILs) and deep euectic solvents (DESs) are not very popular as industrial solvents primarily because of their high cost but research is going on to make these solvents systems cost effective and make them popular in industrial applications.

Dr. Ramavatar Meena	
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Born on	July 05, 1973
Current Responsibility	**Senior Scientist & Professor (AcSIR, New Delhi)** –Natural Products & Green Chemistry Department, CSIR-Central Salt & Marine Chemicals Research Institute, Bhavnagar 364002 (Gujarat), India.
Specialization and Research Interests	Materials Science: Synthesis of sustainable materials; Synthesis of bioactive substances; Nano materials; Sensor; Hydrogels; Green Processes & Technology; Natural products chemistry; etc..
1995-1996	**MSc** (Chemistry), Rajasthan University, Jaipur, India
1997- 2001	**Technical Assistant,** NIPER, Mohali, Chandigarh, Punjab, India.
2001-2002	**Chemical Assistant,** Central Revenue Control Laboratory (Govt. of India), MUMBAI, India.
2005-2007	**PhD,** Awarded by MK Bhavnagar University, Bhavnagar, Gujarat, India.
2010-2011	**Visiting Scientist (UH, Germany),** University of Hamburg, Hamburg, Germany
HRD Experience	**In excess of 25 students/research staff** carried out R&D works under my supervision, **6** of them has awarded/registered for their

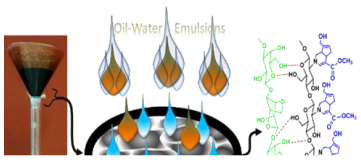
	PhD degrees; **15** did CSIR-800 programme to fulfil PhD course work
Membership of Learned Soc./Univ. senate	Member of the Chemical Research Society of India, Bangalore Member of the *Editorial Board of Indian J. Materials Science* Member of *Management Council of CSIR-CSMCRI* *Life Member of IIMM, Mumbai*
Publications	Research Papers: 60; Published in prestigious journals Patents – 15; Invited Book Chapters – 06; Conference / Invited talks – 40; TV / Radio Talk/ Media – 11; Technology transferred – 04; Trade Mark Product - 01
Awards/Fellowships	Awarded by prestigious DST-FAST Track Scheme for Young Scientists (2006); Awarded by prestigious fellowship DST-BOYSCAST Fellowship 2009; CSIR Award for Science & Technology Innovations for Rural Development -2012; CSMCRI-Best Paper Award 2015; Elected as Associate Fellow of Gujarat Academy of Sciences (2015); CSIR-CSMCRI Best Technology Award 2016 IIMM Outstanding Research Paper Award 2017

Title of the talk: Seaweed Polysaccharides: A Green Source of Sustainable Materials

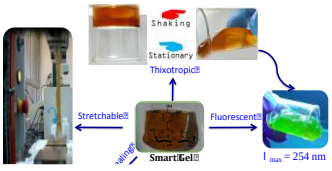
Ramavatar Meena*
Natural Products & Green Chemistry Division, CSIR-Central Salt & Marine Chemical Research Institute, G. B. Marg, Bhavnagar-364002, Gujarat, India.

Abstract: More than 7500 km of coastline in India is available for growth of seaweeds and their farming- red and brown seaweeds are used for commercial production of gelling seaweed polysaccharides such as agar/agarose, carrageenan and alginate. Seaweed polysaccharides have been extensively studied for textile, cosmetics, plant growth promoters, bio-energy and functional food applications. The exploration of these polysaccharides in preparation of sustainable materials for the potential applications such as emulsion separation, drug delivery, sensor, non-gelatin capsule shells, ropes, etc. is still in its infancy. Hence, this lecture will discuss an innovation leading to a greener & energy efficient methods for the extraction and functional modifications of seaweed polysaccharides. The lecture will also discuss potential applications of seaweed polysaccharides-based sustainable materials in emulsion separation, seaweed cultivation, biosensor, drug carrier, non-gelatin capsule shells, self-healable hydrogels, biocatalysts, etc.[1-7] Development of green & energy efficient methods for extraction and functional modifications of seaweed polysaccharides further adds value to seaweed biomass and opens the new research areas for polymer scientists.

Preparation of hydrophobic biomaterials



Foam membrane for emulsion separation



Multifunctional hydrogel materials

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