

Nanostructured Advanced Materials

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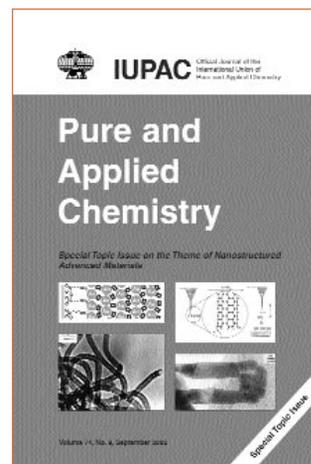
IUPAC, 2002.

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A focus of frontline interdisciplinary research today is the development of the conceptual framework and the experimental background of the science of nanostructured materials and the perspectives of its technological applications. The subjects of nanoscience and nanotechnology pertain to the synthesis, characterization, exploration, interrogation, exploitation, and utilization of nanostructured materials, which are characterized by at least one dimension in the

nanometer domain. Such nanostructured systems constitute a bridge between single molecules and infinite bulk systems. Individual nanostructures involve clusters, nanoparticles, nanocrystals, quantum dots, nanowires, and nanotubes, while collections of nanostructures involve arrays, assemblies, and superlattices of individual nanostructures.

The implications of quantum size and shape effects on the energetics, nuclear-electronic



Typical dimensions of nanostructures and their assemblies

(reproduced from J. Jortner and C.N.R. Rao, *Pure Appl. Chem.* 74(9), 1491-1506, 2002)

Nanostructure	Size	Material
Clusters Nanocrystals Quantum dots	Radius: 1 - 10 nm	Insulators, semiconductors, metals, magnetic materials
Other nanoparticles	Radius: 1 - 100 nm	Ceramic oxides
Nanobiomaterials Photosynthetic reaction center	Radius: 5 - 10 nm	Membrane protein
Nanowires	Diameter: 1 - 100 nm	Metals, semiconductors, oxides, sulphides, nitrides
Nanotubes	Diameter: 1 - 100 nm	Carbon, layered chalcogenides
Nanoblorods	Diameter: 5 nm	DNA
2-D arrays of nanoparticles	Area: Several nm ² - μm ²	Metals, semiconductors, magnetic materials
Surfaces and thin films	Thickness: 1 - 1000 nm	Insulators, semiconductors, metals, DNA
3-D superlattices of nanoparticles	Radius: several nm	Metals, semiconductors, magnetic materials

level structure, electric-optical response, and dynamics, reveal new unique physical phenomena that qualitatively differ from those of the bulk matter and provide avenues for the control of the function of nanostructures.

This special topic issue of *Pure and Applied Chemistry* includes reviews and research papers based on lectures presented at the second Workshop on Advanced Materials: Nanostructured Materials (WAM II), held from 13-16 February 2002 in Bangalore, India (See Conference report, *CI* May 2002, p.22). This PAC issue was coordinated by Professor J. Bull, IUPAC Special Topics Editor and Professor G.U. Kulkarni, chairman of the Local Organizing Committee. The papers addressed recent developments in the broad, interdisciplinary research field of nanostructured materials and are organized under the following categories: synthesis and characterization, spectroscopic and other physical prop-

erties, and applications of nanostructured materials.

Perspectives and directions are given in the introduction authored by C. N. R. Rao and Joshua Jortner. That paper highlights some significant aspects of the characterization, interrogation, and response of nanostructures, in conjunction with theoretical modeling of the unique structure, dynamics, and function of quantum structures and their assemblies.

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IUPAC Materials Initiative

Suggestions, comments, questions regarding IUPAC activities on the subject of **Materials Chemistry** should be addressed to **Prof. John Corish** <jcorish@tcd.ie>, chairman of the Subcommittee on Materials Chemistry.

Macromolecule-Metal Complexes

A. Guiseppi-Elie and K. Levon (symposium eds.)
Macromolecular Symposium, Vol. 186.
Wiley-VCH, 2002, pp. 1-185.
(ISBN 3-527-30476-2)

This text is intended for scientists, engineers, and other technical personnel who seek a current assessment of the rapidly growing field of macromolecule-metal complexes. The book is the result of technical contributions to the 9th International Symposium on Macromolecule-Metal Complexes (MMC-9) sponsored by IUPAC, the Polymer Division of the American Chemical Society (POLY, ACS), and Polytechnic University. The symposium, which featured four plenary addresses, was organized by the Herman F. Mark Polymer Research Institute and held 19-23 August 2001 at the Polytechnic University's Metrotech Center in Brooklyn, NY, USA.

The keynote address was delivered by Professor Eli Pearce, president of the American Chemical Society, who spoke on a "Strategy Plan for the American Chemical Society." The other plenary addresses were delivered by Professor Victor Kabanov (Moscow State University, Russian Academy of Sciences) on "Cooperativity Effects in Polyelectrolyte Complexation;" Professor Alan MacDiarmid (Nobel Laureate in Chemistry, 2000, University of Pennsylvania) on "Synthetic Metals: a Novel Role for Organic Polymers;" and Professor Eishun Tsuchida (Waseda University) on "Human Serum Albumin Incorporating Lipidhemes as an Oxygen Infusior."

Thematically, the book is organized according to the topical conferences of the symposium. The symposium focused on the role of metal ions, complexes, and metallic clusters in macromolecular systems wherein the polymeric materials were either natural or synthetic organic, or synthetic inorganic. The symposium addressed new directions such as supramolecular assemblies, bio-related applications, and organic and inorganic chemistry. Conferences were held addressing such important contemporary issues as macromolecule-metal complexes in green chemistry and polyelectrolytes and polymer batteries. For the first time at this MMC symposium, a conference was dedicated to macromolecule-metal complexes formed from inherently conductive polymers with the potential for metal-like conductivity. Other conferences addressed electronic, magnetic, and optical properties of macromolecule-metal complexes; bio-related applications; and physical properties of macromolecule-metal complexes.

The symposium chairs were Professors E. Tsuchida, Waseda University, Tokyo, Japan, and Kalle Levon and Yoshi Okamoto, Polymer Research Institute, Polytechnic University, Brooklyn, NY, USA. The first MMC symposium was held in Beijing in 1985. The series of conferences has been successfully held every two years. The MMC-8 was held at Waseda University in Tokyo in 1999 and MMC-10 will be held along the Volga River in Russia. 🌐

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