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BOOK REVIEWS

Scanning Probe Microscopies Beyond Imaging: Manipulation of Molecules and Nanostructures. Edited by Paolo Samori (CNR Bologna, Italy and Université Louis Pasteur, Strasbourg, France). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2006. xxiv + 544 pp. $190. ISBN 3-527-31269-2.

The aim of the editor in creating this text was to collect reasonably complete summaries of various methods based on scanning probe microscopies (SPMs) for the manipulation of molecular-scale structures. Although various SPM techniques are discussed—scanning tunneling microscopy (STM), atomic force microscopy (AFM), etc.—discussions of techniques based on scanning force microscopies make up the vast majority of this work (332 pages out of 544).

This book is certainly very timely and relevant to the chemical community, which is well poised to profit from the recent interest in nanoscale science. The references are to current work in the respective fields—references as recent as 2006 appear routinely throughout—but also provide a sufficient base of older foundational references. In places, the summaries focus on the particular field of the author. However, where observed, this has been stated explicitly, and sufficient references are provided so as to provide a good starting point for a complete literature search.

I was very pleased to see some 65 pages of the book dedicated to theoretical approaches, which sometimes get neglected in collections that are oriented toward experimental results. In addition, theoretical approaches are described, where appropriate, in other portions of the text.

It is important to note that this book does not include a general description of STM or AFM. Therefore, I would recommend it as a textbook only for fairly advanced graduate courses with SPM techniques as the specific topic, and then only in conjunction with another text that does include general descriptions of SPM methods. Overall, this book is a welcome addition to the field, and it will take its place among other available SPM texts. I am delighted to make it a part of my own personal collection.

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JA069808V

10.1021/ja069808v

Carbon Nanotubes, Properties and Applications. Edited by Michael J. O'Connell (Theranos, Inc., Menlo Park, CA). CRC Press and Taylor & Francis Group: Boca Raton, FL. 2006. xviii + 320 pages. $99.95. ISBN 0-8493-2748-2.

Carbon nanotechnologies continue to excite laypeople and seasoned researchers alike; thus, captivating such a diverse audience with a single book is a tall task. It was therefore surprising to read in the Preface that the intended audience of this book includes both novice and experienced researchers with only a basic understanding of chemistry as a prerequisite. Having worked with fullerenes and carbon nanotubes (CNTs) for several years, I wondered if such a book would have any audience. This one certainly should.

The book begins with a fairly rudimentary chapter entitled "The Element Carbon" followed by nine others on CNT synthesis, structure, spectroscopy, properties, materials, and devices, all written by experts in the field. The chapters are not organized in any particular fashion but rather can be considered as stand-alone minibooks that can be read by the CNT enthusiast as needed. Most of the chapters are well written and include timely references. The diversity of topics is both appropriate and inspiring. From an organizational perspective, however, some readers may prefer a different ordering of the chapters. For example, Chapter 6 on Raman spectroscopy seems somewhat out of place between a chapter on the magnetic properties of CNTs and another on their electromechanical properties. Also, Chapter 10 on CNTs as atomic force microscopy probes could have been placed alongside Chapter 4, which covers CNT-based devices and electronics. There is nonetheless a certain eclectic charm in the present arrangement that mirrors the diversity of CNT structures, properties, and applications discussed in the book. The curious reader should not be discouraged by the organization.

The first chapter, an introduction to carbon nanotechnology, is well suited for either high school or undergraduate students with an interest in science. It begins with a brief history of fullerenes and CNTs and finishes with a description of the remarkable structures and properties associated with CNTs. Even in this introductory chapter, the reader is encouraged to consider problems associated with CNTs, including their lack of uniformity and the difficulties associated with their assembly and multiscale integration into electronic devices. This dovetails nicely with subsequent sections like Chapter 4, for example, where CNT-based transistors, logic gates, and photodetectors are discussed. In Chapter 4 again, limitations associated with uniform structures and properties of CNTs ("Until now, there is insufficient specificity in the nanotube diameter, let alone chirality...") are addressed, and this draws the reader back to Chapter 2 where the synthesis of CNTs is described. The CNTs thus produced can be structurally characterized using methods like Raman spectroscopy as described in Chapter 6. Sections like Chapter 3 on CNT peapods and Chapter 9 on chemically functionalized CNTs lead the reader to conclude, correctly, that a myriad of CNT-based structures are possible, and we have only just begun to access them. The book contains two chapters relating to CNT-based composites: Chapter 8, "Carbon Nanotube-Enabled Material", and Chapter 9, "Functionalized Carbon Nanotubes in Composites", each told from a different perspective. Chapter 8 is a description of a variety of composites prepared via melt- or solution-processing or *in situ* polymerization and emphasizes mechanical, electrical, and thermal properties. The need for effective physical/mechanical dispersion

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10.1021/ja069808v CCC: $37.00

of bundled CNTs, especially single-walled CNTs, is a recurring theme. Chapter 9, on the other hand, covers the formation of chemically functionalized CNTs, which show considerably less propensity to bundle and may therefore prove advantageous for use in some composites. Functionalized CNTs, especially sidewall-functionalized CNTs, are semisaturated versions of the starting CNTs, and they must therefore possess a different set of electronic and mechanical properties. The magnetic and electromechanical properties of CNTs are reviewed in Chapters 5 and 7, respectively. Finally, Chapter 10 provides a description of CNTs in advanced instrumentation, namely as tips for scanning-probe microscopy.

Owing perhaps to several recurring themes that effectively connect seemingly disparate topics, this eclectic collection of minibooks fits together nicely. Much like CNTs themselves, the book will be a valuable resource for researchers from a variety of disciplines including chemistry, physics, materials science, mechanical engineering, and electrical engineering. A few of the chapters can also serve as a springboard to launch the interest and imagination of younger scholars. The book would make an excellent resource for an upper-level undergraduate or graduate level course in carbon nanotechnology, perhaps best taught as a survey or seminar course in which scholars from several different disciplines in science and engineering contribute.

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JA069764Q

10.1021/ja069764q

Applied Modeling and Computations in Nuclear Science. ACS Symposium Series 945. Edited by Thomas M. Semkow (New York State Department of Health, Albany, NY), Stefaan Pommé (Institute for Reference Materials and Measurements, Geel, Belgium), Simon M. Jerome (National Physical Laboratory, Teddington, U.K.), and Daniel J. Strom (Pacific Northwest National Laboratory, Richland, WA). American Chemical Society: Washington, DC (distributed by Oxford University Press). 2007. xiv + 374 pp. $189.50. ISBN 0-8412-3982-7.

This book was developed from a symposium of the same name held during the 230th National Meeting of the American Chemical Society in Fall, 2005 in Washington, DC and "represents the state-of-the-art modeling and computations as performed today in applied nuclear science" to quote from the Preface. Its 24 chapters are organized under the following headings: Introduction and General Topics; Radiation Risk; Radiation Transport; Radiation Detection; and Radiation Quantification. An author and a subject index complete the book.

JA076933D

10.1021/ja076933d