

Reports from symposia, workshops and conferences



The 2022 edition of 66th DAE Solid State Physics Symposium was organized at the Birla Institute of Technology situated at Mesra in Ranchi, Jharkhand during December 18-22. The symposium was sponsored by BRNS and the scientific program was planned and organized by Physics Group, BARC.

From the 800 contributory papers received for the symposium, 711 were chosen for final presentation. Besides, 3 plenary talks, 39 invited talks, 32 oral presentations, and 578 posters were part of the symposium.

The three talks delivered in the plenary segment are “Metavalent Bonding Origins of Unusual Properties of Group IV Chalcogenides” by Prof. Umesh V. Waghmare, JNCASR, Bangalore; “Premartensitic and Precursor Phenomena in Magnetic Shape Memory Alloys” by Prof. Dhananjai Pandey, IIT, BHU, Varanasi and “Light matter interactions in 2D semiconductors for quantum photonics” by Prof. Samit K. Ra, IIT, Kharagpur.

Dr. R. Chidambaram, Former Chairman, AEC, delivered his talk titled “From Raman Effect to Nuclear Power”. Prof. Indranil Manna, Vice Chancellor, BIT (Mesra) gave his talk on the topic “Science-Engineering-Technology Synergy Needed for Technological Self Reliance”. A talk on “Quantum Magnetism in Spin Systems of Lower Dimension” was delivered by Dr. S. M. Yusuf, Director, Physics Group, BARC.

2 Young achievers, 3 best Ph.D. theses and 29 best posters have been recognized and were duly awarded at the event. The proceedings of the event were uploaded online in DAE SSPS website (www.daessps.in)



Phase transitions

Soft Matter, including Polymer & Biological Systems

Nano-materials

Experimental Techniques and Devices

Single Crystal, Glasses and Amorphous Systems

Surfaces, Interfaces and Thin Films

Electronic Structures and Phonons

Dielectric, Ferroelectric and Piezoelectric

Transport Properties

Semiconductor and Spintronics

Magnetism and Superconductivity

Energy Materials

1-D, 2-D and quantum Materials

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Proceedings of NSRP-2023 released during the Inaugural Function.

(L-R) Dr. Atanu Barik (RPCD, BARC), Dr. Nandita Maiti (RPCD, BARC), Dr. A. K. Tyagi (Chemistry Group, BARC), Dr. Awadhesh Kumar (RPCD, BARC), Prof. Meenal Kowshik (Associate Dean SRCD, BITS Pilani, Goa) and Prof. Mainak Banerjee, (Department of Chemistry, BITS Pilani, Goa).

The 15th National Symposium on Radiation and Photochemistry (NSRP-2023) was held at BITS Pilani, K. K. Birla Goa campus during January 05-07, 2023. The Radiation & Photochemistry Division (RPCD) of Chemistry Group, BARC along with Indian Society for Radiation and Photochemical Sciences (ISRAPS) and Department of Chemistry, BITS Pilani, Goa organized the symposium, which included 9 scientific sessions, comprising 20 invited lectures by eminent scientists across India, and 121 contributory paper presentations. 150 delegates, including 20 eminent scientists from BARC and other reputed Indian R&D institutes attended the three-day scientific program.

The proceedings of the symposium have been covered in detail in a souvenir, which was released by Dr. A. K. Tyagi, Director, Chemistry Group, BARC during the inaugural function. A special ISRAPS bulletin was also unveiled at the program. The fundamental aspects of Radiation & Photochemical sciences, Applications of radiation & photochemistry, Theoretical aspects of radiation & photochemistry, Radiation & photochemistry of advanced materials, Atmospheric chemistry and Radiation & photochemistry in nuclear industry and healthcare and biology/life sciences have been covered in the form of lectures and presentations by the participants. Some important applications in the areas of current interest, such as energy, environment and health, were discussed.

Meritorious young researchers have been recognized by awarding them with Dr. Harimohan Memorial Award in Radiation Chemistry and Dr. P.K. Bhattacharya Award in Photochemistry during the symposium. NSRP-2023 was partially funded by the Board of Research in Nuclear Sciences (BRNS), and Science and Engineering Research Board (SERB), India.

