

Dragica Vasileska
Stephen M. Goodnick *Editors*

Nano-Electronic Devices

Semiclassical and Quantum
Transport Modeling

 Springer

Nano Electronic Devices Semiclassical And Quantum Transport Modeling

JA Banks

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Nano Electronic Devices Semiclassical And Quantum Transport Modeling:

Nano-Electronic Devices Dragica Vasileska, Professor Stephen M Goodnick, 2011-06-12 This exhaustive survey of advanced simulation methods for modeling nanoscale devices systematically covers both theoretical approaches and numerical solutions links methodology with the type of device and includes advice on state of the art semiconductors

Advanced Physics of Electron Transport in Semiconductors and Nanostructures Massimo V. Fischetti, William G. Vandenberghe, 2016-05-20 This textbook is aimed at second year graduate students in Physics Electrical Engineering or Materials Science It presents a rigorous introduction to electronic transport in solids especially at the nanometer scale Understanding electronic transport in solids requires some basic knowledge of Hamiltonian Classical Mechanics Quantum Mechanics Condensed Matter Theory and Statistical Mechanics Hence this book discusses those sub topics which are required to deal with electronic transport in a single self contained course This will be useful for students who intend to work in academia or the nano micro electronics industry Further topics covered include the theory of energy bands in crystals of second quantization and elementary excitations in solids of the dielectric properties of semiconductors with an emphasis on dielectric screening and coupled interfacial modes of electron scattering with phonons plasmons electrons and photons of the derivation of transport equations in semiconductors and semiconductor nanostructures somewhat at the quantum level but mainly at the semi classical level The text presents examples relevant to current research thus not only about Si but also about III V compound semiconductors nanowires graphene and graphene nanoribbons In particular the text gives major emphasis to plane wave methods applied to the electronic structure of solids both DFT and empirical pseudopotentials always paying attention to their effects on electronic transport and its numerical treatment The core of the text is electronic transport with ample discussions of the transport equations derived both in the quantum picture the Liouville von Neumann equation and semi classically the Boltzmann transport equation BTE An advanced chapter Chapter 18 is strictly related to the tricky transition from the time reversible Liouville von Neumann equation to the time irreversible Green s functions to the density matrix formalism and classically to the Boltzmann transport equation Finally several methods for solving the BTE are also reviewed including the method of moments iterative methods direct matrix inversion Cellular Automata and Monte Carlo Four appendices complete the text

Stochastic Approaches to Electron Transport in Micro- and Nanostructures Mihail Nedjalkov, Ivan Dimov, Siegfried Selberherr, 2021-04-05 The book serves as a synergistic link between the development of mathematical models and the emergence of stochastic Monte Carlo methods applied for the simulation of current transport in electronic devices Regarding the models the historical evolution path beginning from the classical charge carrier transport models for microelectronics to current quantum based nanoelectronics is explicatively followed Accordingly the solution methods are elucidated from the early phenomenological single particle algorithms applicable for stationary homogeneous physical conditions up to the complex algorithms required for quantum transport based on particle generation and

annihilation The book fills the gap between monographs focusing on the development of the theory and the physical aspects of models their application and their solution methods and monographs dealing with the purely theoretical approaches for finding stochastic solutions of Fredholm integral equations

Handbook of Optoelectronic Device Modeling and Simulation Joachim Piprek, 2017-10-12 Optoelectronic devices are now ubiquitous in our daily lives from light emitting diodes LEDs in many household appliances to solar cells for energy This handbook shows how we can probe the underlying and highly complex physical processes using modern mathematical models and numerical simulation for optoelectronic device design analysis and performance optimization It reflects the wide availability of powerful computers and advanced commercial software which have opened the door for non specialists to perform sophisticated modeling and simulation tasks The chapters comprise the know how of more than a hundred experts from all over the world The handbook is an ideal starting point for beginners but also gives experienced researchers the opportunity to renew and broaden their knowledge in this expanding field

