INDO-AUSTRALIAN CONFERENCE & WORKSHOP on BIOMIMICRY: NATURES PERFECT INNOVATION SYSTEM TO DESIGN SUSTAINABLE FUTURE

JANUARY 31st to FEBRUARY 07, 2025

MAJOR THEME:

Thematic Lecture Series & Handon Experiments on Modification of Biomass-Derived Nanomaterial as Robust & Efficient Interfaces for Industrial & Therapeutical Applications

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- **ABOUT THE CONFERENCE-LECTURE SERIES AND WORKSHOP**

Development is possible both in industrial and therapeutical sectors by ensuring access to affordable, reliable, and modern energy for citizens, therefore, there is an urgent need to find sustainable sources as alternatives. ***It is apparent that a new era has started, where renewable materials are no longer considered a "Cinderella Option (Grubb, 1990)" but are increasingly seen as "Survival Technologies (Leggett, 2009)"***. To increase the share of renewables in the global energy mix, significant innovations are needed not only in the technical/pharmaceutical fields but also in the social and institutional contexts.

Nanotechnology is a process that combines the basic attributes of biological, physical, and chemical sciences. These processes occur at the minute scale of nanometers. Physically, the size is reduced; chemically, new bonds and chemical properties are governed; and biological actions are produced at the nano scale. Rapid development of nanoscience is proof that, nano-scale manufacturing will be incorporated into almost every domain of science and technology. This lecture series and workshop will cover the recent advanced applications of nanotechnology in different industries, mainly agriculture, food, medicine, healthcare, automotive, oil and gas industries, chemical, and mechanical industries.

The task of making new matrices is, without a doubt, driven by curiosity to explore whether a specific macro-molecular architecture can be made or refurbished to contest the sustainable requirements. There's a necessity for the solutions through ***Biomimicry*** to impair natural processes that entail synthetic practices without disturbing the ecological balance. Biomimicry involves learning from and imitating biological forms, processes, and ecosystems tested by the environment and refined through evolution. "***The aim of Biomimicry is not to create a replica of a natural form, process, or ecosystem; instead, it is to derive design principles from biology and use those principles as a stimulus for ideation***".

Bionanocomposites are a novel class of multiphase nanostructured materials that should contain at least one phase of biological origin and particles with at least one dimension on the nanometer scale. In a similar way to conventional nanocomposites, these hybrid materials may exhibit improved structural and functional properties, opening prospects in both specialty (e.g., regenerative medicine) and commodity (e.g., environmentally friendly materials) applications. In fact, the presence of bio or biomimicked polymers is interesting since they have a limited environmental impact and chemical and structural versatility, and are susceptible to molecular recognition and bio-responsiveness.

A lecture series and workshop is organized on the recent developments of Bionanocomposites. The hand-on experiments and the themed lectures about the meaning of Bionanocomposites, methods of their development and recent application of Bionanocomposites will be taken care. The immediate hand on green syntheses and characterization by UV-Vis spectrophotometry for nanoparticles and the modifications of biopolymer (oxidation, blending, crosslinking) following the Infra-Red characterization for validation will also be taught as real experiments. In this lecture series and workshop, we are focused on the applications of different polymer bionanocomposites particularly in biomedical and pharmaceutical field to get desired interfaces for Industrial and therapeutical applications.

EXPECTED LEARNING OUTCOMES

PURPOSE

The purpose of the 10-days lecture series and lecture series and workshop at the Department of Chemistry, Jamia Millia Islamia is to provide the key knowledge base and laboratory resources to prepare students for careers as professionals in the field of chemistry, for research graduate study in chemistry, biological chemistry and related fields, and for professional institutions including medical, dental, and industrial purposes.

LEARNING OUTCOMES

- Students will have a firm foundation in the fundamentals and application of current chemical and scientific theories including those in nanoscience, polymer/ material science and biomedical engineering relevant to their chemical and Physical Chemistries. Majors to be certified by the MHRD-SPARC will have extensive laboratory work and knowledge of Biological Chemistry.
- Participants will be able to synthesize single and binary metal nanoparticles
- Participants will be able to modify the bulk of sustainable polymers viz Chitosan and derivative of cellulose i.e. CMC, via oxidation
- Blending, crosslinking of the polymer matrices and determination of varying reaction parameters and to compile in graphics will be taught
- In-situ/ ex-situ/ coprecipitation methods for bionanocomposites preparation
- Solvent evaporation and dye casting method for film/membrane preparation
- Characterization-UV on Shimadzu UV1800+, morphology characterization, hydro-hydrophilicity assessment of relatable matrices: Nanoparticles, Biocomposites, film/membranes on the instruments
- Hence, Participants will be able to design and carry out scientific experiments as well as accurately record and analyse the results of such experiments. Participants will be skilled

in problem solving, critical thinking and analytical reasoning as applied to scientific problems communicate the results of scientific work.

- The Participants will develop the ability to effectively compile experimental results in written and oral formats with a diverse range of audiences. Participants will be able to explore new areas of research in both chemistry and allied fields of science and technology.

Finally, the participants will be able to explain why chemistry is an integral activity for addressing social, economic, and environmental problems through interdisciplinary research. The student will understand the interdisciplinary nature of chemistry and will develop an ability to integrate knowledge of mathematics, physics, and other disciplines to a wide variety of chemical and environmental problems.