

LECTURE NOTES IN
NANOSCALE SCIENCE AND
TECHNOLOGY 6

Yoke Khin Yap
Editor

B-C-N Nanotubes and Related Nanostructures

Foreword by Alex Zettl



Springer

B C N Nanotubes And Related Nanostructures Lecture Notes In Nanoscale Science And Technology

Zhiming M. Wang



B C N Nanotubes And Related Nanostructures Lecture Notes In Nanoscale Science And Technology:

B-C-N Nanotubes and Related Nanostructures Yoke Khin Yap, 2009-05-28 Carbon nanotubes CNTs and Boron nitride nanotubes BNNTs are part of the so called B C N material system which includes novel nanostructures of carbon C doped carbon boron B boron nitride BN carbon nitride CN_x boron carbon nitride B_xCyN_z and boron carbide B_xCy BNNTs and CNTs are structurally similar and share extraordinary mechanical properties but they differ in chemical biological optical and electrical properties Therefore hybrid nanotubes constructed of B C N elements are expected to form a new class of nanotubes with tunable properties between those of CNTs and BNNTs In addition these B C N nanostructures will further enhance and complement the applications of CNTs and BNNTs With contributions from leading experts B C N Nanotubes and Related Nanostructures is the first book to cover all theoretical and experimental aspects of this emerging material system and meets the need for a comprehensive summary of the tremendous advances in research on B C N materials in recent years

Carbon Nanotubes and Nanosensors Isaac Elishakoff, Kevin Dujat, Giuseppe Muscolino, Simon Bucas, Toshiaki Natsuki, Chien Ming Wang, Demetris Pentaras, Claudia Versaci, Joel Storch, Noël Challamel, Yingyan Zhang, Guillaume Ghyselinck, 2013-03-04 The main properties that make carbon nanotubes CNTs a promising technology for many future applications are extremely high strength low mass density linear elastic behavior almost perfect geometrical structure and nanometer scale structure Also CNTs can conduct electricity better than copper and transmit heat better than diamonds Therefore they are bound to find a wide and possibly revolutionary use in all fields of engineering The interest in CNTs and their potential use in a wide range of commercial applications such as nanoelectronics quantum wire interconnects field emission devices composites chemical sensors biosensors detectors etc have rapidly increased in the last two decades However the performance of any CNT based nanostructure is dependent on the mechanical properties of constituent CNTs Therefore it is crucial to know the mechanical behavior of individual CNTs such as their vibration frequencies buckling loads and deformations under different loadings This title is dedicated to the vibration buckling and impact behavior of CNTs along with theory for carbon nanosensors like the Bubnov Galerkin and the Petrov Galerkin methods the Bresse Timoshenko and the Donnell shell theory

Physical Properties of Ceramic and Carbon Nanoscale Structures Stefano

Bellucci, 2011-02-28 This is the second volume in a series of books on selected topics in Nanoscale Science and Technology based on lectures given at the well known INFN schools of the same name The aim of this collection is to provide a reference corpus of suitable introductory material to relevant subfields as they mature over time by gathering the significantly expanded and edited versions of tutorial lectures given over the years by internationally known experts The present set of notes stems in particular from the participation and dedication of prestigious lecturers such as Andrzej Huczko Nicola Pugno Alexander Malesev Pasquale Onorato and Stefano Bellucci All lectures were subsequently carefully edited and reworked taking into account the extensive follow up discussions A tutorial lecture by Huczko et al shows how a variety of carbon and

ceramic nanostructures nanotubes nanowires nanofibres nanorods and nanoencapsulates have in particular great potential for improving our understanding of the fundamental concepts of the roles of both dimensionality and size on physical material properties Bellucci and Onorato provide an extensive and tutorial review of the quantum transport properties in carbon nanotubes encompassing a description of the electronic structure from graphene to single wall nanotubes as well as a discussion of experimental evidence of superconductivity in carbon nanotubes and the corresponding theoretical interpretation In the first contribution by Pugno new ideas on how to design futuristic self cleaning super adhesive and releasable hierarchical smart materials are presented He also reviews the mechanical strength of such nanotubes and megacables with an eye to the visionary project of a carbon nanotube based space elevator megacable In his second contribution Pugno outlines in detail the role on the fracture strength of thermodynamically unavoidable atomistic defects with different size and shape both numerically and theoretically for nanotubes and nanotube bundles Focusing on graphitic allotropes the chapter by Bellucci and Malesevic aims to give a taste of the widespread implications carbon nanostructures have on research and applications starting from an historical overview followed by a discussion of the structure and physical properties of carbon nanotubes and graphene in particular in the context of the several different synthesis techniques presently available

