

---

## Editorial

---

### Suresh Mathew

School of Chemical Sciences,  
Mahatma Gandhi University, Kottayam,  
686 560, Kerala, India  
Fax: +91-481-2732278  
E-mail: sureshmathews@sancharnet.in

**Biographical notes:** Suresh Mathew received his MSc in Applied Chemistry from University of Cochin in 1984 and PhD in Chemistry from University of Kerala, India in 1992. He is the recipient of Alexander-von-Humboldt Fellowship for his post-doctoral research at Fraunhofer Institute fur Chemische Technologie, Karlsruhe, Germany (1993–1994). He was a Visiting Scientist at the Propellant and Special Chemicals Group, Vikram Sarabhai Space Centre (VSSC), Thiruvananthapuram (1995–1996) and a Visiting Fellow at the Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore (2000). He has been a Visiting Professor at the Department of Chemical and Materials Engineering, Lunghwa University of Science and Technology, Taiwan in 2009. He joined Mahatma Gandhi University as a Reader in Inorganic Chemistry in 1998 and is a Professor of Inorganic Chemistry since 2006. He has guided five PhD students for the Doctoral Degree and 10 MPhil students. His current research interest are in the broad area of solid state and materials chemistry in general and nanomaterials, composite solid propellants, advanced oxidisers, solid state kinetics, open framework solids, crystal engineering and biomaterials in particular. He is a member of several scientific societies and has 55 research publications in major international journals, two book chapters and two patents. He is a reviewer in the areas of nanomaterials; thermal analysis, catalysis, and coordination chemistry for many international journals of repute. He is currently one of the Associate Editors of *Global Journal of Inorganic Chemistry* and Editorial Board Member of *Journal of Nanoscience Letters* and *Global Journal of Analytical Chemistry*.

---

This special issue of the *International Journal of Nanotechnology* is a compilation of selected contributions at the International Conference on Advanced Materials (ICAM-2008) organised by Mahatma Gandhi University at Kottayam in the State of Kerala in India during 18–21 February.

Material development constitutes the heart of modern advances in science and technology. In materials research, new design paradigms have been enunciated which enable extraordinary control of the structure and properties of materials. From the early years of the new millennium, nano-science, in turn has given birth to the mesmerising world of nanotechnology. Current research efforts are mostly directed to chemical methods for self-assembly of nanomaterials in to complex nanostructures. Due to potential applications in nanocatalysis, optical and electronic devices, quantum computing and crystallography, fabrication of nanostructured materials has been an intensively attracted topic. These nanostructures are generally synthesised in many forms

including highly monodispersed spherical nanoparticles to several anisotropic nanostructures such as wires, rods, tubes and ribbons. The metal composites of carbon nanotubes are of immense interest currently owing to potential applications in the field of catalysis, sensors and fuel cells. Considerable efforts have been focused on the synthesis of oxide nanostructures with tailored morphology for enhanced photocatalysis.

Semiconducting nanoparticles impeded in a conducting polymer matrix have potential applications in solar energy conversion, radiation detection and sensing arrays. Catalysis is the back-bone of chemical industries and they will continue to be essential in numerous applications that are indispensable to enhance quality of our life and society. Magnetic materials are the essential components in most of the technological applications such as information technology and telecommunications. The interesting and unexpected properties of the nanostructured magnetic materials are mainly due to their very high surface to volume ratio.

Composite solid propellants are used in major space boosters because of their high reliability and long shelf life. Energetic materials produced on the nanoscale have the promise of increased performance, energy release and mechanical properties. Modelling and prediction to design new high energy molecules should precede synthetic efforts, in order to reduce cost and hazards. Propellant formulations based on carbon nanotubes are reported to give enhanced performance by way of improved combustion characteristics, energy release and mechanical properties. Inorganic-organic hybrid materials or open frame work solids are another emerging area of advanced materials. Studies on the structure-directed synthesis of chalcogenides with unusual structural features have been reported. Microporous and nano-sized materials like zeolites find potential applications in opto-electronics. In the recent past, zeolites were reported to be synthesised by hydrothermal methods. But now the dry-gel conversion method where the zeolite synthesis is performed under non-aqueous conditions is subsequently developed.

Keeping in pace with the global development of novel synthetic strategies for the formation of advanced functional materials competition, School of Chemical Sciences, Mahatma Gandhi University, Kottayam, Kerala, India launched an "International Conference on Advanced Materials" (ICAM-2008) steered by an expert committee during 18–21 February. The objective was to bring together researchers, scientists and academia active to focus on the overall research and development in this area and to create advanced facilities encompassing universities, national laboratories and industry so that India can become a significant global player in this area and help to bring the products of technology for the benefit of people. The response for the conference from the scientific community was overwhelming. ICAM-2008 technical programme comprised plenary, keynote and invited talks from pioneers, stalwarts and other active researcher's from all over the world, contributed lectures from the young scientists and poster presentations. The four-day conference provided an apt atmosphere for the participants to discuss, to interact and to exchange their prolific ideas and latest findings with some of the best minds in the field. One of the highlights of the conference was the opportunity it gave to the young researchers who could present their ideas before the high level scientific community.

