



MRSI Newsletter

*A quarterly publication of the Materials Research Society of India
for circulation amongst its members*

Volume B 02, Number 4

October 2002

From the Editors' Desk

With the release of this issue we would be completing two volumes of the rejuvenated Newsletter. During the last two years we have strived to make this Newsletter as informative and useful as possible and we should thank our members for their whole hearted cooperation in this endeavour.

Members might recall that we had inserted an item 'Students' Project' in the April issue of the Newsletter soliciting proposals from the Materials Science Community. While we were expecting an overwhelming response to this scheme, we have received only five such proposals. These are being scrutinized and the decision for funding or otherwise will be communicated soon. We hope this scheme will evince more interest amongst the students in the discipline of materials science in future.

The preparations for the 14th AGM is in full swing and it is expected that we should have an exciting meeting. A brief write up on the meeting is included in this issue.



H L Bhat
R V Krishnan
Editors

For more details about the activities of MRSI, members are advised to visit the society's website at

www.igcar.ernet.in/mrsi

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The MRSI Newsletter is a quarterly update published by the Materials Research Society of India. Members are requested to contribute information of interest to Materials Science community. Members can inform through the Newsletter, recognitions/awards received by them, changes in address, forthcoming events, and any interesting scientific/technological developments in the area of materials. The relevant information should be sent to the following address:

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Awards & Distinctions Conferred on Members



We are happy to report that the following members of Materials Research Society of India have received awards and distinctions shown against their names. MRSI congratulates them.

A.K. Tyagi Dr. Laxmi Memorial
Award by Indian Association
of Solid State Chemists &
Allied Scientists

Rheometric Scientific
Award by Indian Thermal
Analysis Society for 2002

Murali Sastry S S Bhatnagar Award for
Chemical Sciences for 2002

**P. Ramachandra
Rao** President, Indian Institute of
Metals

*P.S: Members are requested to communicate to the
Editorial Office about the Awards, Honours and
Distinctions they have received from various agencies.*

14th AGM of MRSI

As you are aware, the Fourteenth Annual General Meeting (AGM) of MRSI will be held in Mumbai during 11-13 February, 2003. This would provide a forum to the materials science community for sharing recent developments and innovations along with emerging challenges. A theme symposium on '*Novel Polymeric Materials*' a mini symposium on '*Ion Beam Processing of Materials*' and a meeting of *Asia Pacific Academy of Materials* (APAM) India Chapter have been planned along with the meeting of AGM of MRSI. As in the previous years, AGM would include Medal Lectures, MRSI Honour Lecture and MRSI-ICSC award lectures. In addition, contributed papers covering the latest work of materials scientists in the country will be presented as posters.

International Travel Fund

MRSI has set up a '**Travel Fund**' for the participation of MRSI members in international conferences such as IUMRS, MRS, APAM, ACCMS. Further details will follow.

Subject Group on :

Materials for Rural Development

We are considering the formation of a Subject Group on '**Materials for Rural Development**'. This will cover Building & Irrigation Materials; Materials for Tools; Clay Materials; High yielding & resistant seeds; Natural & Synthetic Fertilizers; Water-Conservation, Storage & Optimum consumption; Solar Energy Converters, etc.

Suggestions on possible activities and for the formation of a core group are most welcome.

S V Subramanyam

Highlights of R&D in Materials Science & Technology

We would like to bring out the recent developments of materials science in a capsule form to our readers. Readers are invited to contribute to this feature. Kindly send a brief write up of the exciting developments in any branch of Materials Science. The write up can be an innovative idea, a novel material, a new process or even a new product.

Interactive Forum

As you are aware the MRSI Newsletter has started an interactive forum. The purpose of this forum is to exchange scientific information, questions-answers, information on available testing facilities and industrial news. Members are most welcome to contribute to this forum in a concise manner. Contributions may be sent to : **Interactive Forum, MRSI Newsletter, MRSI, IISc Campus, Bangalore - 560 012**

Ion Beam Channeling and Accelerator Programmes in India

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Ion Beam Channeling

Accelerator-based techniques have proved to be immensely important research tools with a variety of applications, in almost all scientific disciplines: chemistry, physics, biology, molecular medicine, materials science, and any other one can name. This is illustrated by the fact that most issues of Science or Nature contain articles, which depend on one of the accelerator-based techniques. This is more true for the interdisciplinary field of materials science and its journals. These techniques include: Rutherford Backscattering Spectroscopy (RBS), experiments with synchrotron radiation (SR) sources, ion channeling, Particle Induced X-ray Emission (PIXE), High Resolution XRD, X-ray Photoelectron Spectroscopy (XPS) and Auger Electron Spectroscopy (AES) to name a few. Each of these techniques and their diverse applications constitute a field and their detailed description is beyond the scope of this article. Here, we shall focus on the science of ion beam channeling and its scenario in India. As accelerators are used to produce ion beams, it is natural to describe the accelerator & beam physics programmes in India.