Basic studies in radiation & photochemical sciences

Applications of radiation & photochemistry

Theoretical aspects of radiation & photochemistry

Radiation & photochemistry of advanced materials

Atmospheric chemistry

Radiation & photochemistry in nuclear industry, health care and biology/life sciences

**Symposium
topics**

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The release of proceedings of BEAM-22. Left to Right: Dr. Anil Boda, ChED, Dr. Sk. Musharaf Ali, Head AMCAS, ChED, Prof. B.K. Dutta, Institute Chair Professor (HBNI), Dr. K.T. Shenoy, Director, ChEG, Dr. Pooja Sahu, ChED and Rupsha Bhattacharyya, HWD, BARC.

BEAM-22

Theme Meeting on ‘Bridging Experiments and Atomistic Modeling’

A one-day theme meeting “Bridging Experiments and Atomistic Modeling” (BEAM-22) was organized at Training School Hostel BARC, Mumbai on November, 4, 2022 by Chemical Engineering Division, BARC in collaboration with the Board of Research in Nuclear Sciences (BRNS), Department of Atomic Energy (DAE).

Shri K.T. Shenoy, Director, Chemical Engineering Group and Chairman, BEAM-22 started the proceedings of the meeting with his welcome address. Dr. B. K. Dutta, Institute Chair Professor, HBNI and Chief Guest of the meeting, in his inaugural speech advocated the needs of multi-scale modeling approach for deciphering complex real problems. He also emphasized on increased cohesiveness between theory, computation and experimentation in various branches of science and engineering for careful conceptualization and successful implementation of research problems. He also advocated the need for constituting an ideal forum, which can function as a bridge for understanding theoretical aspects of atomistic modeling and experiments. The proceedings of the theme meet was unveiled by the Chief Guest. The vote of thanks was delivered by Dr. Sk. Musharaf Ali, Head, AMCAS, ChED and Convener, BEAM-22. Close to 100 delegates from DAE and non-DAE institutes participated in the meeting.

Total 15 invited lectures were delivered on various aspects of atomistic modeling, including application of computational tools for selection of suitable adsorbents for the extraction of metal ion and isotope separation, design of new molecules using machine learning, selection of glass composition for nuclear waste immobilization, thermodynamics of nuclear materials, tailor made deep eutectic solvents, and materials for alternative energy. Experts from various institutes, including IISc, TIFR, IACS (Kolkata), HRI (Prayagraj), IIT (Mumbai, Chennai, Guwahati) and BARC made presentations on various aspects of the theme meeting. In the concluding session, a panel discussion was conducted in which Shri K.T. Shenoy, Director, Chemical Engineering Group stressed the provision of a suitable platform, which can be leveraged properly by groups involved in atomistic and continuum modeling as well as experimentalists for solving complex chemical processes pursued by the Department of Atomic Energy. The registration of a new “Society for Atomistic and Continuum Modeling (SACM)” to bring all stakeholders of atomistic modeling and continuum modeling under a common roof was announced by Dr. Sk. Musharaf Ali (Convener, BEAM-22). The proposed society would function under the auspices of Chemical Engineering Division, BARC, Trombay.

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Theme Meeting on Hydrogen Energy and Technology

The Apex Committee on “Hydrogen Energy Program”, BARC organized a 2-day National Theme Meeting on Hydrogen Energy and Technology 2023 on 23 and 24th January 2023 at the DAE Convention Centre, Anushaktinagar, Mumbai. About 160 participants from DAE units and various public and private industrial organizations participated in this event. The objectives of this event were three-fold:

To showcase the hydrogen energy and economy related research and development activities and commercialization initiatives being carried out at BARC and other research organizations.

To obtain firsthand accounts of the industrial organizations' interest, current plans and programs towards deployment of hydrogen production and utilization technologies.

To identify possible collaborative activities between BARC and industrial sectors that may be taken up to advance the National Hydrogen Energy Program, announced on January 4, 2023.

Thematic areas discussed

- Hydrogen Generation
- Hydrogen Storage and Storage Devices
- Hydrogen Utilization and Safety

There were 21 presentations made in course of the two days, covering hydrogen production, storage and utilization, other than the key note session. The final day saw a panel discussion to summarize the proceedings of the meeting and to seek directions for the way ahead.

Based on the presentations and panel discussion held during the meeting, the following points may be considered regarding the way forward:

- Collaborative activities leveraging the individual strengths of the different collaborators are required. The multiple joint undertakings and projects between the PSUs and academic institutions show that this is the preferred pathway to accelerate system development and deployment.
- The pursuit of a technology development program should be prioritized on the basis of users of that technology. The technology transfer and scale up programs of BARC's alkaline water electrolyser technology reflects this approach. A systematic approach to generating and protecting intellectual property rights is also necessary in this regard.
- Commercial aspects must be taken into account from the initial stages of development; scientists must develop an appreciation of project economics to guide technology development work.

