

# Preface

In recent years, nanomaterials have become the latest research field of interest due to their size-induced unique properties. Nanotechnology has the potential to change all aspects of our lives in such diverse areas including electronics, energy, biomedicine, environment and security. As such, nanoscience is an interdisciplinary research area and its development encompasses various fields of science and engineering. Its applications in real world and commercial developments are already taking place today.

In light of the fast-paced advancements in nanoscience and nanotechnology taking place all over the world, it is of interest to capture state-of-the-art research and development in nanotechnology in India and to facilitate collaboration in multidisciplinary research areas. With this end in view, the Nanocentre at the B. S. Abdur Rahman University organized a three day International Conference on “Nanomaterials: Science, Technology and Applications (ICNM’13)” during Dec 5- 7, 2013 in collaboration with Deakin University, Australia, and Universiti Teknologi MARA, Malaysia.

**The main theme of the conference was to address and deliberate on the latest technical status and recent trends in the research and applications of nanotechnology. This is a unique conference with a specific focus on nanomaterials.** This conference has been so designed with the view to provide an opportunity for the scientists, engineers, industrialists, students and other professionals from all over the world to interact and exchange their new ideas and research outcomes for future collaboration. The conference was also aimed at motivating the next generation of researchers to promote their interests in nanoscience, nanotechnology and their applications.

Over 350 delegates from all over the world were brought together in Chennai to share their latest research in various nanotechnology fields including materials, chemistry, physics, biology, and polymers. To accommodate the large number of lectures, 3 parallel sessions were conducted with the themes in Nano in chemistry and physics, Nano in bio and polymers and Nano in devices and applications.

**26** invited talks including 3 plenary lectures, 3 keynote lectures and 20 invited lectures were presented by world-class experts from various organizations and Universities in India and abroad including Australia, Malaysia, UK, USA and Brazil. In addition, **89** oral and **95** poster presentations were given by the research scholars from all over the world.

This Proceedings contains 55 selected papers which have been authored by a combined total of 147 authors. Each contributed paper was rigorously peer-reviewed by two reviewers who were drawn from a large pool of Organizing and Advisory Committee members as well as other experts in the field from India and abroad.

ICNM13 would not have been possible without the strong support from numerous organizations and individuals. The efforts and support provided by all the authors, reviewers, sponsors, invited speakers, members of advisory board and organizing team comprising students and faculty volunteers and all others who have contributed to the successful organization of this conference, are gratefully acknowledged. Special thanks are due to Vice Chancellors of B S Abdur Rahman University, UiTM, Malaysia and Deakin University for making ICNM13 a grand success.

Dr R.Vasanthakumari  
B S Abdur Rahman University  
March 2014

## ADVISORY AND ORGANISING COMMITTEE

<b>Dr. R. Vasanthakumari</b>	B S Abdur Rahman University – Organising Chair
<b>Dr. I. B. Shameem Banu</b>	B S Abdur Rahman University – Organising Chair
<b>Dr. Jagat R. Kanwar</b>	Deakin University, Australia – Chair
<b>Dr. Takuya Tsuzuki</b>	Australian National University, Australia – Chair
<b>Dr. Abdul Hadi</b>	Universiti Teknologi MARA, Malaysia – Chair
<b>Mr. Abdul Qadir Rahman Buhari A</b>	Chairman, B S Abdur Rahman University, India
<b>Jane Den Hollender</b>	Vice Chancellor, Deakin University, Australia
<b>Prof. Ir. Dr. Sahol Hamid Abu Bakar</b>	Vice Chancellor, Universiti Teknologi MARA, Malaysia
<b>Prof. J A K Tareen (Padma Shri)</b>	Vice-Chancellor, B S Abdur Rahman University, India
<b>Dr. V M Periasamy</b>	Pro-Vice Chancellor, B S Abdur Rahman University, India
<b>Dr. V Murugesan</b>	Registrar, B S Abdur Rahman University, India
<b>Mr. V N A Jalal</b>	Director (Admin), B S Abdur Rahman University, India
<b>Dr. A. Hannah Rachel Vasanthi</b>	Pondicherry University, Pondicherry
<b>Dr. Abdel Hadi Kassiba</b>	Université du Maine, France
<b>Dr. Arunachalam Dharmarajan</b>	Curtin University, Australia
<b>Dr. Ashok M</b>	NIT, Trichy, India
<b>Dr. Brett Kirk</b>	Curtin University, Australia
<b>Dr. David F L Jenkins</b>	Plymouth University, UK
<b>Dr. Jacob Muthu</b>	University of Witwatersrand, South Africa
<b>Dr. Jayavel R</b>	Anna University, Chennai, India
<b>Dr. John V. Kennedy</b>	NIC GNS, New Zealand
<b>Dr. K S Dhathathreyan</b>	ARCI, Taramani, Chennai
<b>Dr. Kishorchandra Rewatkar</b>	Dr. Ambedkar College, Nagpur
<b>Dr. Kulkarni G U</b>	JNCASR, Bangalore, India
<b>Dr. M S Ramachandra Rao</b>	IIT Madras, India
<b>Dr. Mani V N</b>	C-MET, Hyderabad, India
<b>Dr. Mohan Rao G</b>	IISc, Bangalore, India
<b>Dr. Mohd Nasir Taib</b>	Universiti Teknologi, MARA, Malaysia
<b>Dr. Murali Rangarajan</b>	Amrita Vishwa Vidyapeetham, Coimbatore
<b>Dr. Natarajan T.S</b>	IIT, Madras, India
<b>Dr. Norlida Kamarulzaman</b>	Universiti Teknologi, MARA, Malaysia
<b>Dr. Pradeep T</b>	IIT Madras, Chennai, India
<b>Dr. Pramanik</b>	IIT, West Bengal, Kharakpur, India
<b>Dr. Rasiah Ladchumananandasivam</b>	Centre of Technology, URN, Brazil
<b>Dr. Rita John</b>	University of Madras, India
<b>Dr. Seeram Ramakrishna</b>	NUS, Singapore
<b>Dr. Singh V R</b>	IEEE Delhi, New Delhi, India
<b>Dr. Sitaram Dash</b>	IGCAR Kalpakkam, India
<b>Dr. Subrahmanyam A</b>	IIT Madras, Chennai, India
<b>Dr. Tarasankar Pal</b>	IIT Kharagpur, India
<b>Dr. V. Rajendran</b>	KSRCT, India
<b>Dr. Vasu Punj</b>	University of Southern California, USA
<b>Dr. Vijayamohanan K. Pillai</b>	CECRI, Karaikudi, India