Enormous theoretical and experimental research has been carried out in the area of ion-solid interaction; most of the work is concerned with the source of the probes, the beam of the particles, photons, electrons or ions, the interaction cross-section and the emergent electromagnetic radiation etc. Rutherford Backscattering is one among these fundamental processes in which an energetic positively charged particle (a proton, an α particle or heavy ion) is bombarded on a target and the backscattered particle/radiation flux is studied to get the information on the composition, thickness and structure, etc., of the target. When an ion beam impinges on a crystalline solid in a direction parallel to one of the major crystallographic directions, the ions tend to be steered by the rows or planes into the regions between the atoms. This steering effect causes the projectiles to follow trajectories in the open channels into the regions between rows and planes. This phenomenon is known as channeling. The range of channeled particles is anomalously large and close impact phenomena like Rutherford Backscattering Spectrometry (RBS) or Inner Shell excitation yield are reduced drastically, indicating the alignment of the beam with axes or planes.

Ion channeling is widely used to study the crystalline quality of a sample, lattice location of impurities in crystalline materials, defect densities, defects in epilayer and at the buried layer/substrate interface, diffusion across the interface, lattice damage present in the surface region and also allows the determination of strain in epitaxial layered structures. Utilization of the ion channeling technique for characterizing synthetically modulated structures like semiconductor superlattices is another area of special interest. X_{\min} which is the ratio of backscattered particles when aligned to a crystallographic axis to that in the random condition is a measure of crystalline quality of the sample. A typical X_{\min} of a very good crystalline sample is around 2-3%. The knowledge of basic ion-solid interaction phenomena has contributed greatly to materials science. The research area of materials modification and analysis using energetic ion beams has developed over the past three decades, addressing both the fundamental and technological issues.

In close relation with Channeling, a technique called Blocking-ERDA has been developed at the Nuclear Science Centre, using a Position Sensitive Detector (PSD). With the help of a PSD, the energy as well as the position of signals are recorded. This technique also involves the alignment but this alignment pertains to that of detector with respect to the sample. The difference is that, here the recoiled target atoms are recorded on a PSD whereas in RBS/Channeling, the scattered beam is recorded on Solid State Barrier Detector. The recoil atoms, ejected by a heavy projectile, are blocked in the crystal axis or planes and a pattern similar to transmission channeling can be seen using the PSD. Radiation Damage Studies are ideally suited for Blocking-ERDA, where the heavy ions both damage and probe the sample structure at the same time. It is very natural that the research efforts using ion beam channeling are concentrated at the accelerator institutions and places, in collaborative programmes using these facilities.

Accelerator Programmes in India

The accelerator programmes in India have a very long history. It had a very early beginning in 1940 when Prof. Meghnad Saha developed a 37inch cyclotron at the Calcutta based Institute of Nuclear Physics, which is now called Saha Institute of Nuclear Physics (SINP). In 1950, a 1.0MV cyclotron was commissioned at the Tata Institute of Fundamental Research (TIFR) in Mumbai. In 1960, a 5.5MV Van-de-Graaff accelerator was installed at the Bhabha Atomic Research Centre (BARC) in Mumbai. In the same decade, a 2.5MV Van-de-Graaff accelerator was installed at the Indian Institute of Technology (IIT), Kanpur and a 5.0 MV proton cyclotron was installed at Punjab University, Chandigarh. In 1978, an indigenously designed and built 224cm diameter Variable Energy Cyclotron was made operational at the Variable Energy Cyclotron Centre (VECC) in Calcutta. There are several Pelletron facilities which have been operating for over a decade. These include: the 6.0MV Pelletron at the Institute of Physics (IOP) in Bhubaneswar and the 14.0MV Pelletron at TIFR. The Nuclear Science Centre (NSC) in New Delhi has a very energetic 15.0MV Pelletron, which can accelerate very heavy ions to high energies. In 2000, a beam of the radioactive isotope beryllium-7 was produced at the NSC. This marked India's entry into an elite group of nations which are doing research with radioactive-ion beams. NSC has also recently developed a fully automated ion channeling facility. Here the work is being carried out at higher energies (40-150 MeV) with swift heavy ions. At the institute of Physics Bhubaneswar Ion channeling studies are carried out using low energies (3.5 MeV). A 3 MV Tandatron Accelerator at CCCM, Hyderabad is used for Rutherford scattering, Nuclear reaction analysis and PIXE and also for composition analysis of the materials. 1.7 MV accelerator recently installed in IGCAR will be used for ion beam analysis, radiation damage and defect studies.

