

<<纳米结构>>

图书基本信息

书名：<<纳米结构>>

13位ISBN编号：9787030220271

10位ISBN编号：7030220277

出版时间：2008-6

出版时间：科学出版社

作者：狄奈许

页数：304

版权说明：本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问：<http://www.tushu007.com>

## 前言

This book is an introduction to the theory of nanostructures . Its main objectives are twofold : to provide basic concepts for the physics of nano-objects and to review theoretical methods allowing the predictive simulation of nano-devices . It covers many important features of nanostructures : electronic structure , dielectric properties , optical transitions and electronic transport . Each topic is accompanied by a review of important experimental results in this field . we have tried to make the book accessible to inexperienced readers and it only requires basic knowledge in quantum mechanics and in solid state physics . Whenever possible , each concept is introduced on the basis of simple models giving rise to analytical results . But we also provide the reader with the more elaborate theoretical tools required for simulations on computers . Therefore , this book is intended not only for the students beginning in this field but also for more experienced researchers . The context of the book is the rapid expansion of nano-technologies resulting from important research efforts in a wide range of disciplines such as physics , biology and chemistry . If much work is presently focusing on the elaboration , the manipulation and the study of individual nano-objects , a major challenge for nano . science is to assemble these objects to make new materials and new devices , opening the door to new technologies . In this context , as the systems become more and more complex , and because probing the matter at the nanoscale remains a challenge , theory and simulation play an essential role in the development of these technologies.

A large number of simulation tools are already available in science and technology but most of them are not adapted to the nano-world because , at this scale , quantum mechanical descriptions are usually necessary , and atomistic approaches become increasingly important . Thus , one main objective of the book is to review recent progress in this domain . We show that ab initio approaches provide accurate methods to study small systems ( $\approx 100-1000$ ) .

## <<纳米结构>>

### 内容概要

纳米科学的进展正在越来越依赖计算与模拟。

这取决于三个因素的结合：减小纳米物质的尺寸、增强计算机的能力、发展新的理论。

本书主要介绍了纳米结构体系中电子结构、介电性质、光学转换、电学输运的基本物理概念、理论方法、重要实验结果及其理论分析与模拟计算，是一本较为系统的、有使用价值的理论专著。

本书对从事纳米科技多学科交叉领域的高年级本科生、研究生及相关的科研教学人员具有重要的参考价值。

<<纳米结构>>

作者简介

作者：(法国)狄奈许(Delerue.C.)

