World Scientific Series on Carbon Nanoscience

HANDBOOK OF CARBON NANO MATERIALS

Volume 8
Characterization, Conducting Polymer and Sensor Applications

Editors

Francis D'Souza

Karl M. Kadish

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Characterization, Conducting Polymer and Sensor Applications

书章

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Volume 8: Characterization, Conducting Polymer and Sensor Applications

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Volume 8

Characterization, Conducting Polymer and Sensor Applications

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Preface

We are delighted to present the fourth two-volume set (Volumes 7 and 8) of *The Handbook of Carbon Nanomaterials.* Multiple new findings on nanocarbons, both fundamental aspects and applications, are continuously emerging, making topics in this field of extreme interest to numerous scientists, both in academia and in industry. The current set of volumes contains chapters from well-known scientists in their respective research fields and describes recent advances in the field of carbon nanomaterials

The first *Handbook of Carbon Nanomaterials* comprised 23 chapters in two volumes which summarized research developments in the field of carbon nanomaterials as seen through the eyes of more than three dozen leading researchers from around the world. The topics covered four general areas. The first dealt with the chemistry of fullerenes and carbon nanotubes, including organic functionalization, reactivity, perfluoroalkylation, and fullerenes linked to photosensitizers. The second covered the chemistry and physics of endohedral fullerenes. The third covered the molecular and supramolecular chemistry of fullerenes and carbon nanotubes and the fourth described topics related to photoinduced energy and electron transfer. Finally, applications of fullerenes, carbon nanotubes and graphenes as applied to organic molecular electronics, polymers composites, thermal conductive materials, photovoltaics and sensing were presented.

The second published set of volumes in the *Handbook of Carbon Nanomaterials* (Volumes 3 and 4) had 17 chapters; the first volume contained material from leading authors on medicinal and bio-related applications while the second covered topics ranging from fundamental to material applications. Specific topics covered in Volume 3 were fullerenes in biology and medicine, the current state-of-the-art of toxicity studies of fullerenes and carbon nanotubes, methods of detection of carbon nanotubes in living cells, carbon nanotechnology in regenerative medicine, chemical and biochemical

sensors based on carbon nanotubes, molecular recognition approach for separating left- and right-handed structures of single wall carbon nanotubes and open cage fullerene. The specific topics covered in Volume 4 were functionalization of graphene, electrochemical conversion and storage of energy, nanocarbon based molecular architectures for light energy conversion, electrochemistry of fullerenes as applicable for functional devices, fullerenes as self-assembled morphological materials, semiconductor carbon nanotube optics, near-filed optics of nanotubes and energy transfer at the nanoscale level, understanding the role of metal catalysts in chiral selective growth of carbon nanotubes, and finally, computational studies on the stability of fullerenes and metallofullerenes.

The third set of volumes (Volumes 5 and 6) was devoted, in large part, to recent discoveries on graphene. There were nine chapters in this two-volume set; the first four chapters (contained in Volume 5) summarized the basic science of graphene. Specific topics included fundamental properties of graphene, adsorption and reactivity of graphene, chemical manipulation of graphene in dispersions, and thermodynamic characterization of thermal desorption of hydrogen from hydrogenated graphene layers. The next five chapters (contained in Volume 6) covered up-to-date advances related to energy and sensor applications of graphene. The topics covered included graphene materials for energy conversion and storage applications, graphene for biosensor and electrochemical biosensor applications, and finally, carbon nanomaterials in biomedical and energy research.

The current two-volume set of books (Volumes 7 and 8) covers recent synthetic developments, characterization and conducting polymer and sensor applications. There are 10 chapters in the current two-volume set; the first five chapters (contents of volume 7) cover synthesis and applications of graphene, nanocarbon and multifunctional carbon nanostructures, CVD growth and characterization of carbon nanomaterials, and synthesis and electronic properties of single-walled carbon nanotubes filled with inorganic compounds and metals. The next five chapters (contents of Volume 8) covers mainly aspects of applications. Specific topics include nanotube micellar surface chemistry, printing graphene and carbon nanotubes for energy storage and conversion, fullerene-based conducting polymer materials, carbon nanomaterials for electrochemical sensing and synthesis and applications of iron oxide nanoparticles-graphene composite materials.

Like the previous six volumes, the current two-volume set of the Handbook has been written as a hands-on reference guide for scientists working in the fields of materials and solid-state science, physics, chemistry, and nanotechnology. The coverage of topics presented is both in-depth and

comprehensive. When combined with the perspectives for future research given by the contributing authors, this series makes an invaluable reference source that should be considered essential reading for both students and advanced researchers in the field.

The editors would like to acknowledge the contributors for their timely submission of the state-of-the-art reviews. The National Science Foundation and the Welch Foundation are also acknowledged for their support. Last, but not least, the staff of World Scientific Publishing Co. is acknowledged for their immense help in bringing out this publication in a timely manner.

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