India has the expertise and the experience of indigenously building two synchrotrons, at the Centre of Advanced Technology (CAT) in Indore. **Indus-I**, the first synchrotron source in India was commissioned in July 1999 and is in regular operation. It is a 450MeV storage ring with a 20MeV microtron as its injector. The beam energy of this synchrotron can be increased up to 700MeV. The second synchrotron is the **Indus-II**, whose proposed energy has been increased from 2.0GeV to 2.5GeV. The installation and the commissioning of the storage ring is expected to be completed by middle of 2003. Indus-II has provision for 22 beam lines. Six beam lines are expected to be operational by 2005.

Other accelerator activities in India include the construction of a 142cm Superconducting Cyclotron at VECC, expected to be commissioned in 2005. Planning is now underway for the spallation neutron source, which is designed to have a 100MeV linac as an injector and a 1.0GeV proton synchrotron.

Accelerator Schools in India

India is one of the very few countries which very regularly holds Accelerator and Beam Physics Meetings. For several years CAT, Indore has been holding a series of Schools on the Physics of Beams every year in December/January. This series of Schools is funded by the Department of Science and Technology (DST), with the aim of dissemination more widely in India, knowledge of, and interest in, beam physics. The School attracts several speakers from the premiere accelerator laboratories around the world. The Schools are very well-structured with tutorials and a few laboratory experiments. The participants of the School are further attracted to the Summer Research Programme conducted at CAT. The above Schools are extremely significant since, the Accelerator & Beam Physics and associated technologies are not yet part of the regular university curriculum in most parts of the world!, a curious scenario being faced by the interdisciplinary field of Accelerator & Beam Physics, across the globe.

Concluding Remarks

We have briefly described the Ion Beam Channeling and Accelerator Programmes in India. Materials Education is intimately tied with the industrial success and self-reliance of a nation. Taking into account the basic scientific knowledge required in physics, mathematics, and chemistry taught in the high school, and the twenty years or more it takes to create education programmes upto PhD level, we have to lay the foundation of what will be achievable in the year 2020 or may be only much later. Materials education is a very interdisciplinary field and requires support from other areas such as accelerator & beam physics. We need to include both (particularly the later) in the regular university curriculum. We need to evolve forums for accelerators & beam physics. Here we would like to cite the examples of the Japanese Beam Physics Club, the Particle Accelerator Society of China and the R&D Association for Future Electron

Devices, in Japan. When created, such Association/Society will provide the much awaited Forum, strengthening the accelerator & beam physics community nationally and beyond. This has been the case in various other areas of Physics, for a very long time. Then, why should accelerator & beam physics continue to make an exception? It is to be noted that Japan has seventeen synchrotron radiation sources in operation, the highest in the world for a single country! All this is definitely interwoven with the grand industrial success of Japan. With the right planning and suitable patronage, India can definitely achieve a similar industrial success in decades to come.

New Members

Enrolled between July 1 and September 30, 2002

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CALENDAR OF EVENTS, OCT 2002-OCT 2003

DATE	EVENTS	CONTACT PERSON (S)
October 21-25 2002	21 st International Conference on Nuclear Tracks in Solids (ICNTS-21)	The Convenor, 21 st ICNTS Secretariat Nuclear Science Centre Post Box 10502 Aruna Asaf Ali Marg New Delhi 110 067 Tel: 011-6892601/3, 6896639 Fax: 011-6893666 Email: icnts21@nsc.ernet.in Website: www.nsc.ernet.in/conf/icnts21