## 书籍目录

1 General Basis for Computations and Theoretical Models	1.1 Ab initio One-Particle Theories for the Ground State	1.1.1 Non-interacting N Electron System	1.1.2 The Hartree Approximation	1.1.3 The Hartree-Fock Approximation	1.1.4 Correlations and Exchange-Correlation Hole	1.1.5 Local Density Approaches	1.2 Quasi-particles and Excitons	1.2.1 One-Particle Eigenvalues	1.2.2 The Exchange-Correlation Hole and Static Screening	1.2.3 Dynamically Screened Interactions	1.2.4 The GW Approximation	1.2.5 Excitons	1.2.6 Towards a More Quantitative Theory	1.2.7 Time-Dependent Density Functional Theory (TDDFT)	1.3 Semi-empirical Methods	1.3.1 The Empirical Tight Binding Method	1.3.2 The Empirical Pseudopotential Method	1.3.3 The k.p Description and Effective Masses	2 Quantum Confined Systems	2.1 Quantum Confinement and Its Consequences	2.1.1 Idealized Quantum Wells	2.1.2 Idealized Quantum Wires	2.1.3 Idealized Cubic Quantum Dots	2.1.4 Artificial Atoms: Case of Spherical Wells	2.1.5 Electronic Structure from Bulk to Quantum Dots	2.2 Computational Techniques	2.2.1 k - p Method and Envelope Function Approximation	2.2.2 Tight Binding and Empirical Pseudopotential Methods	2.2.3 Density Functional Theory	2.3 Comparison Between Different Methods	2.4 Energy Gap of Semiconductor Nanocrystals	2.5 Confined States in Semiconductor Nanocrystals	2.5.1 Electron States in Direct Gap Semiconductors	2.5.2 Electron States in Indirect Gap Semiconductors	2.5.3 Hole States	2.6 Confinement in Disordered and Amorphous Systems	3 Dielectric Properties	3.1 Macroscopic Approach: The Classical Electrostatic Theory	3.1.1 Bases of the Macroscopic Electrostatic Theory of Dielectrics	3.1.2 From Microscopic to Macroscopic Dielectric Function for the Bulk Crystal	3.1.3 Concept of Dielectric Constant for Nanostructures	3.1.4 The Importance of Surface Polarization Charges	3.1.5 Dielectric Screening in Quantum Wells	3.1.6 Dielectric Screening in Quantum Dots	3.1.7 General Arguments on the Dielectric Response in Nanostructures	3.1.8 Conclusions	3.2 Charging of a Nanostructure	3.2.1 Case of a Quantum Dot	3.2.2 Case of a Quantum Well	4 Quasi-particles and Excitons	4.1 Basic Considerations	4.2 Excitons in the Envelope Function Approximation	4.2.1 Theory of Bulk Excitons	4.2.2 Excitons in Quantum Wells	4.2.3 Exciton Binding Energy in Limiting Situations	4.2.4 The Influence of Dielectric Mismatch	4.3 Excitons in More Refined Semi-empirical Approaches	4.3.1 General Discussion	4.3.2 Excitons in Nanocrystals of Direct Gap Semiconductors	4.3.3 Excitons in Si Nanocrystals	4.3.4 Screening of the Electron-Hole Interaction and Configuration Interaction	4.4 Quantitative Treatment of Quasi-particles	4.4.1 General Arguments	4.4.2 Tight Binding GW Calculations	4.4.3 Conclusions	4.5 Quantitative Treatment of Excitons	4.5.1 Numerical Calculations	4.5.2 Interpretation of the Results	4.5.3 Comparison with Experiments	4.6 Charging Effects and Multi-excitons	4.6.1 Charging Effects: Single Particle Tunneling Through Semiconductor Quantum Dots	4.6.2 Multi-excitons	4.7 Conclusion	5 Optical Properties and Radiative Processes	5.1 General Formulation	5.1.1 Optical Absorption and Stimulated Emission	5.1.2 Luminescence	5.1.3 Nanostructures in Optical Cavities and Photonic Crystals	5.1.4 Calculation of the Optical	5.2 Interband Transitions	5.2.1 Intraband Transitions	5.2.2 The Importance of Electron-Phonon Coupling	5.3 Optical Properties of Si and Ge Nanocrystals	5.3.1 Interband Transitions	5.3.2 Intraband Transitions	5.3.3 The Importance of Electron-Phonon Coupling	6 Defects and Impurities	6.1 Hydrogenic Donors	6.1.1 Envelope Function Approximation	6.1.2 Tight Binding Self-Consistent Treatment	6.2 Deep Level Defects in Nanostructures	6.3 Surface Defects: Si Dangling Bonds	6.3.1 Review of the Properties of Si Dangling Bonds	6.3.2 Si Dangling Bonds at the Surface of Crystallites	6.3.3 Dangling Bond Defects in III-V and II-VI Semiconductor Nanocrystals	6.4 Surface Defects: Self-Trapped Excitons	6.5 Oxygen Related Defects at Si-SiO <sub>2</sub> Interfaces	7 Non-radiative and Relaxation Processes	7.1 Multi-phonon Capture at Point Defects	7.2 Auger Recombination	7.2.1 Theoretical Calculation	7.2.2 Experimental Evidence for Auger Recombination	7.3 Hot Carrier Relaxation: Existence of a Phonon Bottleneck	8 Transport	8.1 Description of the Systems and of the Boundary Conditions	8.2 Weak Coupling Limit	8.2.1 Perturbation Theory	8.2.2 Orthodox Theory of Tunneling	8.3 Beyond Perturbation Theory
---	--	---	---------------------------------	--------------------------------------	--	--------------------------------	----------------------------------	--------------------------------	--	---	----------------------------	----------------	--	--	----------------------------	--	--	--	----------------------------	--	-------------------------------	-------------------------------	------------------------------------	---	--	------------------------------	--	---	---------------------------------	--	--	---	--	--	-------------------	---	-------------------------	--	--	--	---	--	---	--	--	-------------------	---------------------------------	-----------------------------	------------------------------	--------------------------------	--------------------------	---	-------------------------------	---------------------------------	---	--	--	--------------------------	---	-----------------------------------	--	---	-------------------------	-------------------------------------	-------------------	--	------------------------------	-------------------------------------	-----------------------------------	---	--	----------------------	----------------	--	-------------------------	--	--------------------	--	----------------------------------	---------------------------	-----------------------------	--	--	-----------------------------	-----------------------------	--	--------------------------	-----------------------	---------------------------------------	---	--	--	---	--	---	--	--	--	---	-------------------------	-------------------------------	---	--	-------------	---	-------------------------	---------------------------	------------------------------------	--------------------------------

<<纳米结构>>

8.3.1 Elastic Scattering Formalism      8.3.2 Calculation of the Green's Functions      8.4 Electron-Electron Interactions Beyond the Orthodox Theory.      8.4.1 Self-Consistent Mean-Field Calculations      8.4.2 The Self-Consistent Potential Profile      8.4.3 The Coulomb Blockade Effect      8.5 Transport in Networks of Nanostructures      8.5.1 Tunneling Between Nanostructures      8.5.2 Hopping Conductivity      8.5.3 Coherent Potential Approximation      8.5.4 Example of a Network of Silicon NanocrystalsA Matrix Elements of the Renormalizing

<<纳米结构>>

章节摘录

插图：

## <<纳米结构>>

### 编辑推荐

《纳米结构:理论与模拟(影印版)》由科学出版社出版。



<<纳米结构>>

版权说明

本站所提供下载的PDF图书仅提供预览和简介，请支持正版图书。

更多资源请访问:<http://www.tushu007.com>