

tering, ultra small angle X-ray scattering, digital video microscopy and confocal laser scanning microscopy. His talks overlapped those of Sood when he discussed experimental and simulational work on understanding the origin of attractive interactions in colloidal systems with detailed illustrations. So also his presentations dealing with phase transitions observed in colloidal systems by varying particle concentration, salt concentration and charge had echoes of behaviour described earlier in surfactants by Goyal and Manohar.

D. Khakhar (IIT, Mumbai) dealing with suspensions and powders described some of his work on coalescence in emulsions; these processes are of vital interest to industries in the preparation of paints, coatings, cosmetics, cutting oils, foods, etc. Another topic that Khakhar spoke about related to ubiquity of problems involving granular matter.

In a striking tabletop demonstration, he illustrated segregation and pattern formation in a rotating drum, filled with particles of two different sizes.

The Meeting was notable because of several highlights: (a) Theoretical ideas and models went hand-in-hand with tabletop experiments, for example, by Mehta and coworkers on ferrofluids, by Ranganath on liquid crystals and by Khakhar and his students on granular media; some of the video presentations were also illustrative (b) The breadth of topics covered by speakers illustrated the vital character of the field of SCM (c) The interdisciplinary nature of the meeting – as it included physicists, chemists, biologists, chemical engineers and industrial scientists – helped to focus attention on common problems (d) The lecture by V. M. Naik (Hindustan Lever Research Centre, Bangalore) related research aspects of

SCM physics and chemistry to industrial needs and requirements (e) Participant seminars (f) Extensive and informal interactions among all the participants, thanks to the residential nature of the Meeting at Dhvanyaloka. C. D. Narasimhaiah of Dhvanyaloka has been a key factor in the success of these meetings. It would be in the fitness of current trends in Science that the Trust should arrange more such meetings taking into account borderlessness amongst various disciplines of science although physics continues to play a catalysing role in all science activities.

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ICQ7 discussed behaviour of quasicrystalline intermetallics

The 7th International Conference on Quasicrystals (ICQ7) held at Stuttgart (Germany) during 20–24 September 1999 ended after a meaningful deliberation on the problems and the prospects of structure–property correlation in the entire gamut of metallic systems having large unit cell or no unit cell (may be a quasiunit cell in the intermetallics). ICQ7 attracted over 250 participants from 25 countries. The technical programmes were rich in both quality and quantity. Various aspects of quasi-periodic and long period metallic systems were covered in the following broad categories – (A) Synthesis, metallurgy and characterization; (B) Structure and mathematical modelling; (C) Electronic and magnetic properties; (D) Thermal and dynamic properties; (E) Mechanical properties; (F) Surface and thin films. The latest developments in these areas were reviewed by 22 invited speakers and the state-of-the-art was presented through 37 oral contributions and more than 200 posters. The theoretical and experimental results clearly demonstrated the interdisciplinary nature of the subject. The proceedings of the conference will be published in the international journal *Materials Science and Engineering A* after peer review.

India has been invited to host ICQ8 at the Indian Institute of Science, Bangalore during September 2002.

We shall summarize some of the important results, which may be helpful in addressing the unresolved issues in metallic systems having long finite periods and also without any periodicity comparable to the size of the system.

A) Synthesis, metallurgy and characterization: 4 invited lectures, 5 contributed talks and 45 posters were presented in this category. J. M. Dubois (France) stressed the need of precise knowledge of phase diagrams of the multicomponent systems for quasicrystals to be a potential candidate for technological applications. He began his talk with two products commercialized from these materials which refer to precipitation hardened steel and low adhesion coating. The other applications could be in the area of high performance tools, reduction of friction and wear, energy storage and thermal barrier materials. Other important papers pertained to the growth of single grain quasicrystals, phase transitions in qcs, conditions of formation of quasicrystals in Mg–Zn–RE, Al–Co–Ni, Al–Pd–Mn, Al–Cu–Fe and other systems. Newer methods of synthesis of materials were also dis-

cussed. Processing of composites by various routes was also presented.

B) Structure and mathematical modelling: In this category, there were 6 invited lectures, 13 contributed talks and 73 poster presentations. Knowing the underlying atomic arrangements in amorphous, crystalline and quasicrystalline solids has always fascinated scientists for comprehending structures and consequently their properties. Realizing the importance of this topic, the organizing committee supported the satellite workshop on 'Structure analysis of quasicrystals' by C. Beeli and W. Steurer after the conference during 24–25 September 1999. As a part of recommendations of this workshop, all published literature pertaining to structure will be kept in public domain which can be accessed free of cost by all the internet users. The website will be created by Walter Steurer and his colleagues at Zurich (Switzerland). The above theme in the ICQ7 included lectures like those of (a) Jeffery Lagarias (AT&T Bell lab, USA) on the concept of quasi-unit cell for a class of decagonal phases (b) F. Frey (Munich, Germany) on diffuse scattering and those concerning subtle details of HREM and X-ray diffraction studies using imaging plates.

