

1. Record Nr.	UNINA9910792491303321
Titolo	Physics of Quantum Electron Devices [[electronic resource] /] / edited by Federico Capasso
Pubbl/distr/stampa	Berlin, Heidelberg : , : Springer Berlin Heidelberg : , : Imprint : Springer, , 1990
ISBN	3-642-74751-5
Edizione	[1st ed. 1990.]
Descrizione fisica	1 online resource (XVI, 403 p.)
Collana	Springer Series in Electronics and Photonics, , 0172-5734 ; ; 28
Disciplina	620.11295 620.11297
Soggetti	Optical materials Electronic materials Electronics Microelectronics Optical and Electronic Materials Electronics and Microelectronics, Instrumentation
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Note generali	Bibliographic Level Mode of Issuance: Monograph
Nota di bibliografia	Includes bibliographical references at the end of each chapters and index.
Nota di contenuto	1. Introduction -- 1.1 A Perspective on the Evolution of Quantum Semiconductor Devices -- 1.2 Outline of the Book -- References -- 2. The Nature of Molecular Beam Epitaxy and Consequences for Quantum Microstructures -- 2.1 Dimensional Confinement and Device Concepts -- 2.2 Molecular Beam Epitaxy -- 2.3 The Surface Kinetic Processes and Computer Simulations of Growth -- 2.4 Quantum Wells: Growth and Photoluminescence -- 2.5 Concluding Remarks -- 2.6 Recent Advances -- References -- 3. Nanolithography for Ultra-Small Structure Fabrication -- 3.1 Overview -- 3.2 Resolution Limits of Lithographic Processes -- 3.3 Pattern Transfer -- References -- 4. Theory of Resonant Tunnelling and Surface Superlattices -- 4.1 Tunnelling Probabilities -- 4.2 Tunnelling Time -- 4.3 Pseudo-Device Calculations -- 4.4 Lateral Superlattices -- References -- 5. The Investigation of Single and Double Barrier (Resonant Tunnelling) Heterostructures Using High Magnetic Fields -- 5.1 Background -- 5.2 LO Phonon Structure in

the I(V) and C(V) Curves of Reverse-Biased Heterostructures -- 5.3 Magnetotunnelling from the 2D Electron Gas in Accumulated (InGa)As/InP Structures Grown by MBE and MOCVD -- 5.4 Observation of Magnetoquantized Interface States by Electron Tunnelling in Single-Barrier n⁺ (InGa)As/InP/n⁺ (InGa)As Heterostructures -- 5.5 Box Quantised States -- 5.6 Double Barrier Resonant Tunnelling Devices -- References -- 6. Microwave and Millimeter-Wave Resonant-Tunnelling Devices -- 6.1 Speed of Response -- 6.2 Resonant-Tunnelling Oscillators -- 6.3 Self-Oscillating Mixers -- 6.4 Resistive Multipliers -- 6.5 Variable Absolute Negative Conductance -- 6.6 Persistent Photoconductivity and a Resonant-Tunnelling Transistor -- 6.7 A Look at Resonant-Tunnelling Theory -- 6.8 Concluding Remarks -- Note Added in Proof -- List of Symbols -- References -- 7. Resonant Tunnelling and Superlattice Devices: Physics and Circuits -- 7.1 Resonant Tunnelling Through Double Barriers and Superlattices -- 7.2 Application of Resonant Tunnelling: Transistors and Circuits -- References -- 8. Resonant-Tunnelling Hot Electron Transistors (RHET) -- 8.1 RHET Operation -- 8.2 RHET Technology Using GaAs/AlGaAs Heterostructures -- 8.3 InGaAs-Based Material Evaluation -- 8.4 RHET Technology Using InGaAs-Based Materials -- 8.5 Theoretical Analyses of RHET Performance -- 8.6 Summary -- References -- 9. Ballistic Electron Transport in Hot Electron Transistors -- 9.1 Ballistic Transport -- 9.2 Hot Electron Transistors -- 9.3 Hot Electron Injectors -- 9.4 Energy Spectroscopy -- 9.5 Electron Coherent Effects in the THETA Device -- 9.6 Transfer to the L Satellite Valleys -- 9.7 The THETA as a Practical Device -- References -- 10. Quantum Interference Devices -- 10.1 Background -- 10.2 Two-Port Quantum Devices -- 10.3 Multiport Quantum Devices -- Appendix: Aharonov — Bohm Phase-shift in an Electric or Magnetic Field -- References -- Additional References -- 11. Carrier Confinement to One and Zero Degrees of Freedom -- 11.1 Experimental Methods -- 11.2 Discussion of Experimental Results -- 11.3 Conclusions -- References -- 12. Quantum Effects in Quasi-One-Dimensional MOSFETs -- 12.1 Background -- 12.2 MOSFET Length Scales -- 12.3 Special MOSFET Geometries -- 12.4 Strictly 1D Transport -- 12.5 Multichannel Transport (Particle in a Box?) -- 12.6 Averaged Quantum Diffusion -- 12.7 Mesoscopic Quantum Diffusion (Universal Conductance Fluctuations) -- 12.8 Effect of One Scatterer -- 12.9 Conclusion -- References.

Sommario/riassunto

The ability to engineer the bandstructure and the wavefunction over length scales previously inaccessible to technology using artificially structured materials and nanolithography has led to a new class of electron semiconductor devices whose operation is controlled by quantum effects. These structures not only represent exciting tools for investigating new quantum phenomena in semiconductors, but also offer exciting opportunities for applications. This book gives the first comprehensive treatment of the physics of quantum electron devices. This interdisciplinary field, at the junction between material science, physics and technology, has witnessed an explosive growth in recent years. This volume presents a detailed coverage of the physics of the underlying phenomena, and their device and circuit applications, together with fabrication and growth technology.
