



ANNUAL DAY 2006

UGC-DAE Consortium for Scientific Research celebrated its Annual Day Function on Tuesday, December 12, 2006.

The chief guest of the annual day function was Professor. D. D. Sarma, Mahendra Lal Saha Chair Professor of Physics, Centre for Advanced Materials, Indian Association for the Cultivation of Science, Kolkata. He spoke on “Nano-systems and mega facilities: What can we learn from the application of synchrotron radiation to semiconducting quantum dots”. The other invited speaker for the day was Dr P. S. Goyal Centre-Director of the Mumbai centre of the Consortium.

The function started with Dr P. Chaddah, Director, UGC-DAE CSR welcoming the guests. He reviewed the progress made by the institution during the last year. The significant achievements include the new facilities for high resolution X-ray diffraction, pulsed laser and magnetron deposition systems for thin film deposition, installation of a low temperature – down to 0.3K and high magnetic field – up to 14 Tesla facility for measurement of physical properties, low temperature attachment for scanning electron microscope and the installation of a powder diffractometer on the neutron beam line using focusing optics on the Dhruva reactor at BARC, Mumbai. The other achievements of the institute involves a large number of on going projects in association with university scientists and the consequent high quality research output indicated by publication of a number of research papers in prestigious international and national journals. He specifically mentioned the hosting of the 72nd Annual meeting of the Indian Academy of Sciences in association with the DAVV University at Indore.



Dr Chaddah then introduced the chief guest of the annual day, Professor D. D. Sarma, an eminent professor of physics who recently moved from Indian Institute of Science, Bangalore to Kolkata. Prof. Sarma’s research covers both basic and applied aspects of condensed matter physics and materials science. He is a fellow of Indian National Science Academy, Indian Academy of Sciences and the National Academy of Sciences, India. He is also the recipient of many prestigious awards including the INSA Young Scientist award, Bhatnagar Award, G. D. Birla award, Sir C. V.

Raman award and presently holds the prestigious M. L. Saha Chair at the Indian Association for the Cultivation of Science.

In his address Professor Sarma described the progress made in the field of materials at the level of nanometer dimensions and its possible applications – in nano-electronics and other fields. He emphasized the need to understand the basic properties of these materials by analyzing their structural and electronic properties using the high intensity synchrotron radiation. He described in detail three different kinds of experiments using synchrotron radiation – X-ray absorption studies, small angle X-ray scattering and photo electron spectroscopy work and dwelt on how to extract unique and meaningful information about nonmaterial using these techniques.

Dr. Goyal gave a talk on “Collaborative research schemes on neutron scattering – recent results”. He described experimental work done in association with various university researchers using the neutrons from the Dhruva reactor at Bhabha Atomic Research centre, Mumbai. The work involved primarily small angle scattering and powder diffraction of neutrons from condensed matters of various kinds. He described the various experimental facilities available at the Dhruva reactor for neutron beam research and showed some results on quasielastic neutron scattering, small angle X-ray scattering and powder diffraction by a magnetic system.

The vote of thanks was proposed by Prof Ajay Gupta, Centre-Director of the Indore centre.

A poster session was organized to display the research work carried out by the students and staff of the CSR.

In the evening a concert of classical music was organized.

Honours / Recognitions

Dr. Praveen Chaddah, Ph.D., F.N.A., F.A.Sc., Director, UGC-DAE Consortium for Scientific Research, was elected a Fellow of The National Academy of Sciences, India Allahabad in 2006 for his significant contributions on 1st order phase transitions in vortex-matter in superconductors, as also in magnetic materials.

Workshop on Use of Diffraction Methods in Condensed Matter

At Department of Physics & Electronics, University of Jammu, March 7-9, 2007

UGC-DAE Consortium for Scientific Research, Mumbai Centre, in association with the Department of Physics & Electronics, University of Jammu, Jammu, had organized a three-day workshop on “Use of Diffraction Methods in Condensed Matter”. The main objectives of the workshop were to create awareness among scientists and research students from various universities and other academic institutions on the recent developments in diffraction methods used in condensed matter research, and to familiarize the university scientists about the various advanced research facilities available at and through the different centres of the Consortium.

A total of 30 participants comprising 10 faculty members and 20 students from various universities and research institutes in India participated in the workshop. In addition to this, about 15 students and faculty members from University of Jammu also attended the workshop.

The workshop was inaugurated by the Chief Guest, Mr. Javid Mustafa Mir, Minister for Science and Technology, Jammu & Kashmir Government. Prof. Amitab Mattoo, Vice Chancellor, University of Jammu, presided over the function. Prof. Naresh Padha, Head, Department of Physics & Electronics, University of Jammu welcomed the gathering and Dr. P.S. Goyal, Centre Director, CSR Mumbai Centre, gave introductory remarks about the workshop and its objectives as well as about the Consortium. Prof Mattoo expressed his happiness that CSR had chosen University of Jammu as the venue to hold the workshop and hoped that it would prove useful to the participants in their research work. Prof. Dhananjai Pandey, Department of Materials Science, Institute of Technology, Banaras Hindu University, in his Keynote lecture, talked about the importance of crystal structures in nature and the use of diffraction methods in unraveling the structures. Dr. V. Siruguri, CSR Mumbai Centre, proposed a vote of thanks.