<p>October 24-25 2002</p>	<p>Resurgence of Metallic Materials - The current Scenario ROMM-2002</p>	<p>Dr. C S Sivaramakrishnan Co-ordinator, ROMM-2002 The Institution of Engineers (India) Subarnarekha Link Road, Sakchi, Jamshedpur 831 001 Tel : 0657-235636 Email : siva3a@sify.com</p> <p style="text-align: right;">OR</p> <p>Dr. S K Narang Deputy Director & Head, CRP Division Joint Co-ordinator, ROMM –2002 National Metallurgical Laboratory Jamshedpur 831 007 Tel : 0657-271709-14 (ext. 2120/2163) Fax : 0657-270527/2702511270279 Email : sknarang@csnml.ren.nic.in Shrikrishnan_narang@epatra.com</p>
<p>October 24-26 2002</p>	<p>32nd National Seminar on Crystallography (32nd NSC' 02)</p>	<p>Dr. Rajnikant Convenor, 32nd NSC'02 Crystallography Research Group Dept. of Physics, University of Jammu Jammu (Tawi) 180 006 Tel/Fax: +91 0191-453079/457137 Email: rkantverma@rediffmail.com</p>
<p>November 11-15 2002</p>	<p>47th Annual Conference on Magnetism & Magnetic Materials</p>	<p>Dr. James C Eckert Physics Department Harvey Mudd College, 301 E. 12th Street Claremont, CA 917119, USA Email: James_Eckert@hmc.edu</p>
<p>November 21-22 2002</p>	<p>National Seminar on Recent Trends in Optoelectronic Materials and Devices</p>	<p>Prof. B C Venkata Reddy Co-Convenor-NSRTOM-2002 Dept. of Physics, Sri Venkateswara University Tirupati 517 502 Tel: 91-8574-49666 Ext: 272/274 Email: profbcvr@hotmail.com</p>
<p>November 25-28 2002</p>	<p>Seventh APAM Topical Seminar on Multilayered Structures and Coatings</p>	<p>Prof. Zeng Dechang Institute of Materials Science & Technology Dept. of Mechano-Electronic Engineering South China University of Technology Guangzhou 510640, China Fax: +86-20-87111312 or 87111317 Email: medczeng@scut.edu.cn</p>
<p>November 27-29 2002</p>	<p>Seventh International Symposium on Advances in Electrochemical Science and Technology (ISAEST VII)</p>	<p>Dr. R Pattabiraman, Secretary Society for Advancement of Electrochemical Science & Technology (SAEST) Central Electrochemical Research Institute Karaikudi 630 006 Tel: 4565-427550-559 (10 lines) 424198 Fax: 4565427713/427779/427205/427206 Email: saestkkd@yahoo.com</p>

November 28-30 2002	CORCON 2002 National Convention on Corrosion East Asia Pacific Regional Conference	Conference Secretariat NACE International India Section 305-A, Galleria, Hiranandani Gardens, Powai Mumbai 400 076 Tel: 022-5797354, Fax: 022-6921572 Email: nace@bol.net.in Website: www.naceindia.org
December 2-5 2002	Eighth APAM Topical Seminar on Creating A Global Nanotechnology Network	Prof. Hwang Huey Liang Nano Technology and MEMS Research Centre National Tsing Hua University, Hsin-chy, Taiwan Email: hlhwang@ee.nthu.edu.tw
December 5-6 2002	National Symposium on Nanostructured Materials	A K Ganguli Dept. of Chemistry Indian Institute of Technology-Delhi Hauz Khas, New Delhi 110 016 Tel: 011-6591511, Fax: 011-6854715 E mail : ashok@chemistry.iitd.ernet.in ashokganguli@hotmail.com B R Mehta Dept. of Physics Indian Institute of Technology-Delhi Hauz Khas, New Delhi 110 016 Tel: 011-6591333, Fax: 011-6854715 Email : brmehta@physics.iitd.ernet.in brmehta_p@hotmail.com
December 10-17 2002	African Material Research Workshop African Renaissance through Science, Technology & Engineering	Prof. Aboubaker Chedikh BEYE Chairman of the Organizing Committee Universite Cheikh Anta Diop de Dakar Groupe de Laboratoires de Physique des Solides et Science des Materiaux et des Techniques Avancees GLPSSMTA/BP 5376/Dakar-Fann/SENEGAL Tel: (221)825-77-26 (O), (221)824-46-7 (R) Fax: (221)824-63-18, Email: acbeye@refer.sn
December 11-13 2002	International Symposium on Recent Advances in Inorganic Materials	Prof. D Bahadur Convener, RAIM-02 Dept. of Metallurgical Engineering & Materials Science Indian Institute of Technology-Bombay, Powai Mumbai 400 076 Tel: 022-5767632, Fax: 022-5723480 Email: raim02@met.iitb.ac.in / dhirn@met.iitb.ac.in
December 11-12 2002	National Conference on Recent Advances in Materials Science (NCMS 2002)	Dr. V Krishnakumar Convener-NCMS 2002 PG & Research Dept. of Applied Physics Nehru Memorial College Puthanampatti, Trichy 621 007 Tel: 04327- 434227, Fax: 0431-791300 Email: vkrishna_kumar@yahoo.com ncms2002@nmc.ac.in