## LOCAL ORGANISING COMMITTEE

**Dr. S. S. M. Abdul Majeed**, Polymer Engg  
**Dr. D. Easwaramurthy**, Chemistry  
**Dr. M. Basheer Ahamed**, Physics  
**Dr. P. M. Usha Rani**, English  
**Mr. G. V. Vijayaraghavan**, Physics  
**Dr. J. Thirumalai**, Physics  
**Dr. S. Krishnan**, Physics  
**Dr. R. Karthikeyan**, Life Science  
**Dr. Revathy Purushothaman**, Chemistry  
**Dr. S. Mahasampth Gowri**, Chemistry  
**Dr. A. Shahjahan**, Chemistry  
**Mr. D. Murali Manohar**, Polymer Engg  
**Mr. Basanta Kumar Behera**, Polymer Engg  
**Ms. M. Katheeja Parveen**, CA  
**Dr. P. Panneerselvam**, Library  
**Ms. K. P. Sindhu**, Polymer Engg  
**Dr. T. R. Rangaswamy**, Dean (Academics)  
**Mr. L. Aravindh Kumaran**, CBS  
**Dr. K. Boopathy**, EEE  
**Mrs. K. Yogeswari**, Arch.  
**Mr. S. Akbar Basha**, Civil  
**Dr. P. S. Sheik Uduman**, Maths  
**Dr. A.S. Prasanna Venkatesh**, Maths  
**Dr. Md Khurshid Alam Khan**, Life Science  
**Dr. Soumen Bera**, Life Science  
**Dr. M. K. Sangeetha**, Life Science  
**Dr. P. Rathna**, English  
**Mrs. A. Catherine Anna Pushpam**, English  
**Mrs. S. Grace Vinitha**, English  
**Mr. R. Sathish Kumar**, Mech.  
**Dr. Naseer Ahmad**, Life Science  
**Mrs. L. Annagowsalya**, Mech.  
**Mr. Sudarshan**, ECE (Student Sec.)

**Dr. S. K. Rani**, Chemistry  
**Dr. K. Karthikeyan**, Chemistry  
**Dr. I. Raja Mohamed**, Physics  
**Dr. S. Hemalatha**, Life Science  
**Mr. M. Mohamed Sheik Sirajudeen**, Physics  
**Dr. R. Indirajith**, Physics  
**Dr. E. Manikandan**, Physics  
**Dr. S. Chandran**, P.Edu.  
**Dr. S. Bhagavathy**, Chemistry  
**Dr. J. Elangovan**, Chemistry  
**Dr. J. Herbert Mabel**, Chemistry  
**Mrs. J. Shahitha Parveen**, Polymer Engg  
**Ms. S. Shamshath Begum**, Polymer Engg  
**Mr. F. Abubecker**, AR/PRO  
**Mr. M. Meenakshi Sundaram**, Est. office  
**Mr. D. Shanmugam**, Canteen Manager  
**Dr. I. Mohammed Bilal**, Controller of Exam  
**Mr. I. Hasan Abdul Kader**, Est. office  
**Ms. S. Vijayarani**, Polymer Engg  
**Mr. S. Vikram**, PNTC  
**Mrs. R. Gayathri**, PNTC  
**Mr. A. Musammil Hareed**, PNTC  
**Mr. G. Dhanasekaran**, Polymer Engg  
**Mr. R. Krishnan**, Physics  
**Mr. G. Shanmuganathan**, Physics  
**Ms. R. Rizwana**, Physics  
**Ms. A. Sathiya Priya**, Physics  
**Ms. R. Sasikala**, Chemistry  
**Mr. R. Mohanraj**, Chemistry  
**Mrs. S. Thilagavathy**, Chemistry  
**Mr. D. Somasundaram**, Chemistry  
**Mr. T. R. Ashok Kumar**, Physics  
**Mr. G. Somasundaram**, Chemistry