The workshop sessions consisted of the following lectures: Basics of Crystallography (Prof. Dhananjai Pandey), facilities at CSR Indore Centre (Prof. Ajay Gupta), single crystal x-ray diffraction (Prof. Rajnikanth, University of Jammu), powder x-ray diffraction and structures of some novel materials (Dr. A.K. Tyagi, BARC), electron diffraction (Dr. J.B. Singh, BARC), overview of the neutron scattering facilities at Dhruva reactor (Dr. P.S. Goyal), small angle neutron and x-ray scattering (Dr. P.S. Goyal), overview of the facilities at Dept. of Physics, University of Jammu (Prof. N. Padha), diffraction from liquids and amorphous systems (Prof. A. Srinivasan, IIT Guwahati), neutron diffraction from chemical structures (Dr. V. Siruguri, CSR-MC), neutron diffraction from magnetic structures (Dr. P.D. Babu, CSR-MC), neutron reflectivity (Dr. Mukul Gupta, CSR-MC). A visit to single crystal x-ray diffraction facility was also arranged for the benefit of the participants.

The workshop concluded on March 9. The participants, giving their feedback, were appreciative of the lectures during the course of the workshop and also thanked the local organizers for their excellent hospitality.



Foreign Visits by Faculty and Students of CSR during Jan. – May 2007

S.No.	NAME	DESIGNATION	PERIOD OF FOREIGN TRAVEL	PLACE LAB./UNIV.
1	Ms. Shilpa Tripathi	Research Scholar Indore Centre	15 – 19 Jan 2007 23 Apr – 4 May 2007	ICTP, Trieste (Italy) National Synchrotron Research Centre, Thailand
2	Mr. Anupam Kumar Sharma,	Research Scholar Indore Centre	15 – 19 Jan 2007 23 Apr – 4 May 2007	ICTP, Trieste (Italy) National Synchrotron Research Centre, Thailand
3	Mr. Ranjeet Brajpuria	Research Scholar Indore Centre	23 Apr – 4 May 2007	National Synchrotron Research Centre, Thailand
4	Prof. A. Gupta	Centre-Director Indore Centre	14 May - 14 June 2007	ESRF, Grenoble, France and Berlin, Germany
5	Dr. S. R. Barman	Scientist Indore Centre	12 -22 May 2007 23-29 May, 2007	ICTP, Trieste (Italy) Paris & Dijon, France
6	Dr. V. G. Sathe	Scientist Indore Centre	14 – 22 May 2007	ICTP, Trieste (Italy)
7	Ms. Aditi Dubey	Research Scholar Indore Centre	14 – 22 May 2007	ICTP, Trieste (Italy)
8	Dr. V. Siruguri	Scientist Mumbai Centre	15 – 20 April 2007	Cryogenic Limited, London (U.K.)

National Workshop on Nuclear and Atomic techniques based Pure and Applied physics

At Kalyani University



UGC-DAE CSR, Kolkata Centre, in collaboration with University of Kalyani, organized a two-day workshop on Nuclear and Atomic Techniques based Pure and Applied Sciences at the University of Kalyani, Kalyani during March 29-30, 2007. The workshop dwelt on the advanced nuclear and atomic techniques that are available at VECC, IOP and the Consortium and aimed to identify research areas of overlapping interest so that collaborative research proposals from universities, affiliated colleges and other institutions could be initiated.

The Vice Chancellor, Kalyani University, Prof. Arabinda Kumar Das, in his inaugural address expressed his happiness in organizing the workshop and said that it was an opportunity to have an exchange of ideas and facilities between the universities and institutes. He appreciated the efforts of UGC DAE CSR in making the experimental facilities in DAE institutions accessible to the University community. Prof. P. Chaddah, Director of the Consortium highlighted the role of UGC DAE CSR saying that the purpose of the Consortium is to increase the output and impact of university research in the country. He said that the University system had more creative minds, which need to be tapped. The DAE facilities are open to the University community with the Consortium being a conduit. This workshop would be successful only if researchers from the University and colleges would want to use the DAE and the Consortium facilities, he said. Dr. R. K. Bhandari, Associate Director of VECC spoke on the Accelerator facilities in Kolkata. He gave a brief history of accelerators and carried on to highlight various facilities in Kolkata starting from the Cyclotron, to the RIB facility, Super conducting Cyclotron and Medical Cyclotron. Dr Bhandari extolled the participants to visit and utilize the facilities at VECC. In his keynote address “ Pure and Applied Physics – two sides of the same coin” Dr. Bikash Sinha, Director VECC and SINP very lucidly spoke of the urge of man, specially scientists to explore what the universe was made of, leading to the development of various experimental facilities. Dr. Ajit K. Sinha, Centre Director, UGC DAE CSR, Kolkata Centre, delivered the vote of thanks.



The workshop was divided into six sessions, with 15 talks by scientists from VECC Kolkata, IOP Bhubaneswar, Kalyani University and the Indore, Kolkata and Mumbai Centres of UGC DAE CSR. Different facilities were highlighted and some recent work carried out using these facilities was discussed.