Nanoscale Photonics and Optoelectronics Zhiming M Wang, Arup Neogi, 2010-11-16 The intersection of nanostructured materials with photonics and electronics shows great potential for clinical diagnostics sensors ultrafast telecommunication devices and a new generation of compact and fast computers Nanophotonics draws upon cross disciplinary expertise from physics materials science chemistry electrical engineering biology and medicine to create novel technologies to meet a variety of challenges This is the first book to focus on novel materials and techniques relevant to the burgeoning area of nanoscale photonics and optoelectronics including novel hybrid materials with multifunctional capabilities and recent advancements in the understanding of optical interactions in nanoscale materials and quantum confined objects Leading experts provide a fundamental understanding of photonics and the related science and technology of plasmonics polaritons quantum dots for nanophotonics nanoscale field emitters near field optics nanophotonic architecture and nanobiophotonic materials

One-Dimensional Nanostructures Zhiming M Wang, 2008-07-20 One dimensional 1D nanostructures including nanowires nanotubes and quantum wires have been regarded as the most promising building blocks for nanoscale electronic and optoelectronic devices Worldwide efforts in both the theory and the experimental investigation of growth characterization and applications of 1D nanostructures have resulted in a mature multidisciplinary field In this book a wealth of state of the art information offers the opportunity to uncover the underlying science from diverse perspectives Leading researchers elucidate the synthesis and properties of 1D nanostructures for various morphologies and compositions semiconductor metal carbon etc as well as their considerable impact on spintronics information storage and the design of field effect transistors

Nanoscale Phenomena Zikang Tang, Ping Sheng, 2007-11-22 Nanotechnology is the result

of the continuing technological trend toward device miniaturization and the characterization manipulation and fine control of structure and function at diminishing length scales A large class of nanoscale materials can be stable even though they are far from the lowest energy thermodynamic state and many possess novel properties unattainable in bulk These trends are supported by the increasing sophistication of characterization and fabrication tools such as the scanning tunneling microscope and the transmission electron microscope which allow the resolution and manipulation of single atoms and molecules Nanoscale Phenomena Basic Science to Device Applications presents selected lectures from the Third Workshop of the Croucher Advanced Study Institute on Nano Science and Technology and showcases contributions from world renowned researchers Chapters fall into four major categories Nanostructured Carbon and its Applications Quantum Dots and Molecular Spintronics Nanomaterials Design and Synthesis and Molecular Electronics Nanodroplets Zhiming M. Wang, 2014-01-08 Nanodroplets the basis of complex and advanced nanostructures such as quantum rings quantum dots and quantum dot clusters for future electronic and optoelectronic materials and devices have attracted the interdisciplinary interest of chemists physicists and engineers This book combines experimental and theoretical analyses of nanosized droplets which reveal many attractive properties Coverage includes nanodroplet synthesis structure unique behaviors and their nanofabrication including chapters on focused ion beam atomic force microscopy molecular beam epitaxy and the vapor liquid solid route Particular emphasis is given to the behavior of metallic nanodroplets water nanodroplets and nanodroplets in polymer and metamaterial nanocomposites The contributions of leading scientists and their research groups will provide readers with deeper insight into the chemical and physical mechanisms properties and potential applications of various nanodroplets **Nanoparticles and Nanodevices in Biological Applications** Stefano Bellucci, 2008-10-24 The first volume in a series on selected topics in nanoscale science and technology this book is based on lectures given at the well known INFN schools The aim of the collection is to provide a reference corpus of introductory material to relevant subfields

Isotopes in Nanoparticles Jordi Llop, Vanessa Gomez-Vallejo, 2016-03-30 Nanoparticles may be used in industrial processes incorporated into consumer products or applied as biomedical agents Isotopic radio labeling is one of the most powerful methods for nanoparticle tracing in experimental studies This book presents an introduction to some commonly used nanomaterials describes various methods with which they may **Self-Assembled Quantum Dots** Zhiming M Wang, 2007-11-29 This multidisciplinary book provides up to date coverage of carrier and spin dynamics and energy transfer and structural interaction among nanostructures Coverage also includes current device applications such as quantum dot lasers and detectors as well as future applications to quantum information processing The book will serve as a reference for anyone working with or planning to work with quantum dots

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