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Asian and Oceanic Congress for Radiation Protection

The Indian Association for Radiation Protection (IARP) and the Asian and Oceanic Association for Radiation Protection (AOARP) jointly organized the sixth edition of Asian and Oceanic Congress for Radiation Protection (AOCR6) with the theme *Radiation Protection and Surveillance in Nuclear, Medical, Industrial Facilities and the Environment* during February 7-11, 2023 at Nehru Centre, Worli, Mumbai.

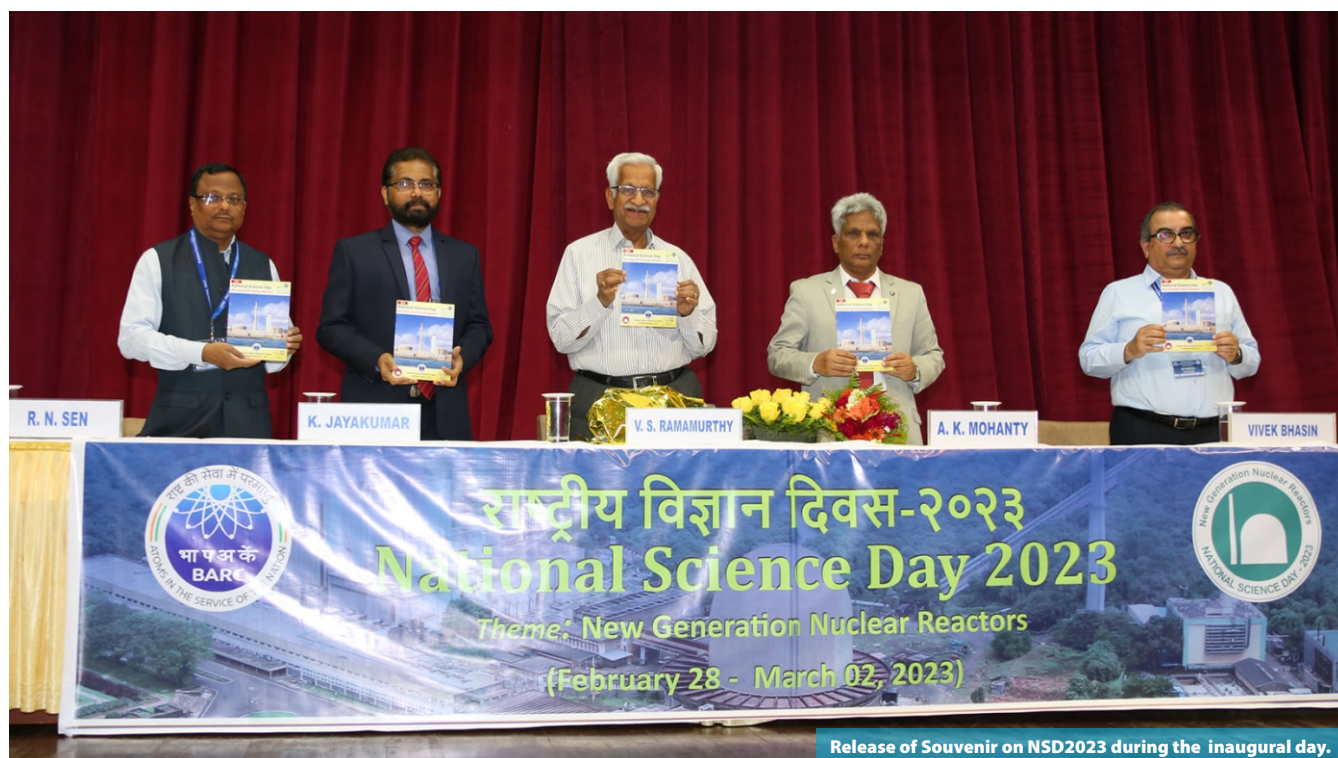
The scientific deliberations of the conference included latest developments in radiological surveillance at nuclear facilities and environment, assessment of radiation exposure to the public from natural radiation, environmental radioactivity, radiation dosimetry and preparedness to potential emergencies. The conference deliberations included 32 invited talks, 2 oratory talks, 92 oral presentations, 365 poster presentations and a panel discussion on *Radiation protection of people and the Environment: Future Perspectives*.