In all 151 participants and speakers attended the workshop. Participants attended from the following Universities around the country - Andhra University, Visakapatnam,

Anna University, Chennai, Manipur University, Imphal, G.B.Pant University, Pant Nagar Aligarh Muslim University, Aligarh, Viswabharati, Shantiniketan, University of Kolkata, University of Kalyani. Several college teachers affiliated to University of Kalyani and Calcutta University also attended the workshop.

Discussion Meeting on Manganites and Related Systems

A one day discussion meeting on Manganites and Related Systems was organized at CSR, Indore on 23rd Feb 2007. The participants for this meeting were chosen from the university researchers (faculty) working in these areas who have used CSR, Indore facilities in recent times. The objective of the meeting was to highlight the new facilities and nucleate a focused approach on some particular aspect of these materials which may result in research output making greater impact.

The meeting started with a welcome address by Prof. A. Gupta, Centre-Director, Indore Centre of CSR. He emphasized on the objective of the meeting and announced that such meetings will be conducted regularly to cover other research areas as well. Dr. Ganesan gave an overview of low temperature and high magnetic field facilities at CSR, Indore and presented some results to highlight their capabilities. Dr. Rajeev Rawat presented studies on the first order transition in NSMO. He showed various anomalous features associated with this transition and explained these features as arising due to critically slow dynamics of first order transition at low temperatures. Dr. Banerjee gave a detailed overview of manganites and current understanding and problems in the field. To highlight the complexities in this field he presented some of his recent work on thermo magnetic irreversibility in Al doped PCMO and anticorrelation between kinetic arrest and band and super cooling spinodal. Dr. Lalla discussed low temperature TEM and XRD studies on LCMO. He highlighted the role of strain in phase coexistence. These studies showed how a simple sample preparation method can modify the properties of the system. Dr. Chaddah started his talk with his wish list where he wished for meaningful collaboration between university and CSR, Indore which will result in high impact research output. Then he discussed current interest and future direction in the field of manganites. He also talked about the contribution of CSR, Indore to this field of manganites and phase coexistence.

During participation session talks from participants were arranged. Dr. V. Sathe (CSR, Indore) presented Raman studies on manganite thin films. Dr. D.G. Kuberkar (Saurashtra University, Rajkot) presented his work on LPSMO film and manganite multilayers for making p-n junctions. Dr. Vilash Shelke (Barkatullah University, Bhopal) presented his work on broad magneto resistance in Hg and Ag doped manganites. Mr. Umesh Palikundwar (Nagpur) presented his studies on $\text{LaMn}_{1-x}\text{Co}_x\text{O}_3$. The concluding remarks were made by Dr. S.B. Roy, RRCAT, Indore. He encouraged university researchers to work on interesting and challenging problems to make full use of state of art facilities at CSR, Indore.

Awareness Workshop on the Facilities of UGC-DAE CSR

At Department of Physics, Kurukshetra University

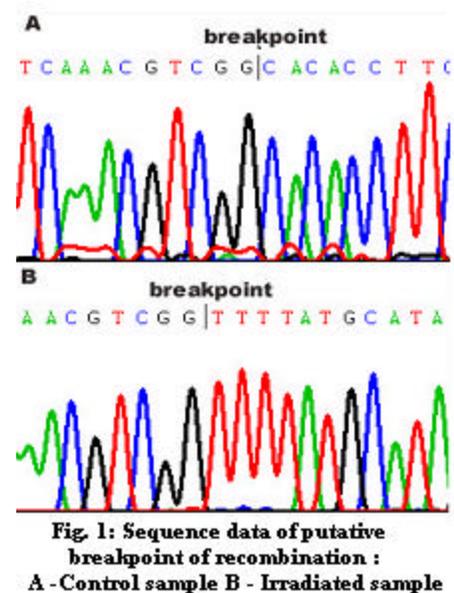
An awareness workshop on “The facilities of UGC-DAE Consortium for Scientific Research” was held at the Department of Physics, Kurukshetra University, KURUKSHETRA during December 45, 2006. The workshop started with a brief inaugural function. Dr.Sanjeev Agarwal, Department of Physics, K.U., welcomed the participants and speakers. Dr.P. Chaddah, Director, UGC-DAE CSR has inaugurated the workshop. Prof.P.I.George, Dean, K.U., has presided over the inaugural function of the workshop. Dr.P.Chaddah delivered his address highlighting the motive of the workshop and invited researchers from universities and colleges to actively participate in the research programs of CSR that will be a mutually beneficial one. Prof.Nafa Singh, Prof.Shyam Kumar Physics Department, K.U., and Dr.K.G.M.Nair, Senior Scientist, IGCAR, Kalpakkam were present during the inaugural function.

About 50 participants attended the workshop from all the major universities of region close to Kurukshetra. Invited lectures were delivered by the Scientists of consortium and also by Dr.A.K.Sinha of RRCAT and Dr.K.G.M.Nair of IGCAR, Kalpakkam. Prof.Nafa Singh presented the research work of the department of Physics of Kurukshetra University, Prof.Shyam Kumar presented the research work carried out by his group with ion beam irradiation and Prof.Rajnikanth of University of Jammu presented the research work carried out by his group. Prof.R.K.Bedi, Prof.Nati Singh and Prof.Nafa Singh chaired the sessions. The participants raised questions about various current scientific issues that were answered by the senior scientists in the gathering.