**Organized**

**by**

**B.S.ABDUR RAHMAN UNIVERSITY, INDIA**



**DEAKIN UNIVERSITY, AUSTRALIA**



**UNIVERSITI TEKNOLOGI MARA, MALAYSIA**



## Sponsors



**Department of Science and Technology  
Ministry of Science and Technology**



**Department of Bio Technology  
Ministry of Science and Technology**



**S R M UNIVERSITY**



**RELIANCE INDUSTRIES LIMITED**



**CIPET**



**THE HINDU**



**INDIAN OVERSEAS BANK, VANDALUR Branch**



**APOLLO TYRES**



**THERMO FISHER SCIENTIFIC**



**PANALYTICA INDIA SPECTRIS  
TECHNOLOGIES PVT LTD**



**RANGA TECHNO IMPEX**

## **Plenary and Keynote Lectures**

Multifunctional Chimeric Survivin Targeted Nano-bullets against Cancer Stem Cells  
Dr. Jagat Kanwar, Deakin University, Australia

Clusters, nanoparticles and water  
Dr. T. Pradeep, IIT Madras, Chennai

Physics and Applications of Nanostructures and Nanomaterials  
Dr. M. S. Ramachandra Rao, IIT Madras, Chennai

Life Cycle Assessment of Nanomaterials: Towards Green Nanotechnology  
Dr. Takuya Tsuzuki, Australian National University, Australia

Metal oxide nanostructures and metal oxide thin films  
Dr. Norlida Kamarulzaman, Universiti Teknologi, MARA, Malaysia

## **Invited Lectures**

Structure and electric-magnetic properties of nanosized hexaferrites synthesized by sol gel auto combustion technique for high frequency applications.  
Dr. Kishore Chandra Rewatkar, Dr. Ambedkar College, Nagpur

Nanocomposite substrates for surface enhanced Raman scattering (SERS) down to single molecular level  
Dr. Tarasankar Pal, IIT Kharagpur

Synthesis and application of TiO<sub>2</sub> nanocoating on PLA fibres by pulsed dc magnetron sputtering (PMS)  
Dr. Rasaiah Ladchumanandasivam, URN, Brazil

Polymer nano-composites: an engineering perspective  
Dr. Jacob Muthu, University of Witwatersrand, South Africa

Biocompatible nanocomposites for tissue engineering applications  
Dr. V. Rajendran, KSRCT, Thiruchengode

Electrospun metal-oxide nanofibers and their applications  
Dr. T. S. Natarajan, IIT Madras, Chennai

Study on the microstructure and redox properties of C<sub>x</sub>Zr<sub>(1-x)</sub>O<sub>2</sub> nanocatalysts  
Dr. Abdul Hadi, Universiti Teknologi, MARA, Malaysia

Thin film microbatteries – power sources for next generation devices  
Dr. G. Mohan Rao, IISc, Bangalore

Wnt Antagonist, Secreted Frizzled-Related Protein-4 (sFRP4), Increases Chemotherapeutic Response Of Glioma Stem-Like Cells

Dr. Arunachalam Dharmarajan, Curtin University, Australia

Quantifying the relationship between the biomechanical properties and microstructure of connective tissues

Dr. Brett Kirk, Curtin University, Australia

Interesting aspects of heavy metal interaction with biopolymer composites for environmental remediation

Dr. N. Rajesh, BITS-Pilani, Hyderabad Campus

Detecting Silver Nanoparticles in Aqueous Colloids with Surface Plasmon Resonance – Challenging the Limits of Dynamic Light Scattering

Dr. David F. Jenkins, Plymouth University, UK

Graphene-metal oxide composites with improved properties for photo catalytic and super capacitor applications

Dr. R. Jayavel, Anna University, Chennai

Functionalized graphene as electrochemical sensing platform

Dr. Murali Rangarajan, Amrita Vishwa Vidyapeedam, Coimbatore

Role of advanced nano pure electronic materials and devices in strategic aerospace/ defence applications – a bird's eye view and select results on the preparation of nano pure gallium for GaAs technology - an indigenous effort

Dr. V. N. Mani, C-MET, Hyderabad

Influence of Transition metals on the Optical and Magnetic properties of Nano ZnO

Dr. Rita John, University of Madras, Chennai

Nanomedicine of Ancient Times - A Scientific Study of a Herbometallic Siddha drug Tamira Parpam

Dr. A. Hannah Rachel Vasanthi, Pondicherry University, Pondicherry

Nanostructured Coatings for Surface Engineering Applications

Dr. Sitaram Dash, IGCAR, Kalpakkam

Recent developments in Electrocatalysts for Low Temperature Fuel Cells at ARCI

Dr. K S Dhathathreyan, ARCI, Taramani, Chennai