C) Electronic and magnetic properties: The novel atomic order propagating in quasicrystalline solids is expected to possess electron transport behaviour and band structures qualitatively different from those of periodic translational order in 3d. Apart from these, the different nature of coordination and interatomic distances may also influence the splitting of various energy levels in quasiperiodic intermetallics, which in turn affect the magnetic behaviour of materials. These aspects were covered through 6 invited lectures, 8 contributed talks and 43 poster presentations. The nature of electron transport was discussed by O. Rapp (Stockholm, Sweden) and U. Mizutani (Nagoya, Japan). Apparently, the nature of electron conduction seems to be strongly sensitive to quality of the specimen and hence reproducibility seems to be a major problem. Photoemission studies reported by Z. M. Stadnick (Ontario, Canada) seem to suggest a universal pseudogap in the density of states curve at or around the Fermi level. Mg–Zn–RE systems are reported to be an ideal class of quasicrystalline solids for studying magnetic correlations. T. J. Sato (Tsukuba, Japan) presented various aspects of the above in a lucid manner for which he was adjudged the best speaker of ICQ7.

D) Thermal and dynamic properties: The dynamics of quasicrystals in Al–Ni–Co decagonal phase and Zn–Mg–Y

icosahedral quasicrystals were studied by inelastic neutron scattering and were reported by M. De Boisseu (Grenoble, France). High temperature specific heat of Al–Pd–Mn reported by K. Edagawa (Tokyo, Japan) was an important experimental study depicting a constant value of C_V between 300 K and 700 K which attained a value of 5 R at 1100 K. The experimental findings however, need to be understood. Other aspects of the nature of the thermal conductivity, process of diffusion, elastic constants, atomic defect studies by positron life time spectroscopy and time differential dilatometry were also discussed in this category of presentations. Apart from one invited lecture, there were four contributed talks and 23 posters covering various aspects of thermal and dynamical properties of qcs.

E) Mechanical properties: The three invited presentations pertaining to mechanical behaviour of qcs discussed (a) high strength quasicrystalline base aluminium alloys [A. Inoue, Sendai (Japan)], (b) defects and plastic behaviour of quasicrystals and approximants [M. Feuerbacher, Juelich (Germany)], (c) dislocations in quasicrystals and micromechanisms of plastic deformation of quasicrystals [R. Wang, Wuhan (China)]. Dislocation structures and toughness of qcs and also mechanical properties of composites were presented in this category. Apart from the 3 invited lectures, 2 contributed papers and

20 poster presentations deliberated on the challenges in these areas with particular reference to mechanisms of deformation and also the nature of dislocation movement in the presence of phonon and phason displacement fields.

F) Surface and thin films: The two invited lectures in this category dealt with (a) various aspects of interface characterization in qcs and their related phases [R. K. Mandal, Varanasi] and (b) the nature of surfaces in view of corrosion resistance, low friction, low surface and interfacial energy [P. A. Theil, Ames (USA)]. Many other aspects of coatings, surface oxidation and the nature of surface transformations were discussed through 5 contributed talks and 22 poster presentations.

The area of quasiperiodic structures has been shown to be truly international and interdisciplinary in nature.

All the delegates were appreciative of the splendid organization of the scientific, social and cultural aspects of ICQ7 by the three conference chairs, Professors Peter Kramer (Tubingen), H. R. Trobin (Stuttgart) and Knut Urban (Juelich).

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12th Khwarizmi International Award

Govind Swarup, Homi Bhabha Senior Fellow of the Homi Bhabha Fellowship Council has been awarded the 12th Khwarizmi International Award by the Iranian Research Organization for Science & Technology for his outstanding scientific contributions to the field of radio astronomy and for innovative design of the Giant Metrewave Radio Telescope recently constructed near Pune, India. The Award was presented to Govind Swarup by the President of Iran on 6 February 2000. Over the last decade, Govind Swarup was responsible for the indigenous design and construc-

tion of the Giant Metrewave Radio Telescope (GMRT) which has been set up recently by the National Centre for Radio Astrophysics of the Tata Institute of Fundamental Research, about 80 km north of Pune. GMRT consists of 30 fully steerable 45 m dish antennas of a novel design. The antennas are located in an interferometric array spread over a 25 km region, which provides radio images of celestial radio sources with a high resolution. GMRT has been fully designed and built in India by a team of dedicated Indian scientists and engineers. It is one of the largest radio telescopes in the world for operation at

decimetre and metre wavelengths. It has been designed for investigating certain outstanding problems in the field of astrophysics and cosmology.

Al-Khwarizmi was a ninth century scholar from Baghdad who wrote several books based on hellenistic, Hebrew and Hindu knowledge of which three are best known, viz. *Kitab al-jabr wa al-muqabalah*, *Algoritmi de numero Indorum* (as translated into Latin) and *Sind-Hind*. It is remarkable that the words algebra and algorithm can be traced to his books based on India's contributions to mathematics.