Ionizing Radiation and Recombinant Sequences during Somatic Embryogenesis in plant

International Gene banks conserves and documents the genetic variation of different species that would be made useful for future research and any other bona fide use. GSS is one such gene bank. The Kolkata centre in collaboration with Calcutta University submitted result of a recent work on gene sequencing to GSS database which has been accepted and this is the first ever data of gene sequence of *Vigna radiata*. This is an outcome of the ongoing collaborative research program on ionizing radiation induced changes in plant molecular biology. To study the effect of gamma exposure on biochemical and molecular changes in relation to *in vitro* plant regeneration, tissue culture has been exploited to understand molecular aspects of regeneration potential of the plants in normal and in stressed conditions. The study employs the ionizing gamma rays from ^{60}Co source facility at the centre and SINP as the stress stimulator to assess *in vitro* development of somatic embryo of *Vigna radiata*, a protein rich pulse. Callus culture was established, using leaves of *V. radiata*. Somatic embryogenesis was induced by manipulating plant hormones. Calli were exposed to gamma rays.

Genomic DNA isolated from gamma-irradiated callus samples were subjected to random amplified polymorphic DNA (RAPD) analysis. RAPD phenotypes indicate dose dependent induction of alteration in genomic DNA. A band of molecular weight 1440 bp was used as a probe and Southern hybridization was carried out. Probe with higher molecular weight bands, hybridizing with bands of low molecular weight, indicates sequence homology. This was further studied by cloning and sequencing RAPD fragments of nearly the same molecular weight in control and irradiated samples. The results indicated recombination in irradiated samples- a direct evidence of mutation caused by gamma rays (Figs. 1A & B, showing break points). The sequence of RAPD band amplified by a specific primer from the control has been submitted to GSS database of the International gene bank.



The present report would help in designing breeding program, where both radiations coupled with somatic embryogenesis could be employed to build up the desired variants.

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Report on the BRNS Workshop on Synthesis & Characterization of Advanced Functional materials

At IGCAR, Kalpakkam during March 26-28, 2007

A workshop on “Synthesis & Characterization of Advanced Functional materials” was held at IGCAR, Kalpakkam during March 26-28, 2007. It was organized jointly by IGCAR and UGC-DAE CSR, Indore.



The aim of the workshop was two-fold. A) To bring researchers from different universities and institutes who are working in various disciplines under the broad theme of functional materials and B) to spread awareness about the facilities available at IGCAR and CSR Indore.

The Workshop started with a brief inaugural function. Dr.C.S.Sundar, Head, Materials Science Division, IGCAR welcomed the gathering. Dr. P.Chaddah, Director, UGC-DAE CSR emphasized the importance of UGC-DAE collaboration for fruitful quality research gauged by peer reviewed publications in emerging areas. He also highlighted the need for the university researchers not only participating in the activities

involving major facilities of DAE like accelerator based experiments but also with the medium sized but important facilities like experiments at extreme conditions of temperature, pressure and magnetic fields which are otherwise normally not accessible to the university researchers. Dr.P.R.Vasudeva Rao, Director, Chemistry, Metallurgy and Materials Groups, gave the inaugural talk. He emphasized the need for development of functional materials citing numerous examples ranging from polymers to manganites to applications on confectionaries.

Dr..Sundar, gave a lecture on “Materials Research at IGCAR: What do we do and why?” He described the broad spectrum of activities at IGCAR. Note worthy was the strong expertise in the areas of high pressure coupled with low temperatures and physics with ion beams with significant contributions from university researchers, especially students, and many of them supported by the collaborative schemes of CSR. He identified areas where in university researchers can contribute towards materials that may have a bearing on fast breeder reactor programs. Examples include material properties at extreme environments, super hard coatings, growth of single crystals etc.

Chemical sciences at IGCAR were covered by Dr.K.S.Viswanathan, especially high temperature chemistry, which finds applications in nuclear reactors as well as space research

Prof. Ajay Gupta, Centre-Director, CSR Indore gave an over view of the research programs and facilities at UGC-DAE CSR, Indore. He categorized the CSR Indore facilities in to three major areas: electronic structure of solids, condensed matter physics at low temperatures and high magnetic fields and thin films and multi-layers. He described the facilities for photo-electron spectroscopy using synchrotron beam lines and associated laboratory based spectroscopy tools like XPS, UPS and Auger, inverse PES, Micro-Raman and Mossbauer as well as the low temperature and high magnetic facilities. He also gave details of thin films and multi-layer deposition techniques covering electron beam evaporation, ion beam sputtering and laser ablation. He described some recent work on characterization of nano-materials using GIXRD, multi layers using x-ray standing wave techniques and substrate independent epitaxial growth of Fe_3O_4 .

Kinetics of precipitation and consequent strengthening of Ni based inter-metallic alloys that find applications in aircraft, nuclear and chemical industries were described by Dr.M.Sundaraman. He emphasized use of electron microscopy in resolving anti-phase boundaries in these materials..

