

1. Record Nr.	UNINA9910827948003321
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Titolo	Introduction to nanomaterials and devices / / Omar Manasreh
Pubbl/distr/stampa	Hoboken, N.J., : Wiley, 2012
ISBN	9786613332349 9781283332347 1283332345 9781118148419 111814841X 9781118148402 1118148401 9781118148372 1118148371
Edizione	[1st ed.]
Descrizione fisica	1 online resource (488 p.)
Classificazione	TEC008090
Disciplina	620.1/15
Soggetti	Nanostructured materials Optoelectronic devices Semiconductor nanocrystals Quantum electronics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Description based upon print version of record.
Nota di bibliografia	Includes bibliographical references.
Nota di contenuto	INTRODUCTION TO NANOMATERIALS AND DEVICES; CONTENTS; Preface; Fundamental Constants; 1 Growth of Bulk, Thin Films, and Nanomaterials; 1.1 Introduction; 1.2 Growth of Bulk Semiconductors; 1.2.1 Liquid-Encapsulated Czochralski (LEC) Method; 1.2.2 Horizontal Bridgman Method; 1.2.3 Float-Zone Growth Method; 1.2.4 Lely Growth Method; 1.3 Growth of Semiconductor Thin Films; 1.3.1 Liquid-Phase Epitaxy Method; 1.3.2 Vapor-Phase Epitaxy Method; 1.3.3 Hydride Vapor-Phase Epitaxial Growth of Thick GaN Layers; 1.3.4 Pulsed Laser Deposition Technique; 1.3.5 Molecular Beam Epitaxy Growth Technique 1.4 Fabrication and Growth of Semiconductor Nanomaterials1.4.1 Nucleation; 1.4.2 Fabrications of Quantum Dots; 1.4.3 Epitaxial Growth of Self-Assembly Quantum Dots; 1.5 Colloidal Growth of Nanocrystals;

1.6 Summary; Problems; Bibliography; 2 Application of Quantum Mechanics to Nanomaterial Structures; 2.1 Introduction; 2.2 The de Broglie Relation; 2.3 Wave Functions and Schrodinger Equation; 2.4 Dirac Notation; 2.4.1 Action of a Linear Operator on a Bra; 2.4.2 Eigenvalues and Eigenfunctions of an Operator; 2.4.3 The Dirac  $\delta$ -Function; 2.4.4 Fourier Series and Fourier Transform in Quantum Mechanics; 2.5 Variational Method; 2.6 Stationary States of a Particle in a Potential Step; 2.7 Potential Barrier with a Finite Height; 2.8 Potential Well with an Infinite Depth; 2.9 Finite Depth Potential Well; 2.10 Unbound Motion of a Particle ( $E > V_0$ ) in a Potential Well With a Finite Depth; 2.11 Triangular Potential Well; 2.12 Delta Function Potentials; 2.13 Transmission in Finite Double Barrier Potential Wells; 2.14 Envelope Function Approximation; 2.15 Periodic Potential; 2.15.1 Bloch's Theorem; 2.15.2 The Kronig-Penney Model; 2.15.3 One-Electron Approximation in a Periodic Dirac  $\delta$ -Function; 2.15.4 Superlattices; 2.16 Effective Mass; 2.17 Summary; Problems; Bibliography; 3 Density of States in Semiconductor Materials; 3.1 Introduction; 3.2 Distribution Functions; 3.3 Maxwell-Boltzmann Statistic; 3.4 Fermi-Dirac Statistics; 3.5 Bose-Einstein Statistics; 3.6 Density of States; 3.7 Density of States of Quantum Wells, Wires, and Dots; 3.7.1 Quantum Wells; 3.7.2 Quantum Wires; 3.7.3 Quantum Dots; 3.8 Density of States of Other Systems; 3.8.1 Superlattices; 3.8.2 Density of States of Bulk Electrons in the Presence of a Magnetic Field; 3.8.3 Density of States in the Presence of an Electric Field; 3.9 Summary; Problems; Bibliography; 4 Optical Properties; 4.1 Fundamentals; 4.2 Lorentz and Drude Models; 4.3 The Optical Absorption Coefficient of the Interband Transition in Direct Band Gap Semiconductors; 4.4 The Optical Absorption Coefficient of the Interband Transition in Indirect Band Gap Semiconductors; 4.5 The Optical Absorption Coefficient of the Interband Transition in Quantum Wells; 4.6 The Optical Absorption Coefficient of the Interband Transition in Type II Superlattices

#### Sommario/riassunto

"This book introduces the basic concepts of nanomaterials and devices fabricated from these nanomaterials. Explicates cutting-edge topics and concepts in the field, such as plasmon-photon interaction and coupling of photonic crystals to devices with the purpose of enhancing the device performance. Provides a thorough background in quantum mechanics/physics. Successfully details the interrelationship between quantum mechanics and nanomaterials"--