OR

December 11-13 2002	International Conference on Sonar- Sensors & Systems ICONS-2002	HRS Sastry ICONS-2002 Naval Physical & Oceanography Laboratory Thrikkakara, Cochin 682 021, Kerala, India Tel: 0484-424929, 424911, Fax: 0484-424858 Email: icons2002@vsnl.net
December 16-18 2002	Twelfth National Seminar on Ferroelectrics and Dielectrics (NSFD-XII)	Prof. S B Krupanidhi Materials Research Centre Indian Institute of Science Bangalore 560 012 Email: sbkn@mrc.iisc.ernet.in
December 18-20 2002	Conference on Liquid Crystals and other Soft Materials	The Chairman Liquid Crystal Laboratory Raman Research Institute C V Raman Avenue, Sadashivanagar P.O Bangalore 560 080, India Fax : 080-3610492 Email: sadashiv@rri.res.in
December 19-22 2002	Recent Developments & Challenges in Physics	Prof. S N Kaul, Convener RDGP-2002, School of Physics University of Hyderabad Hyderabad 500 046 Tel : 040-3010500 (X-4300); 040-3012455 Fax : 040-3010227 Email : rdgph@uohyd.ernet.in http : //202.41.8516/~sop/index.html http : //www.uohyd.ernet.in
January 20-23 2003	International Conference on Phonons in Condensed Materials (Phonons 2K3)	Dr. Sankar P Sanyal Convener, Phonons 2K3 Department of Physics, Barkatullah University Bhopal 462 026 Tel: 0755-488539/489028 (O) Fax: 0755-550606 Email: spsanyal@sancharnet.in
January 20-27 2003	International School on Crystal Growth of Technologically Important Electronic Materials (ISCGTIEM)	Prof. Dr. K Byrappa, Chairman, ISCGTIEM University of Mysore, Dept. of Geology P B No. 21, Manasagangotri Mysore 570 006, India Tel: +91-821-515185 Fax: +91-821-515185 Email: kbyrappa@rediffmail.com byrappak@yahoo.com OR Dr. B Basavalingu, Secretary, ISCGTIEM University of Mysore, Dept. of Geology P B No. 21, Manasagangotri Mysore 570 006, India Tel: +91-821-515256, Fax: +91-821-515185 Email: bbmysore@yahoo.com

January 22-24 2003	International Workshop on Recent Advances in Nanotechnology of Magnetic Fluids (RANMF-2003)	Dr. R P Pant Secretary, RANMF-2003 National Physical Laboratory Dr. K S Krishnan Road New Delhi 110 012, India Tel : 011-5742610, Ext: 2309, Fax : 011-5852678/5764189 Email : rppant@csnpl.ren.nic.in ranmf@csnpl.ren.nic.in Website : http://www.nplindia.org
February 11-13 2003	14 th Annual General Meeting of MRSI	Dr. S Banerjee Materials Group Bhabha Atomic Research Centre , Trombay Mumbai 400 085 Tel: 022-5505239/5505050 Fax: 022-5560750 Email: sbanerji@magnum.barc.ernet.in OR Prof. Ashok Misra Director, IIT-Bombay Powai, Mumbai 400 076 Tel: 022-5723488/5767000, Fax: 022-5723456 (P) 5723480 (G) Email: director@iitb.ac.in/amisra@iitb.ac.in
April 21-25 2003	2003 MRS Spring Meeting	Materials Research Society 506 Keystone Drive, Warrendale PA 15086-7573, USA Tel: 724-779-3003 Fax: 724-779-8313 Email: info@mrs.org
June 29- July 4 2003	ICMAT 2003 International Conference on Materials for Advanced Technologies and IUMRS-ICA 2003 International Conference in Asia	ICMAT Secretariat Materials Research Society (Singapore) Institute of Materials Research & Engineering (IMRE) 3 Research Link Singapore 117602 Tel: (65) 6874 1975 Fax: (65) 6777 2393 Email: icmat@mrs.org.sg
October 10-13 2003	IUMRS-ICAM	Yokohama, Japan (details will be given later)

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