An exiting talk on “Light localization in magnetically tunable photonic medium” using the ferro fluids was given by Prof. R.V.Mehta of Bhavanagar University. At a critical value of the magnetic field applied in the direction perpendicular to that of the propagation of incident linearly polarized light with its electric vector oriented perpendicular to that of the direction of the field the light beam completely vanished. A slight increase in the field resulted in increase of the back scattered intensity while the forward scattered intensity remained zero. Thus a stop band of magnetic field with in which forward scattering of light is inhibited was demonstrated.

Prof. A.K.Ganguli, a participant from IIT Delhi, described synthesis of nano-materials using reverse micelles as nano-reactors. Tunable thermo-reversible visco-elastic micelles in CTAB from self assembly of surfactants were described by Dr.Lisa Sreejith from NIT, Calicut.

Dr.B.V.R.Tata of IGCAR described application of dynamic light scattering (DLS) and confocal laser scanning microscope (CLSM) to study structure, dynamics and phase transitions in colloids, gels and biological systems. Application of magnetic fluids in optical tunable light filters, sensors for detection of defects in ferromagnetic materials and dynamic seals were described by Dr. John Philip of IGCAR.

Prof. S. K. Kulkarni from University of Pune, talked about nano forms of CdS,ZnS,CdSe, ZnSe, polymer composites and their characterization. She described how the materials can be engineered by using shape tuning. tools like synchrotron radiation, surface plasmon resonance etc. Growth of nano-clusters of metals or semiconductors in insulators or semiconductors using ion beam techniques was described by Dr. R. Kesavamoorthy, IGCAR, polymer nano-composites containing layered silicates by Dr.S.Thomas, MG university, Kottayam, functionalized carbon nanotubes for sensor and bio-medical applications, development of amperometric sensors by Prof.S.S.Narayanan of University of Madras, self organization and electron transport in C₆₀ fullerene based single molecular junctions and development of 2D nanoscale metal architecture by Prof. Archita Patnaik.

Dr.Alok Banerjee from CSR, Indore described the low temperature and high magnetic field facilities at CSR Indore, especially 14T VSM and 14T/0.3K system for heat capacity and resistivity measurements. The need for such extreme conditions of fields and temperatures was made evident from examples taken from manganites and magneto caloric materials showing arrest of kinetics and disorder induced broadening of phase boundaries across the phase transitions. This was followed by a review of low temperature facilities at IGCAR by Dr.A.Bharathi. Recent addition of a Heliox system that can reach 0.3K and a unique facility of fields up to 12T and 7 GPa at 4.2K were mentioned. Dr. P.Ch.Sahu covered the high temperature and high pressure regime (1500K/10GPa) and with Diamond Anvil Cell up to 60GPa, along with a laser heating extreme condition 100GPa and 5000K. Dr.V.Sridharan of IGCAR talked on the d⁰ magnetism especially ferromagnetic semiconductors with room temperature Curie points. Examples dealt with were TiO₂, HfO₂ and In₂O₃.

Dr.C.Sekar, Periyar University described growth of single crystals by traveling solvent floating zone method.

Dr.G.Amarendra described use of positrons as probes for study of atomistic defects. Susy Varughese of IITM talked on estimation of free volume in polymers by PAS and DMA of polymers and C.Ranganathiah of University of Mysore dealt with PMMA, PS/PVC. Dr.T.Kaliappan of Pondichery talked on ion exchange resins in waste water treatment.

Dr.V.Ganesan from CSR Indore gave a talk on “Microscopy from a characterization to a research perspective” covering various microscopy facilities like SEM, TEM, Raman mapping and Scanning Probe Microscopy. He emphasized the need to create environments like low and high temperatures, magnetic fields so that one can study phase transitions, evolution of electric, magnetic domains etc. The power of SPM modes like Nano-indentation, lateral force microscopy and dynamics was demonstrated with reference to nano materials. Topics covered included irradiation effects, nano materials and technology and physics with biological systems.

Materials modification and characterization using ion beams is an active area in IGCAR. This facility was covered by KGM Nair. Band structure, interface and surface modifications by Swift ion irradiation in InGaAs/InP multi quantum wells: were described by Prof.A.P.Pathak, University of Hyderabad.

Nucleation of mono-disperse nano particles using ion beam implantation was discussed by Dr.M.Tanuja from JNU and tailoring of magnetic structures by ion beam irradiation with references to magnetic anisotropy changes upon irradiation in FeCo and Co deposited on Si by Dr.Ratnesh Gupta; effect of ion irradiation on the structural and ferro electric properties of sol-gel prepared compositionally graded lanthanum modified bismuth titanate thin films by Dr.A.Marikani, MSE college Sivakasi and ferro-magnetism in Co implanted ZnS:Mn single and nano crystals by Dr.K.Ramachandran, MK University, Madurai are few other presentations.

