



The National Academy of Sciences, India Kharagpur Chapter

Virtual Talk Series, June 16-17, 2021

Google Meet Link:

<https://meet.google.com/err-cyqs-agh>

Talk 1: Electrochemical Energy Storage with Zn

Schedule: 5.00 PM – 5.30 PM, June 16, 2021

Speaker: Prof. C Retna Raj [Dept. of Chemistry, IIT Kharagpur]

Abstract: The limited availability of fossil fuels and the environmental consequences associated with the use of fossil fuels demands for efficient energy conversion and storage devices for automotive and portable electronics. The renewable energy sources of low emission are limited by time and an ideal energy storage system is critically required to assure a balanced power supply. The Zn-air and Zn-ion batteries are emerging as potential energy storage devices. The rechargeable Zn-air battery requires an efficient bi-functional electro catalyst that can simultaneously catalyze both oxygen reduction and oxygen evolution reactions. The fundamentals of oxygen electro catalysis and a brief highlight on our contribution in the development of zinc-based energy storage device will be presented.

Speaker Bio: Prof. C Retna Raj is a Professor in the Department of Chemistry the Indian Institute of Technology Kharagpur. He joined IIT Kharagpur in the year 2002. Prof. Raj is a NASI fellow and recipient of various prestigious awards. He has significant contribution in the area of Materials Chemistry with research interest in electrochemistry functional materials, biosensors, electro catalysis, energy conversion and storage-fuel cell, super capacitor, metal-air & metal-ion batteries and water splitting.

Talk 2: Do the Galaxies have a Multi-fractal Distribution?

Schedule: 5.30 PM – 6.00 PM, June 16, 2021

Speaker: Prof. Somanath Bharadwaj [Dept. of Physics, IIT Kharagpur]

Abstract: The Cosmological Principle assumes that the Universe is Homogeneous and Isotropic. However, the distribution of galaxies shows structures on a variety of scales. In fact, there have been proposals that the galaxy distribution exhibits multi-fractal scaling which would violate the Cosmological Principle. In this talk I will review some of our work which tests whether the galaxies actually have a multi-fractal distribution or not.

Speaker Bio: Prof. Somnath Bharadwaj has done an Integrated MSc in Physics from IIT Kharagpur, followed by a Ph.D. jointly at IISc Bangalore and the Raman Research Institute. He joined IIT Kharagpur as a faculty member after a brief tenure as a PDF at HRI Allahabad. He currently teaches Physics at IIT Kharagpur, and carries out research in Astrophysics and Cosmology.

Talk 3: Remediation of Hexavalent Chromium from Mine Effluent & Surface Runoff: Solution to regional problem in the largest chromium reserve in India

Schedule: 5.00 PM – 5.30 PM, June 17, 2021

Speaker: Prof. Ashok Kumar Gupta [Dept. of Civil Engineering, IIT Kharagpur]

Abstract: The present talk describes one of the field-based technical projects conducted by Dr. Gupta on the remediation of hexavalent chromium, which has a significant scientific impact. The project conducted to provide the feasibility of common effluent treatment plant(s) in Sukinda valley along with a proper treatment method for the removal of chromium in the mine drainage as well as surface runoff from the contaminated area. The existing treatment methods were critically analyzed from the aspect of technical feasibility and cost-effectiveness. He has recommended the target discharge standard and proposed the concept plan of the treatment system. The project has improved environmental sustainability as well as the life of thousands of people who were under the threat of toxicity of the carcinogenic pollutant.

Speaker Bio: Dr. Ashok Kumar Gupta is a Professor in the Environmental Engineering Division of the Civil Engineering Department at the Indian Institute of Technology Kharagpur. He has remarkable contributions to fundamental and applied research specifically in technology development, theoretical formulation, field-based projects, etc. His research is highlighted in the published book, several book chapters, patents, and many publications in high-impact international journals. He has executed numerous field-based projects of national and international importance for various industries and Government organizations. Dr. Gupta has been awarded a Fellow of the Indian National Academy of Engineering (FNAE) and a Fellow of the National Academy of Sciences (FNASc), in the year 2018 and 2020, respectively.

Talk 4: Hydrodynamics of Swimming Micro-organisms: Real Life to Microfluidic Systems

Schedule: 5.30 PM – 6.00 PM, June 17, 2021

Speaker: Prof. G P Raja Sekhar [Dept. of Mathematics, IIT Kharagpur]

Abstract: Microorganisms follow various strategies to swim in a viscous medium. From the modelling perspective, theoretical works concentrated on the active systems. On the other hand, droplets are also used in different microfluidic devices involving encapsulation of biological cells. In order to understand the swimming of ciliated microorganisms, this talk briefs our study on low Reynolds number locomotion of a spherical viscous droplet under the combined influence of an inhomogeneous surfactant and non-isothermal temperature fields. Then we move on to rigid slip- stick swimmer where the propulsive slip-velocity is concentrated around annular patch which imitates the distinctive surface activity of the microorganisms.

Speaker Bio: Dr. P Raja Sekhar did his Masters (1990) and PhD (1997) at Hyderabad Central University. He was a JSPS Post-Doc till 2000 at Tokyo University of Agriculture & Technology, Tokyo, Japan. He joined IIT Kharagpur in December 2000 and currently Professor at Department of Mathematics. He works on PDE theory and applications, deals with problems involving viscous flows and flow through porous media. He focuses on modeling mechanical behavior inside biological tumors, thermo capillary migration of droplets, swimming microorganisms. He is Alexander von Humboldt Fellow, NASI Fellow.