The conference was attended by about 450 delegates, including Radiation Protection professionals from India and abroad (particularly from Asian and Oceanic countries), DAE establishments, experts from ICRP, IAEA, IRPA and Japan Health Physics Society, students from educational institutions from India and abroad, and Radiation Safety Officers (RSO) of hospitals and industry.

A dedicated special session of IRPA young generation network (IRPA-YGN) forum was conducted on February 11 to generate a network among young radiation protection professionals in Asia Oceanic region on various issues related to career in radiation protection and safety in nuclear energy program, scientific developments in this field, public awareness.

One of the important outcomes of the AOCR6 congress was that "ICRP has considered deliberating on the revision of dose limits for the workers and public based on the scientific contents and discussions held during AOCR6, in their future reviews on Revision of System of Radiation Protection".

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NSD2023

on New Generation Nuclear Reactors

The National Science Day is celebrated every year on 28th February to commemorate the discovery of *Raman Effect* by renowned Indian Scientist and Nobel Laureate Prof. C. V. Raman. The aim of this celebration is to provide a platform for fruitful interactions between the students from various schools/colleges and leading scientists of BARC, as well as to emphasize on the significant role of science for the benefit of the society.

This year, it was celebrated at Central Complex Auditorium during 28th February to 2nd March 2023, with the theme *New Generation Nuclear Reactors*, to spread awareness about Nuclear Power as a clean, safe and sustainable option for our ever-increasing energy demands and global wellbeing.

More than 650 students and teachers from around 30 schools/colleges from Mumbai and Navi Mumbai have visited BARC Trombay. Audio-visuals, skits, quizzes, invited talks by eminent personalities on the topics broadly related to the theme, visits to various laboratories, exhibition of working models etc. were also organized. All these programs were planned to popularize scientific thinking, as well as to open up the new frontiers to the young minds.





Training Course on Isotope Hydrology

Bhabha Atomic Research Centre, Trombay and the Ministry of Jal Shakti (Water Resources) have joined hands to collaborate in an exercise for training and equipping the officials of Central Ground Water Board (CGWB) in the field of Isotope Hydrology. The training program was organized in two stages – classroom lectures at a dedicated facility of CGWB followed by practical training in BARC Trombay campus.

In the first leg of the program, a classroom based training course comprising lectures as well as case studies on Isotope techniques and its application in groundwater, was conducted at the Rajiv Gandhi National Ground Water Training & Research Institute (RGNGWTRI) in Raipur during November 7-11, 2022, by senior officers of Isotope and Radiation Application Division (IRAD), Bhabha Atomic Research Centre.

This was followed by a four-day training program (December 19-23) in BARC Trombay during which senior officers of BARC offered practical training in isotope hydrology techniques to CGWB officials. The specialized areas covered in this program include demonstration of sampling protocols to be followed for the measurement of various isotopes (both stable & radioactive) in water, training on the operation of various laboratory instruments such as Isotope Ratio Mass Spectrometer (IRMS), Low Level Liquid Scintillation Counter (LSC), Alpha Spectrometer, Radon monitor, Radium Delayed Coincidence Counter (RaDeCC), NaI Scintillation detectors, Ion Chromatograph (IC), field equipment.

Dr. J. Noble of BARC acted as the coordinator for the training program. Technical lectures on various topics in isotope hydrology were delivered by Dr. H.J. Pant, Dr. U.K. Sinha, Dr. J. Noble, Dr. K. Tirumalesh and Dr. S. Chatterjee of BARC.

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Training Program on safety and regulatory measures

The BARC Safety Council Secretariat (BSCS) conducts short term training courses for scientific and technical personnel of BARC facilities regularly. The 43rd course on 'Safety and Regulatory Measures for BARC Facilities' was conducted during June 22-25, 2022, which saw participation of sixty-one individuals from BARC.

Important topics addressed in the course include regulatory framework of BARC, radiation basics and natural radiation, radiological safety in front-end and back-end nuclear facilities, electrical safety, occupational health care, biological effects of radiation, industrial hygiene and safety, safety in storage and handling of chemicals, industrial safety aspects in fuel fabrication facilities, safety aspects of material handling equipment, regulatory aspects of radioactive waste management, regulatory inspections, event reporting, emergency preparedness and response to nuclear & radiological emergencies, and improvement of safety culture in the facilities.