Multi-Band Effective Mass Approximations Matthias Ehrhardt, Thomas Koprucki, 2014-07-17 This book addresses several mathematical models from the most relevant class of kp Schrödinger systems Both mathematical models and state of the art numerical methods for adequately solving the arising systems of differential equations are presented The operational principle of modern semiconductor nano structures such as quantum wells quantum wires or quantum dots relies on quantum mechanical effects The goal of numerical simulations using quantum mechanical models in the development of semiconductor nano structures is threefold First they are needed for a deeper understanding of experimental data and of the operational principle Secondly they allow us to predict and optimize in advance the qualitative and quantitative properties of new devices in order to minimize the number of prototypes needed Semiconductor nano structures are embedded as an active region in semiconductor devices Thirdly and finally the results of quantum mechanical simulations of semiconductor nano structures can be used with upscaling methods to deliver parameters needed in semi classical models for semiconductor devices such as quantum well lasers This book covers in detail all these three aspects using a variety of illustrative examples Readers will gain detailed insights into the status of the multiband effective mass method for semiconductor nano structures Both users of the kp method as well as advanced researchers who want to advance the kp method further will find helpful information on how to best work with this method and use it as a tool for characterizing the physical properties of semiconductor nano structures The book is primarily intended for graduate and PhD students in applied mathematics mathematical physics and theoretical physics as well as all those working in quantum mechanical research or the semiconductor optoelectronic industry who are interested in new mathematical aspects

Nanomaterial Synthesis and Integration for Sensors, Electronics, Photonics, and Electro-optics Nibir K. Dhar, Achyut K. Dutta, M. Saiful Islam, 2006 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences in the broad ranging fields of optics and photonics These books provide

prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature *International Conference on Simulation of Semiconductor Processes and Devices* ,2005 *Dissertation Abstracts International* ,2008 *Selected Papers on Nanotechnology--theory and Modeling* Akhlesh Lakhtakia,2006 Presents a collection of papers focusing on the theory and modeling of nanoscale materials and structures This book provides an anthology of papers for the understanding of nanotechnological principles The topics covered include nanotubes quantum dots photonic crystals sculptured thin films spintronics nanomagnetism and nanobiotechnology **2002 International Conference on Computational Nanoscience and Nanotechnology** Matthew Laudon,2002 The worlds most comprehensive and up to date collection of Nanotechnology and Nanoscience technical papers Technical Proceedings of the Nanotech 2002 and the International Conference on Computational Nanoscience and Nanotechnology Nanotech Vol 1 Sequence and Biological Structure Computer Aided Drug Design Biological Conduction Processes Biotechnology Micro and Nano Fluidic Systems Soft Condensed Matter Extended Scale Atomistics Quantum Effects Quantum Devices Spintronics Mechanical Properties at the Nanoscale Molecular and Nano Electronics Condensed Matter Phenomena Process Modeling Nanotechnology Materials and Nanostructures Studies Nano Particles and Molecules Papers taken from the 2002 Nanotechnology Conference and Trade Show San Juan Puerto Rico April 2002 VLSI Electronics: Advanced MOS device physics Norman G. Einspruch,1989 **Simulation of Semiconductor Processes and Devices 1998** Kristin De Meyer,Serge Biesemans,1998-08-17 This volume contains the proceedings of the 1998 International Conference on Simulation of Semiconductor Processes and Devices and provides an open forum for the presentation of the latest results and trends in modeling and simulation of semiconductor equipment processes and devices Topics include semiconductor equipment simulation process modeling and simulation device modeling and simulation of complex structures interconnect modeling integrated systems for process device circuit simulation and optimisation numerical methods and algorithms compact modeling and parameter extraction modeling for RF applications simulation and modeling of new devices heterojunction based SET s quantum effect devices laser based *Physics of Semiconductors* José Menéndez,Chris Gilbert Van de Walle,2005 Annotation All papers have been peer reviewed This is the most important conference in the field of semiconductor physics It has been held biennially since 1951 The proceedings cover a wide range of topics from fundamental structural vibrational and electronic properties to device applications Special emphasis is given to areas of current interest such as nitride semiconductors nanostructures spintronics and quantum computing This volume is a fundamental reference for physicists chemists materials scientists and electrical engineers **Physics of Semiconductors** ,2005 Proceedings of the ... ASME Integrated Nanosystems Conference ,2004 Journal of Nanoscience and Nanotechnology ,2005 Noise and Information in Nanoelectronics, Sensors, and Standards II Janusz M. Smulko,2004 Proceedings of SPIE present the original research papers presented at SPIE conferences and other high quality conferences

in the broad ranging fields of optics and photonics These books provide prompt access to the latest innovations in research and technology in their respective fields Proceedings of SPIE are among the most cited references in patent literature

Australian Journal of Physics ,2000 **Physics Briefs** ,1994 Proceedings of the 3rd ASME Integrated Nanosystems Conference ,2004

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