A second session on nano-materials included talks by. S.Dhar, IIT Bombay on Gd atom in GaN:Gd system, Dr.B.K.Panigrahi of IGCAR on synthesis and ordering of nano structures (clusters) of Ag,Au,Si,Co and Ge on various substrates by ion irradiation, Dr.S.K.Saha, IACS,Kolkata on synthesis of polypyrrole nanotubes using a chemical route, Dr.Sitaram Dash of IGCAR on nano-mechanics of surface coatings with special reference to TiAlN, AlN, TiN, Dr.M.Ashok, NIT, Trichy on layered double hydroxides functionalized by intercalating with variety of species to form nano hybrids, . Dr.M.Vijayalakshmi, IGCAR on grain boundary engineering in the development of industrial materials, Dr.Muruganath, PSG-Tech, Coimbatore on directive modeling for novel material development

The last technical session was on sensors. Dr.M.P.Janawadkar, IGCAR, started from the fundamentals of SQUID, and went on to describe the most powerful magnetometer which should be based on SQUID. He described the efforts at IGCAR to develop a system for MEG (Magnetoencephalography) based on in-house developed SQUID sensors. The second talk was on MEMS sensor technology by Dr.J.Jayapandian, where in the use of indigenous capacitative micro electro mechanical ultrasonic transducer for the in-service inspection of reactor vessels and other MEMS device fabrication scenario were discussed.

The workshop ended with a discussion on probable collaborative projects. A panel of experts headed by Dr.Baldev Raj, Director, IGCAR conducted the proceedings. Dr.Chaddah and Dr.Sundar coordinated the discussions. Many of the senior participants expressed their views and suggestions. Many youngsters too were keen in participating in the joint ventures. Pertinent points raised by Dr.Baldev Raj related to reactor technology included the following: In order to have fruitful results, the materials to be tested for next 50 years. This is because if once used for building reactors, they stay inside for many decades and are bound to face extreme conditions. To achieve this goal of over seeing for next few generations, one should consider diversity in science and science based technology. Another important point of success is to be proactive in assembling expertise rather than depending on individual own expertise. He also emphasized the need for excellent proposals with a peer reviewing that ensures funding, treatment of. young researchers and scholars as a kind of joint faculty and work with zero bureaucracy.

Prof. Mehta had recalled his association with CSR, Mumbai for a decade and a half and emphasized the need for well characterized samples before one goes through costly national facilities.

The meeting ended with a vote of thanks by Dr.C.S.Sundar.



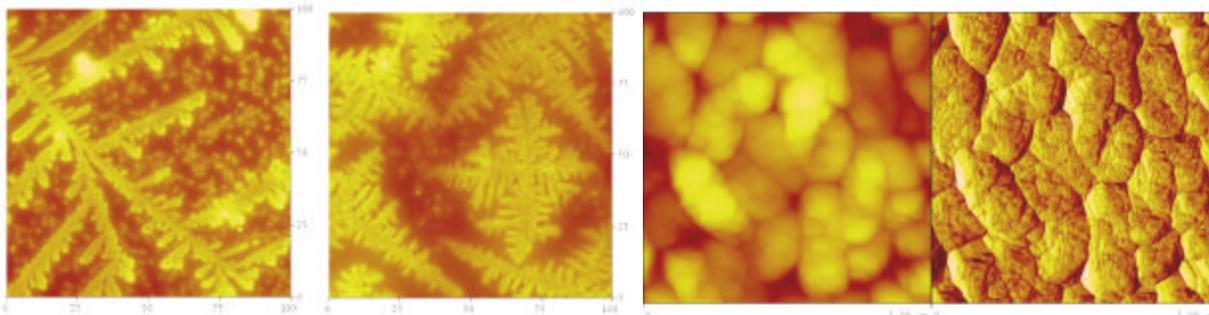
Seminars by Visiting Faculty at CSR Indore Centre

Speaker	Affiliation	Title	Date
Dr Shanthanu Ghosh	Physics Dept., IIT Delhi	Heavy Ion Induced Sputtering: From Fundamental Physics to Nanoscale Synthesis	18 May 2007
Prof. A. P. Pathak	University of Hyderabad	Ion Beam studies of Semiconductor Heterostructures	11 May 2007
Dr. A.K. Saxena	Scientist-G, DMSRDE, Kanpur	Preparation and Technologic al Applications of Ceramic Materia Precursors	02 February 2007
Prof. Osami Sasaki	Dept Electrical and Electronics Engg.,Nigata University, JAPAN	The idea of sinusoidal phase-modulating interferometry and its applications	27 Nov 2006