The conference covered a wide range of interdisciplinary topics such as nanomaterials, framework solids, porous materials, biomaterials, energetic materials and energy storage materials which are in the forefront of present day material-development. The conference also covered theoretical modelling/simulations, novel approaches in

materials synthesis, characterisation techniques and applications along with materials education.

The keynote lectures in the conference were delivered by Prof. Gerard Ferey, Institut Lavoisier, University of Versailles, France, Prof. Bruce Parkinson, Colorado State University and Prof. Robert M. Metzger, University of Alabama, USA. Prof. Ferey spoke about the recent advances in the area of porous solids, having immense applications in every day human life. Prof. Parkinson discussed the combinational approach for solving the problems of solar water photo electrolysis. Prof. Metzger presented his latest findings in the area of unimolecular rectifiers.

Other prominent speakers included Stephen Pennycook (Oak Ridge National Lab, USA), Alan Herbert Cowley (University of Texas, Austin, USA), Maurizio Prato (Universita degli Studi di Trieste, Italy), Annie Powell (Universität Karlsruhe, Germany), Hua Chun Zeng (NUS, Singapore), Bernd Harbrecht (Philipps University Marburg, Germany), Song GAO (Peking University, China), Jiesheng Chen (Jilin University, China), Gopinath Sankar (Davy Faraday Research Laboratory, UK), A.V. Powell (Heriot-Watt University, UK), Helmut Ehrenberg (Institute for Complex Materials, Germany), Sang Il Seok, (Korea Research Institute of Chemical Technology, Korea). Lu Li (Advanced Materials for Micro and Nano System, Singapore, Micha Polak (Ben-Gurion University, Israel), Luis Augusto Rocha (Universidade do Minho, Portugal). K George Thomas of NIST, Trivandrum, and Guru Row of IISc, Bangalore, G.U. Kulkarni and Chandrabhas Narayana of JNCASR, Bangalore were among the prominent speakers from India.

About 40 delegates from USA, UK, Japan, Russia, France, Germany, Italy, Singapore, South Africa, Taiwan, China, South Korea and more than 200 scientists and experts from various research institutes and universities in India had attended the conference spanned over four days. Scientific sessions of the conference included 50 invited lectures and two poster sessions. In addition to the stimulating scientific sessions of the conference, the participants enjoyed the natural beauty and cultural heritage of Kottayam known as the “land of letters, lakes and latex” in the state of Kerala, one of the world’s major tourist attractions and nicknamed as “Gods Own Country”.

After discussion and agreement by the Editor-in-Chief, Dr. Lionel Vayssieres, it was decided to create this special issue to enable the best selected papers presented at this conference to be featured in *International Journal of Nanotechnology*. In this special issue, galaxies of eminent and upcoming dedicated scientists working in the field of nanoscience have contributed interesting articles addressing diverse topics related to nanotechnology. After several months of strict and thorough selection and review processes, 19 papers were selected for this special issue dedicated to nanotechnology. These contributions cover a wide range of topics: Carbon Nanotubes, Magnetic Nanomaterials, Composite solid propellants, Nano-bio-sciences, Nanotechnology, Nanoelectronic, Modelling and simulation. Although they are independent works, they constitute an overall reference of very latest scientific and technological progress in nanotechnology.

To quote a few among the selected papers in this special issue, Stephen J. Pennycook in his paper, “Seeing inside materials by aberration-corrected electron microscopy” discusses the recent successful correction of lens aberrations. He also shows how combining the microscopy data with first-principles theory gives new insights into materials properties. Micha Polak and Leonid Rubinovich in their paper explain that theoretical computations of alloy surface phenomena, such as elemental segregation,

within atomic pair-interaction models, necessitate the use of reliable bond energies as input. This work introduces the idea to extract the coordination dependence of bond energies from density-functional theory (DFT) computed surface energy anisotropy. The paper by Maurizio Prato is focused on the importance of functionalised carbon nanotubes and their high biocompatibility with lack of toxicity. The papers by Anthony V. Powell discuss the structure directed synthesis of chalcogenides from chains to 3-dimensional frame works and by Hartmut Fuess, structural characterisation of textured gold nanowires. The work by K.S. Yang is novel in its preparation method to produce well-dispersed iron oxide nanoparticles in polyacrylonitrile (PAN) nanofibres.

I would like to thank Editor-in-Chief, Dr. Lionel Vayssieres for giving the opportunity to edit this special issue of the *International Journal of Nanotechnology*. It has been a pleasurable and educational experience. As the guest editor, I wish to extend my sincere gratitude to all the authors who eagerly contributed high quality manuscripts in this special issue.