

DAE-Solid State Physics Symposium*

At the annual Solid State Physics Symposium for the year 2003, 470 papers were presented by about 430 participants. The programme included 20 invited talks, one seminar session comprising three talks, 35 orals, 10 theses (oral and poster) presentations and two evening talks.

On the first day, after the inaugural function, the scientific session started with three invited talks on superconductivity and magnetism. The plenary talk was delivered by S. Ramakrishnan (TIFR, Mumbai) on the coexistence and competition of charge density waves with superconductivity or magnetism in $\text{RE}_3\text{Ir}_4\text{Si}_{10}$ compounds. He discussed the nature of multiple phase transitions in these compounds with $\text{RE} = \text{Dy}$ to Lu and Y . In the second talk, M. K. Wu (Academia Sinica, Taiwan) explained the nature of magnetic ordering in superconducting mixed ruthenium–copper oxide $\text{Sr}_2\text{RE}(\text{Ru}_{1-x}\text{Cu}_x)\text{O}_6$ ($\text{RE} = \text{Y}$ or Ho). A plausible theoretical model based on the double exchange mechanism explained the observed features of coexistence of magnetism and superconductivity. D. D. Sarma (IISc, Bangalore) discussed about the electronic and magnetic properties of a new class of magnetic materials, $\text{Sr}_2\text{FeMoO}_6$. He described the transitions in this compound having tungsten at various concentrations and presented its phase diagram. The next session of talks was focused on nano-phase materials. S. Ghosh (IISc, Bangalore) talked about carbon nanotube flow sensors in which results of recent experiments carried out by him and his group were presented. He explained how the flow of water and other liquids induces voltage/current in single-walled carbon nanotubes and discussed detailed features. This was followed by a talk on the defect and phase evolutions in self-ion implanted GaN nanowires by S. Dhara (IGCAR, Kalpakkam). He discussed the role of dynamic annealing (irradiation-induced defect annihilation) with emphasis on the fluence-dependent defect structure. The last talk of this session was on dynamics of monolayers on

metal nanoparticles by T. Pradeep (IIT-Madras, Chennai). He presented results of investigations on equilibrium structures of monolayers on planar and cluster surfaces. In the evening, S. K. Joshi (NPL, New Delhi) delivered a special lecture on 'The solid state needs a push with cohesion, collaboration and quest for quality'.

The first session on the second day contained three invited talks related to superconductivity and magnetism. S. Patnaik (JNU, New Delhi) talked about the physics and prospects of superconductivity in magnesium diboride (MgB_2) that was discovered in early 2001. He pointed out some of the open questions in this simple inter-metallic material. This talk was followed by a critical review by G. Baskaran (IMS, Chennai) on a currently popular theory of superconductivity in (MgB_2) involving sigma and pi-bands and a strong electron–phonon coupling. He pointed out certain difficulties with the electron–phonon mechanism and argued that a good fraction of Cooper pairing arises from resonating valence-band type correlations. Later, S. B. Roy (CAT, Indore) talked about phase coexistence and metastability across disorder-influenced first-order magnetic transition in doped CeF_2 . He described results of investigations showing clear evidence of magnetic phase-coexistence as the system is driven across a first-order antiferromagnetic to ferromagnetic transition. These two features, phase coexistence and metastability, must always be present at a disorder-influenced first-order transition.

The next session of invited talks was focused on high-pressure techniques. D. Häusermann (HPCAT, APS, USA) reviewed the beamlines and related facilities and the first results of the High-Pressure Collaborative Access Team (HPCAT) at the APS, which operates the research facility dedicated to study of materials under extreme conditions of pressure and temperature. This was followed by a talk on heating of samples at high pressure in diamond anvil cells by Sandeep Rekhi (Harvard University, USA). He described the experimental set-up by which materials can be heated from room temperature to thousands of degrees Kelvin using an ohmic and high power focused laser beam. He presented a method of determining the temperature using time-averaged

measurements with a CCD. B. K. Godwal (BARC, Mumbai) spoke about the studies on high-density matter created by laser-driven shocks. He pointed out the recent developments from several leading laboratories of the world involving the use of laser-driven shock-wave technique with the capability to measure the parameters (shock and particle velocities) of the equation of state. Rajeev Ahuja (Uppsala University, Sweden) dealt with results of molecular dynamics simulations in iron based on embedded atom potentials obtained by fitting to results of *ab initio* full potential LMTO and projector-augmented wave implementations of density functional theory. It was shown that both the models pointed to the stability of body-centred cubic phase of iron at high temperature and high pressure. In the evening, Satya Prakash (Jiwaji Univ., Gwalior) delivered a talk on 'The physics of nano materials'.