Usage and Capabilities of the recently installed Scanning probe Microscope

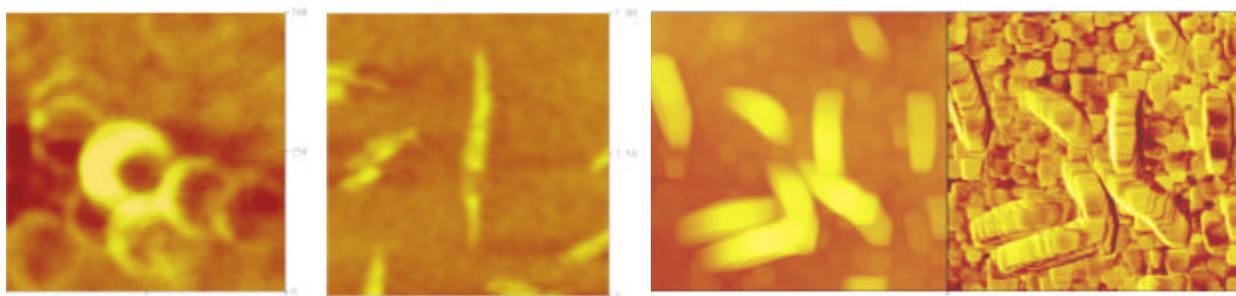
As a part of its up-gradation program, CSR Indore has recently installed a new Scanning Probe Microscopy (SPM) system. Capabilities apart from routine contact mode Atomic Force Microscopy (AFM) and Lateral Force Microscopy (LFM) include the following: Tapping Mode (TM-AFM) useful for soft samples, Magnetic Force Microscopy (MFM), Conducting-AFM (C-AFM), Nano-indentation etc. Representative pictures that can demonstrate the capabilities of the system are shown below.

AFM and LFM



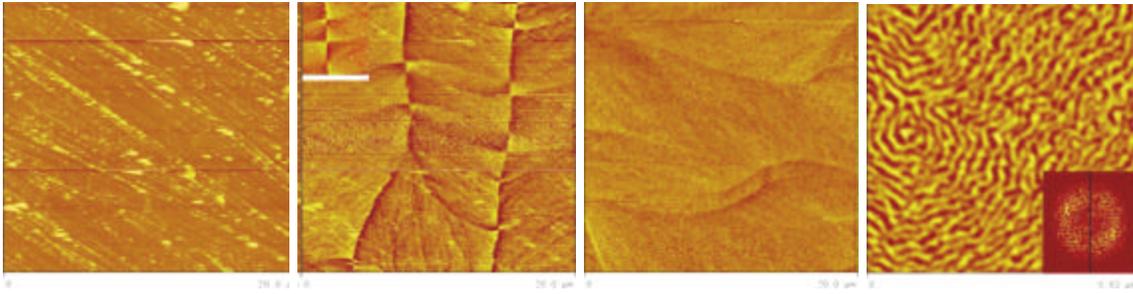
Pattern formation ($100\mu \times 100\mu$) –(a-b) Chemotaxis Signaling in E.Coli by AFM. Fine structure of Proteus bacterial cell wall imaged by AFM and LFM (c-d) ($5\mu \times 5\mu$) showing Peptidoglycan net work of N-acetylglucosamine (NAG) and N-acetylmuramic acid (NAM) (Deepti Jain, R.Nath et al, CSR Indore + Chitnis et al, Choitram Hospital, Indore).

TM-AFM and LFM



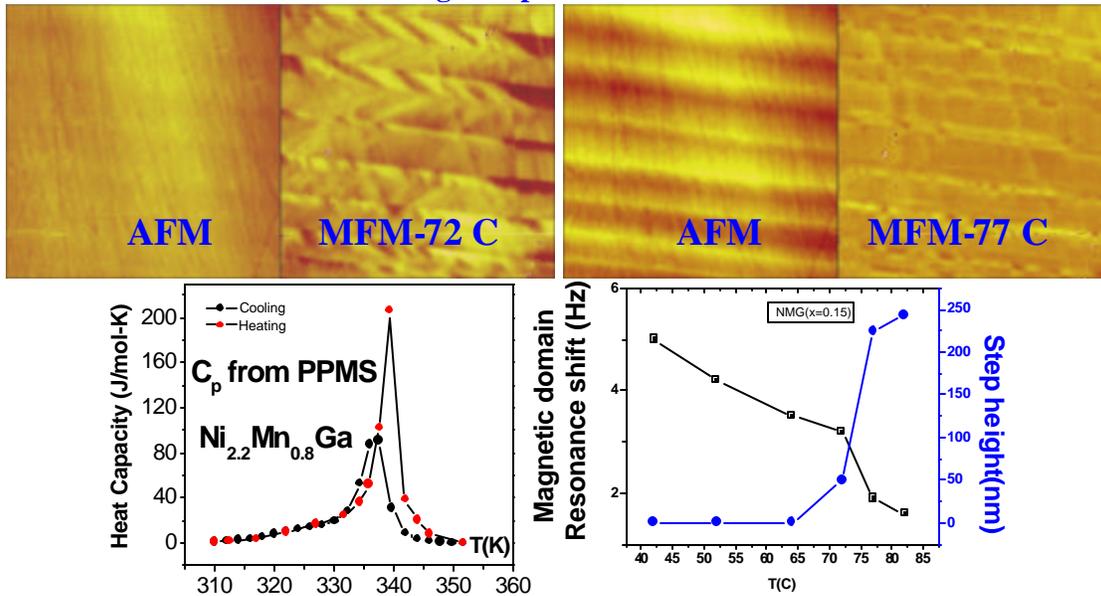
Nano ring and nano-rod formation due to annealing on C(20A)/Cr(250A)/Si100 thin film (Tapping Mode AFM) a) Pristine ($500 \text{ nm} \times 500 \text{ nm}$), b) 600°C ($5\mu \times 5\mu$) (CSR, Indore + I.P.Jain et al, University of Rajasthan, Jaipur). (c-d) AFM and LFM ($5\mu \times 5\mu$) image-Formation of nano rods-Fe Doped CdS (CSR, Indore+Vikram University, Ujjain)

