<<电脑升级优化入门与提高>>

图书基本信息

书名：<<电脑升级优化入门与提高>>

13位ISBN编号：9787302082125

10位ISBN编号：730208212X

出版时间：2004-4-1

出版时间：清华大学出版社

作者：王世高,张涛

页数：310

字数：514000

内容概要

碳纳米管的研究已经进行了13年之久。
碳纳米管已成为纳米科学和技术研究和发展中一种独特而且具有代表性的材料。
目前有关碳纳米管的合成和性能表征方面的书籍已有几本。
作为发现碳纳米管的第一手段，高分辨透射电子显微镜在整个碳纳米管的研究中起了关键的作用，但介绍如何利用电子显微镜来分析碳纳米管方面的书籍却没有。
考虑到大量读者的需求，我们在2003年编辑的英文版《Electron Microscopy O{Nanotubes》一书主要是介绍透射电子显微镜在分析和测试管形纳米结构中的方法和应用。
本书集结了世界范围内在应用透射电子显微镜进行纳米管研究方面的专家编写出这一独特的科技参考书。
希望本书能对从事纳米管研究方面的科技工作者和学生有所帮助。

Research in carbon nanotubes has reached a horizon that is impacting a variety offields, such as nanoelectronics, flat panel display, composite materials, sensors,nanodevices, and novel instrumentation. The unique structures of the nanotubes resultin numerous superior physical and chemical properties, such as the strongest mechan-ical strength, the highest thermal conductivity, room-temperature ballistic quantumconductance, electromechanical coupling, and super surface functionality. Severalbooks are available that introduce the synthesis, physical and chemical properties, andapplications of carbon nanotubes.

Among the various analytical techniques, high-resolution transmission electronmicroscopy (HRTEM) has played a key role in the discovery and characterization ofcarbon nanotubes. It may be claimed that carbon nanotubes might not have beendiscovered without using HRTEM. There is a great need for a book that addresses thetheory, techniques, and applications of electron microscopy and associated techniquesfor nanotube research. The objective of this book is to fill this gap.

The potential of HRTEM is now well accepted in wide-ranging communities suchas materials science, physics, chemistry, and electrical engineering. TEM is a powerfultechnique that is indispensable for characterizing nanomaterials and is a tool that eachmajor research institute must have in order to advance its research in nanotechnology.This book focuses on the applications of TEM in structural, electronic, and propertycharacterization of carbon nanotubes. The book contains 12 chapters, and the authorsof the chapters are the world's most prominent scientists in this field. The contents ofthe book can be grouped into three parts. The first part (Chapters I-6) is about the dif-fraction, imaging, and spectroscopy of carbon-based nanotubes. The second part(Chapters 7-9) describes the physical property nanomeasurements of carbonnanotubes based on in-situ TEM. The last part (Chapters 10-12) is about inorganictubular structures and one-dimensional nanocrystals grown by filling nanotubes. Thetext is organized in a coherent and logical manner so that readers can easily follow theflow of concepts in a materials system.

The first chapter, by L.C. Qir~, describes in detail the geometry of individualsingle-walled nanotubes (SWNTs), their diffraction characteristics, and mathematicalanalysis. The mathematical description given in this chapter about the structure of the nanotubes and the corresponding diffraction features establishes the foundation for understanding the contents of the future chapters. Chapter 2, by J.-F. Colomer and G. Van Tendeloo, focuses on the image and diffraction of bundles of SWNTs, which occur frequently in SWNTs. They provide an in-depth and systematic description of the nanotube and bundle structures derived from diffraction information. This chapter can be directly correlated to the material introduced in Chapter 1. Chapter 3,by J. M. Cowley, is dedicated to nanodiffraction of multiwalled nanotubes by using anelectron probe of -0.5 nm in size in a scanning transmission electron microscope. Thisis a powerful tool for analysis of the helical angle as well as of local defects in the tubeand at its tip, and the chapter gives a detailed introduction and application of this tech-nique. Chapter 4, by N. Wang, is about the smallest nanotubes found up to now witha diameter of -0.4 nm. Details are given about the determination of the size of the tubeand the best imaging condition of the tubes, as well as its electrical properties.

Chapter 5,by T. St6ckli, provides a comprehensive introduction to electron energy-loss spectroscopy (EELS) studies of individual carbon nanotubes and onions. It covers theory and experiments for valence excitation and the application of core losses. Chapter 6,by S. Trasobares and P. M. Ajayan, is about some novel structures produced by irradiating carbon using an electron beam in TEM, such as the formation of onions,growth of diamond, as well as the formation of a single-gold-atom chain. The fundamentals covered in Chapters 1 to 5 are comprehensively used in this chapter for structure analysis, especially a combination of high-resolution TEM imaging and EELS for detecting local electronic structure.

Chapters 7 to 9, by Z. L. Wang, address some novel techniques developed usingin-situ TEM for quantifying the physical properties of individual carbon nanotubes,such as the Young's modulus, the field emission property, and electrical transportproperty. Due to the small size of the nanotubes, measuring their unique propertiesrelies on some new techniques for manipulation, ln-situ TEM provides a new directapproach that allows the observation of the nanotube structure while its property isbeing measured. This is an innovative method for studying nanotube and nanowire structures.

Chapter, 10, by D. Golberg and Y. Bando, gives a systematic review of the novel BN nanotubes and related structures. The difference in BN structure from that of graphite induces drastically different structures in the BN system, such as the limited choice of helical angles. Doping of BN nanotubes as well as their fillings is also described. Chapter 11, by R. Tenne and R. Popovitz-Biro, is about the inorganic nanoparticles with fullerene-like structure and inorganic nanotubes, such as MoS2 nanotubes, H2TiO307 nanotubes, and WS2 nanotubes. These last two chapters collect some of the unique noncarbon-based tubular structures. Chapter 12, by J. Sloan, A. I. Kirkland, J. L. Hutchison, and M. L. H. Green, uses single-walled carbon nanotubes as templates for growing the inner wall-confined structures of less than 1 nm across. The filling creates the smallest crystals in the world. The one-dimensional nanostructures created by this method have been systematically invested by HRTEM, image simulation, and EELS.

This book illustrates a comprehensive application of HRTEM and associated new techniques for nanotube research, and the fundamentals covered can be applied to a wide range of materials. The book is unique in its coverage. It is intended as a textbook that can be adopted by students and researchers with a wide range of backgrounds--physics, chemistry, electrical engineering, mechanical engineering,and biology. We anticipate the book is useful for characterizing not only thenanotube-based structures but also nanowire-based materials.

书籍目录

版权说明