

# A short course on Polyoxometalates in materials science, technology and medicine

6 May – 28 May 2017

## OVERVIEW

Metal oxide based clusters with charge, commonly known as polyoxometalates, have in recent times gained immense importance due to their application in materials science, medicine and technology. An understanding of the basics of polyoxometalates provides an opportunity to design novel materials that can perform diverse set of applications from water-splitting reactions to anti-retroviral activities.

### Objectives and course details:

The main objective of this course is to provide the key concepts of polyoxometalate chemistry and its applications to problems of daily life to our students from a pioneer of the field. No doubt such a course will also open up possible collaborative research with the international faculty and the participants of the course along with IISER Kolkata faculty. The lectures will be given by Professor Craig L. Hill, who is pioneer of polyoxometalate chemistry and is at present, in the Department of Chemistry of Emory University, USA. The local coordinator of IISER Kolkata will coordinate the tutorials each day in the afternoon. We plan to have ten lectures and ten tutorials within the time frame mentioned above. The tentative title of the course would be: Polyoxometalates in materials science, technology and medicine. The tentative course content is as following:

1. Overview of Polyoxometalate science — what we know and we don't; possibilities and promise
2. Polyoxometalate properties — geometrical and electronic structures, spectroscopic, electrochemical properties
3. Counter cation effects in POM science
4. POM reactivity
5. POMs in materials science
6. Solar fuels (artificial photosynthesis). Part 1 — overview of natural and artificial photosynthesis
7. Solar fuels (artificial photosynthesis). Part 2 — POM water oxidation catalysts (WOCs) and reduction catalysts
8. Solar fuels (artificial photosynthesis). Part 3 -- POMs in light driven nano assemblies and photoelectrocatalytic cells.
9. POMs in biology and medicine
10. Conclusion.

Every morning there will be a one-hour lecture on the topics outlined above. This will be followed by tutorial and discussions. Tutorials will be based on concepts developed in the lecture and will be designed by the external expert. The local coordinator, together with PhD students, will conduct the tutorials. There will be ample opportunities for participants to interact with the expert throughout the duration of the course.

## COURSE VENUE

Lecture Hall Complex  
Indian Institute of Science Education and Research Kolkata  
Mohanpur – 741 246, West Bengal, India

## TARGET AUDIENCE

- The proposed course is aimed at 4th and 5th year BS-MS, Integrated PhD and PhD students of IISER Kolkata.
- Teachers and researchers from colleges and universities.

## COURSE FEES

- Student participants: ₹2,000/- (refundable caution money)
- Academics, Researchers and Teachers: ₹5,000/-
- Industry participants: ₹10,000/-
- Participants from abroad: \$200/-

The above fee includes all instruction material, computer use for tutorials and assignments, laboratory equipment usage charges, free internet facility.

## THE FACULTY



**Craig L. Hill** is one of the foremost experts internationally on transition-metal oxygen anion clusters (polyoxometalates or “POMs”) and his papers have impacted virtually every area of POM science. His prominence is based on the diversity of fundamental findings, aggregate citation impact and many seminal papers that have generated at least four subfields of POM science: catalysts for alkane functionalization, selective inhibitors of viral proteins, multifunctional nanostructures, and water oxidation catalysts. His scientific contributions include, but are not limited to, development of the first self-repairing and self-buffering catalysts, elucidation of the extensive and useful photochemistry of POMs, establishment of many of the biological properties of POMs and other clusters (mechanisms of antiviral action and other attributes) and some of the most successful POM-based oxidation catalysts known.

Hill's impact on chemical sciences research has been substantial as noted by honorary societies and associations (von Humboldt, AAAS, VICS), recently in addition to students in the USA, co-advising Ph.D. students in Germany and France, editing one of the main European journals, *New Journal of Chemistry*, for North America, serving on multiple editorial advisory boards of European journals and giving short courses in several American and European countries, primarily on catalysis, nanoscience and biology of clusters, including POMs, and solar fuel chemistry. Among some of the awards and positions of trust held by Prof. Hill, some are mentioned below: Professeur associe a l'Universite de Lille (2000); Professeur

associe, University of Paris (1997); USDA National Group Honor Award for Excellence in Research (1996); Albert E. Levy Science Research Award (Sigma Xi) (1996); Senior Award, Alexander von Humboldt Foundation (1994); Charles H. Stone Award of the ACS (1992); National Science Foundation Graduate Fellowship Program, Chair, Chemistry Panel (1994-1996) Editor for North America, New Journal of Chemistry (1990-1997) a corporate advisory board, and international organizing committees for 3 conferences (1995-present).



**Soumyajit Roy** is an Associate Professor of Chemical Sciences at Indian Institute of Science Education and Research Kolkata. His research focuses on soft-oxometalates, polyoxometalates, polymers and colloids.

### **COURSE CO-ORDINATOR**

#### **Dr. Soumyajit Roy**

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### **IMPORTANT INFORMATION**

- For course registration please visit: <http://www.gian.iitkgp.ac.in/GREGN/index>
- Registration Deadline: **30 January 2017**
- Fess to be paid by NEFT:
  - Name of the Beneficiary: IISER Kolkata Project A/c
  - Name of Bank and Branch: Indian Overseas Bank, Mohanpur
  - Beneficiary Account No.: 325001000000002
  - Bank MICR Code: 700020092
  - Bank IFS Code: IOBA0003250
- Accommodation based on nominal charges (per day) will be available to all participants. Participants need to bear their own accommodation and food expenses.
- After successful completion of the course, all participants will get participation certificates.
- No TA, DA will be provided to the participants.
- How to reach: <http://www.iiserkol.ac.in/contactus/how-to-reach>

## ABOUT IISER KOLKATA

The Indian Institute of Science Education and Research (IISER) Kolkata was established in 2006 by the Ministry of Human Resource Development (MHRD), Government of India. This initiative was a part of the Government's effort to set up a number of new academic institutions of international standard that would train specialised manpower in basic sciences and allied technologies. Our central theme is to provide quality science education and to carry out research in basic and frontier areas of science involving both undergraduate and postgraduate students, in an intellectually vibrant atmosphere. Through borderless and flexible education programmes involving multi-disciplinary as well as inter-disciplinary curriculum, IISER Kolkata provides an unparalleled opportunity for young students to experience the excitements of research in basic sciences. In essence, IISERs are devoted to both teaching and research in an integrated manner – thus nurturing both curiosity and creativity. For more details please visit the link <http://www.iiserkol.ac.in>, and to reach **IISER Kolkata**, please see the link <http://www.iiserkol.ac.in/contactus/how-to-reach>.