

**SHORT TERM COURSE
ON
SCATTERING AND DIFFRACTION TECHNIQUES FOR MATERIAL
CHARACTERIZATION (SDTMC2012)**

10th DEC- 15th DEC , 2012

Course Coordinator:

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INTRODUCTION:

The importance of Small Angle Scattering(SAS) to the development of modern technology can be appreciated best by considering its wide spread influence on physics, chemistry, materials science, nanotechnology, biological and medical sciences.

It is amazing that an analytical technique (SAS) developed in the early parts of 20th century is still so important and advancing so rapidly. Modern crystallography like protein crystallography among others is no more just structure determination nor is it just fundamental knowledge. Crystal structure analysis is done with application in mind. It provides answer to specific problems, leads to new product and opens new perspectives. The application of SAS technique leads to abundant opportunities and challenges.

With the advent of different processing techniques to produce different material with diversified properties like nano materials, it is necessary to create awareness amongst the scientist regarding scope and potential of SAS technique to characterize these materials. Moreover the statistical averaging the nano order structure is predominated by SAS technique over electron microscopy. It is with this view; the proposed short term course has been planned. Lectures on various aspects of advanced techniques like SAXS, XRD, SALS, DLS, SANS and Neutron Diffraction have been included in addition to the presentation on processing aspects of nano materials.

The lectures of the course have been structured to blend the fundamental concepts and methodology of Scattering and diffraction technique for upgrading the knowledge of academicians, scientists, medical science, Bio-scientists and technologists responsible for quality of materials. Scattering and diffraction are really the wonderful techniques to estimate average structural information at Nano order and also noble techniques, which is much much superior then any MICROSCOPY.

ABOUT NIT ROURKELA:

National Institute of Technology (NIT) Rourkela came in to existence as Regional Engineering College Rourkela in 1961. It is a prestigious institute with a reputation for excellence at both undergraduate and postgraduate levels, fostering the spirit of national integration among the students, a close interaction with industry and a strong emphasis on research both basic and applied.

The city of Rourkela is a bustling industrial town, cosmopolitan by nature and is well connected to all parts of the country by road and rail. It is en-route Howrah-Mumbai main line of South Eastern Railway. Nesting amidst greenery on all sides, NIT campus is approximately 7km from Rourkela Railway station. The nearest airport is Ranchi, Kolkata & Bhubaneswar, which are well connected by trains.

DEPARTMENT OF PHYSICS:

Department of physics, NIT Rourkela was established in 1961. Since its inception, the department is under dynamic progress and is reputed for imparting education both at under graduation and post graduation levels along with PhD and M.Tech (Research) programme.

The department has its own identity in the field of Small Angle X-ray Scattering (SAXS) research since its inception and already produced 16 PhD scholars in this specialized field of research. Presently few Scholars are also working in the same field for their PhD degree. The department has well equipped laboratories such as low temperature physics lab, Spectroscopy lab, X-ray lab. [Recently procured Rigaku JAPAN make High resolution XRD ULTIMA-IV, system with Small Angle x-ray Scattering (SAXS) and thin film characterization attachments], Thin film lab., Solid state physics lab, Computational Physics lab, Electro ceramic lab etc. for pursuing research keeping in view of the World scenario on advancing technology.

SCOPE OF THE COURSE:

Diffraction and scattering techniques analyze the patterns produced when a sample is illuminated by radiations and causes deflections. Diffraction patterns provide the atomic structure of molecules such as powders, small molecules or larger ordered molecules like protein crystals. Diffraction can be used to measure strains in materials under load, by monitoring changes in the spacing of atomic planes (see energy-dispersive diffraction). Scattering experiments are used to determine the molecular structure of non-crystalline materials, including complex biological samples and polymers.

With all available facilities one must characterize the material of potential applications at the atomic or even at nano order structure. It is understood that all the properties of any material is intrinsically related with that order structure and hence one must decide depending on its structure order what will be the most convenient wavelength of the source of energy to resolve it. In this context x-ray, neutron, light, electron and other such radiations contribute a lot to the scientific community.

With these entire sources one can decide the techniques like scattering and diffraction for characterization of the materials. Now the advanced sources like synchrotron plays major contributions in the field of dynamic study of any system (both living and non-living) i.e. of immense applications in our day to day life.

Keeping all these facts in mind the course is designed to benefit the academicians, industrialist, engineers, medical scientists and many more to explore the knowledge on the subject matter to feel the realistic

The course has been structured to blend the fundamental concepts and methodologies with advanced innovative techniques of Scattering and Diffraction for upgrading the knowledge of persons responsible for controlling the quality of life and materials. The most advanced techniques under these phenomena and its approach to solve various problems of material characterization in general and the relevant applications in particular to Nanoscience and nanotechnology are included in the course with special emphasis on industrial and medical applications. Besides class room teaching there are also experimental demonstration are important features of the course.

It is expected the participants from academic institution (both faculties & students), R&D organization as well as professional scientists, Physicians and engineers will be highly benefited by the course.

COURSE CONTENTS (Precise):

- 1. Introduction to scattering and diffraction with visible demonstration**
- 2. Scattering and Diffraction with different probes like X-ray, LASER & Neutrons.**
- 3. Briefing on WAXS & SAXS with their advantage and disadvantages.**
- 4. Advantage of the WAS & SAS technique over Microscopy (both optical & electron).**
- 5. Contributions of scattering and Diffraction to the scientific community for material characterization including Nanoscience and Nanotechnology**

FACULTY LIST:

- 1. Dr. DK Bisoyi (Course coordinator)**
- 2. Dr. S Jena, HOD Physics Department, NIT Rourkela.**
- 3. Dr. P S Goyal (Retired), BARC Mumbai.**
- 4. Dr. RP Mukhopadhyay, BARC Mumbai.**
- 5. Dr. H.K. Sahu (Retired), IGCAR, Kalpuk (TN)**
- 6. Dr A.K. Singh, DMRL, Hyderabad (AP)**

REGISTRATION AND FEE PARTICULARS:

Applications in prescribed format and the course fee in the form of a cheque / demand draft drawn in favor of “Continuing Education , NIT Rourkela” payable at any bank in Rourkela must reach the coordinator on or before 30th November 2012 .

COURSE FEE:

Participants from Academic and Research Institute: Rs 5000/-

Participants from any other Organizations: Rs 8000/-

Boarding, lodging and travel expenses shall be borne by the participants. Accommodation will be provided in the H B Halls of Residence on sharing basis (except Faculty participants, for which single room accommodation is made in the same Hall) on prior request. The selected participants will be informed by 30th November 2012.