On the third day of the symposium, during the first session, G. Ravikumar (BARC, Mumbai) presented his work on equilibrium magnetization in the peak-effect regime of weakly pinned superconductors. He explained that the existence of a unique stable state corresponding to a particular critical current density is established experimentally in weakly pinned superconductors. Based on the evidence obtained from investigations of his group, he pointed out that the peak effect corresponds to a first-order transition. Umesh Waghmare's (JNCASR, Bangalore) talk dealt with the *ab initio* study of multiferroic materials. He presented results of *ab initio* calculations that help understand properties of BiFeO_3 multiferroic films whose structure is controlled through hetero-epitaxy. In the next session on disordered systems, Prabhodh Shukla (NEHU, Shillong) gave an analysis of random field Ising model. He presented some recent results on (a) roughening of domain walls in two dimensions, (b) magnetization in slowly driven ferromagnetic model starting from an arbitrary state and (c) magnetization in an anti-ferromagnetic model having an unbounded continuous distribution of the random field. His talk was followed by a presentation of $1/f$ noise in non-ohmic regimes of disordered systems by Kamal K. Bardhan (SINP, Kolkata). He reviewed

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some unique transport-related properties in time and frequency domains in relation to those in the ohmic regimes. The next session consisted of three talks, which were based on the soft condensed matter. N. V. Madhusudana (RRI, Bangalore) presented the results on liquid crystals made of banana-shaped molecules. He gave an overview of this subject with an emphasis on investigations of his group describing that by judiciously choosing compounds with rod-like and BC molecules, their binary mixtures exhibited several liquid crystalline phases, including a biaxial smectic A phase. D. C. Tiwari (Jiwaji Univ., Gwalior) talked about the development of organic polymer films for electronic applications. He presented the work done by his group on preparation of thin films of various polymers (by chemical and plasma polymerization), their characterization and investigations of electrical and optical characteristics such as conductivity, dielectric, UV, IR and visible properties.

The fourth day started with thesis presentations and a special oral session on manganites, followed by a talk by Arun Bansil (Northeastern Univ., USA). He

covered recent theoretical studies of electron correlation effects in novel materials related to cuprate superconductors, manganites and 3D quantum dots. In addition, he also explained an exactly solvable model Hamiltonian for describing the interacting electron gas in a quantum dot and presented results for a spherical square-well potential.

On the fifth day, there was a seminar session on neutron scattering containing three talks. V. C. Rakecha (BARC, Mumbai) gave an overview on various activities using neutron beams at BARC, Trombay. He described various facilities based on neutron scattering that were developed at BARC using which experiments in condensed matter physics are being successfully performed by scientists for over four decades. His presentation was followed by a talk on the Super Ultra-Small Angle Neutron Scattering (SUSANS) with polarized neutrons by A. G. Wagh (BARC, Mumbai). He reviewed investigations involving characterization of micrometre-size magnetic and nonmagnetic agglomerates in samples by SUSANS technique and presented illustrative results to demonstrate the capabilities of this technique. In the last talk, S. Yasho-

nath (IISc, Bangalore) presented results of studies on translational and rotational motions of small organic molecules in zeolites by Quasi-elastic Neutron Scattering (QENS) and molecular dynamics simulations. Based on QENS studies, the motion of propane molecules in cavities of zeolite Y was described using jump diffusion model. He also discussed the preliminary results on motion of acetylene within the zeolite Y.

In the concluding session, thesis presentations by Ranjan Mittal (BARC, Mumbai) and S. V. S. Nageswara Rao (University of Hyderabad) were jointly selected for the annual Indian Physics Association 'best thesis' award. B. K. Godwal summarized the scientific deliberations of the symposium and Satya Prakash made the concluding remarks.

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Workshops on open access in India*

Two workshops on open access and institutional archives were organized with a view to developing a cadre of open access experts in Indian higher educational and research institutions. The primary purpose of the workshops was to provide Indian scientists and librarians with (i) a thorough understanding of the global scientific and scholarly communication issues that open access addresses; (ii) the technical knowledge of how to set up and

maintain an open access institutional archive, and (iii) an awareness of the local institutional policy and organizational requirements for a successful, sustainable open access institutional archive.

In all, 48 participants representing general and agricultural universities and government laboratories under the various councils and departments, were trained in the two workshops. Some of them were scientists and others librarians, drawn from different parts of India and from different disciplines. There were four faculty members: Leslie Chan, University of Toronto, Leslie Carr, University of Southampton, D. K. Sahu, MedKow Publications, Mumbai, and T. B. Rajashekar, Indian Institute of Science (IISc), Bangalore. Incidentally, Chan was a resource person and Sahu a participant at the workshops on open access electronic journals that S. Arunachalam had organized two

years ago at IISc. In the intervening two years, Sahu had brought 20 Indian medical journals into the open access domain.

The workshops were held in a multi-purpose classroom, where each participant was provided with an Internet-connected PC preloaded with Linux (RedHat 7.3). Apart from discussing the philosophy of open access and the current international developments, the faculty members helped the participants learn to set up interoperable institutional open access archives using the Eprints software developed at the University of Southampton and the Open Archives Initiative's Interoperability protocol. Participants were asked to load papers from their own institutions and prepare the metadata.

Among the issues discussed at the workshop were: Who is responsible for setting up IR? How can we promote participation at the institutional level? What

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