MFM



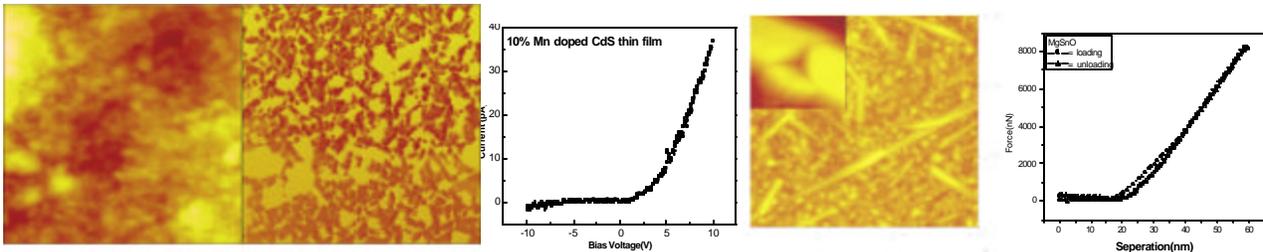
Morphology (a) and MFM of 40nm (b, $20\mu \times 20\mu$), 80nm (c, $20\mu \times 20\mu$) and 200nm (d, $8\mu \times 8\mu$) Co films showing (b-c) in-plane and (d) perpendicular anisotropy. Insert is Fourier transform-Domain period 260nm for 200nm film (Samples from A. Sharma et al, CSR, Indore).

High temperature MFM



Visualization of Structural (Martensite-Austenite) and Magnetic transition (FM-PM) in $\text{Ni}_{2.2}\text{Mn}_{0.8}\text{Ga}$ using MFM with high temperature attachment a) $T=72^\circ\text{C} < T_c$, b) $T=77^\circ\text{C} > T_c$. ($125\mu \times 125\mu$). Heat Capacity by PPMS and Resonance shift by MFM (Samples from Soma Bainik and S.R.Barman, CSR Indore).

C-AFM and Nano-Indentation



Topography and current image (a-b, $2\mu \times 2\mu$) using Conducting-AFM in Mn doped CdS, local I-V (c), (CSR, Indore + S.B.Srivastava et al, Vikram University, Ujjain), Nano indentation in MgSnO_3 nano rods (d, $3\mu \times 3\mu$ and insert is $400\text{nm} \times 400\text{nm}$) and Force curve (e)-Hardness ~ 12 GPa. (CSR, Indore + Sanjeevi Raja et al, Alagappa University, Karaikudi)

Deepti Jain, L.S.Sharath Chandra, Mohan Gangrade and V.Ganesan
UGC-DAE CSR, University Campus, Khandwa Road, Indore

UGC-DAE CSR Node at Kalpakkam.

It is heartening to note that a MOU has been signed between IGCAR and UGC-DAE CSR on 16th Jan 2007. The essence of the MOU is the following: In the area of the Physical Sciences, there is an ongoing collaboration in the field of Materials Sciences that include accelerator based materials research, studies on the physical properties of materials under extreme conditions of temperature, pressure and magnetic fields, and studies on defects in materials. Several research scholars from the university system are benefited from this collaboration.

Encouraged by this success, this collaboration is being enhanced to include Chemical and Engineering sciences, in which IGCAR has a strong presence and interest. In the area of Chemical sciences, collaboration will be pursued in the area of chemical sensors, high temperature thermodynamics, molecular structure and interactions, solvent extraction etc. Collaboration in Engineering sciences will encompass the disciplines of mechanical, metallurgical, electronics and instrumentation engineering.

IGCAR will open its medium sized high technology facilities for university researchers in the area of Physical, Chemical and Engineering Sciences. These will be accessible to researchers from universities and Institutions of higher learning. This enhanced collaboration between IGCAR and UGC-DAE CSR is being formalized with the **creation of a UGC-DAE CSR Node at Kalpakkam**. The facilities created at this node will be accessible to the scientific community through the usual procedure of project proposal and peer review processes of UGC-DAE CSR.



The MOU was signed by Dr. Baldev Raj, Director IGCAR and Dr. P. Chaddah, Director UGC-DAE CSR in the presence of many distinguished scientists of IGCAR.



INSA Medal for Young Scientists of 2007 is awarded to **Dr. Sunil Nair** who has done his Ph.D. work at CSR, Indore under the supervision of Dr A. Banerjee. He got the degree from the Barkatullah University, Bhopal in 2005. Dr Nair is presently Alexander von Humboldt Fellow, Max Planck Institute for Chemical Physics of Solids, Nothnitzer Str 40 01187, Dresden, Germany.

The Citation of the award :

“Dr Nair has built state of the art vibrating sample magnetometer and AC Susceptometer working at low temperatures and low magnetic field. Using these systems, he has obtained valuable insights into the phase transition in manganites.”

For further information contact Administrative Officer, UGC-DAE CSR, University Campus, Khandwa Road, Indore 452 017; Fax (091) (0731) 2462294; website: www.csr.ernet.in