



Low-Dimensional Structures in Semiconductors From Basic Physics to Applications

Edited by

**A. R. Peaker and
H. G. Grimmeiss**

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Low Dimensional Structures In Semiconductors From Basic Physics To Applications

JR Anderson



Low Dimensional Structures In Semiconductors From Basic Physics To Applications:

Low-Dimensional Structures in Semiconductors A.R. Peaker, H.G. Grimmeiss, 2013-06-29 This volume contains a sequence of reviews presented at the NATO Advanced Study Institute on Low Dimensional Structures in Semiconductors from Basic Physics to Applications This was part of the International School of Materials Science and 1990 at the Ettore Majorana Centre in Sicily Technology held in July Only a few years ago Low Dimensional Structures was an esoteric concept but now it is apparent they are likely to play a major role in the next generation of electronic devices The theme of the School acknowledged this rapidly developing maturity The contributions to the volume consider not only the essential physics but take a wider view of the topic starting from material growth and processing then progressing right through to applications with some discussion of the likely use of low dimensional devices in systems The papers are arranged into four sections the first of which deals with basic concepts of semiconductor and low dimensional systems The second section is on growth and fabrication reviewing MBE and MOVPE methods and discussing the achievements and limitations of techniques to reduce structures into the realms of one and zero dimensions The third section covers the crucial issue of interfaces while the final section deals with devices and device physics

Low-dimensional Structures in Semiconductors A.R. Peaker, H. G. Grimmeiss, 1991 *Low-dimensional Structures in Semiconductors* A.R. Peaker, H. G. Grimmeiss, 1991 *Low-Dimensional Semiconductor Structures* Keith Barnham, Dimitri Vvedensky, 2001-07-12 Low Dimensional Semiconductor Structures offers a seamless atoms to devices introduction to the latest quantum heterostructures It covers their fabrication electronic optical and transport properties role in exploring new physical phenomena and utilization in devices The authors describe the epitaxial growth of semiconductors and the physical behavior of electrons and phonons in low dimensional structures They then go on to discuss nonlinear optics in quantum heterostructures The final chapters deal with semiconductor lasers mesoscopic devices and high speed heterostructure devices The book contains many exercises and comprehensive references

Fabrication, Properties and Applications of Low-Dimensional Semiconductors M. Balkanski, Ivan Yanchev, 2012-12-06 A recent major development in high technology and one which bears considerable industrial potential is the advent of low dimensional semiconductor quantum structures The research and development activity in this field is moving fast and it is thus important to afford scientists and engineers the opportunity to get updated by the best experts in the field The present book draws together the latest developments in the fabrication technology of quantum structures as well as a competent and extensive review of their fundamental properties and some remarkable applications The book is based on a set of lectures that introduce different aspects of the basic knowledge available it has a tutorial content and could be used as a textbook Each aspect is reviewed from elementary concepts up to the latest developments Audience Undergraduates and graduates in electrical engineering and physics schools Also for active scientists and engineers updating their knowledge and understanding of the frontiers of the technology

Optical Spectroscopy of Low Dimensional Semiconductors G.

Abstreiter, Atilla Aydinli, J.P. Leburton, 1997-09-30 Proceedings of a September 1996 meeting in sections on quantum films and superlattices quantum wires and quantum dots Coverage includes basic physics aspects novel technology and material fabrication tools characterization methods and new devices with special attention to quantum wire and quantum dot lasers Specific topics include inelastic light scattering by electrons in low dimensional semiconductors band gap renormalization in quasi one dimensional systems conductance in nanowires and fabrication of quantum dots for semiconductor lasers with confined electrons and photons Annotation copyrighted by Book News Inc Portland OR *Ultrafast Photonics* A. Miller, D.T. Reid, D.M. Finlayson, 2019-08-22 Ultrafast photonics has become an interdisciplinary topic of high international research interest because of the spectacular development of compact and efficient lasers producing optical pulses with durations in the femtosecond time domain Present day long haul telecommunications systems are almost entirely based on the transmission of short burst Compound Semiconductors 1999 K Ploog, Gunter Weimann, 2000-01-01 An international perspective on the latest research Compound Semiconductors 1999 presents an overview of important developments in all III V compound semiconductors such as GaAs InP and GaN II VI compounds such as ZnS ZnSe and CdTe IV IV compounds such as SiC and SiGe and IV VI compounds such as PbTe and SnTe The book emphasizes piezoelectric or potentially smart material heterostructures Ga Al In N which will influence future research and development funding As the preeminent forum for research in compound materials and their applications in devices this essential library reference is invaluable reading for all researchers in semiconductor physics and electronic and electrical engineering Aspects of Seismic Reflection Data Processing R. Marschall, 2012-12-06 **Physics Briefs**, 1994 Devices Based on Low-Dimensional Semiconductor Structures M. Balkanski, 2012-12-06 Low dimensional semiconductor quantum structures are a major high technological development that has a considerable industrial potential The field is developing extremely rapidly and the present book represents a timely guide to the latest developments in device technology fundamental properties and some remarkable applications The content is largely tutorial and the book could be used as a textbook The book deals with the physics fabrication characteristics and performance of devices based on low dimensional semiconductor structures It opens with fabrication procedures The fundamentals of quantum structures and electro optical devices are dealt with extensively Nonlinear optical devices are discussed from the point of view of physics and applications of exciton saturation in MQW structures Waveguide based devices are also described in terms of linear and nonlinear coupling The basics of pseudomorphic HEMT technology device physics and materials layer design are presented Each aspect is reviewed from the elementary basics up to the latest developments Audience Undergraduates in electrical engineering graduates in physics and engineering schools Useful for active scientists and engineers wishing to update their knowledge and understanding of recent developments **Dilute Nitride Semiconductors** Mohamed Henini, 2004-12-15 This book contains full account of the advances made in the dilute nitrides providing an excellent starting point for workers entering the field It gives the

reader easier access and better evaluation of future trends Conveying important results and current ideas Includes a generous list of references at the end of each chapter providing a useful reference to the III V N based semiconductors research community The high speed lasers operating at wavelength of 1.3 μm and 1.55 μm are very important light sources in optical communications since the optical fiber used as a transport media of light has dispersion and attenuation minima respectively at these wavelengths These long wavelengths are exclusively made of InP based material InGaAsP InP However there are several problems with this material system Therefore there has been considerable effort for many years to fabricate long wavelength laser structures on other substrates especially GaAs The manufacturing costs of GaAs based components are lower and the processing techniques are well developed In 1996 a novel quaternary material GaInAsN was proposed which could avoid several problems with the existing technology of long wavelength lasers In this book several leaders in the field of dilute nitrides will cover the growth and processing experimental characterization theoretical understanding and device design and fabrication of this recently developed class of semiconductor alloys They will review their current status of research and development Dilute Nitrides III N V Semiconductors Physics and Technology organises the most current available data providing a ready source of information on a wide range of topics making this book essential reading for all post graduate students researchers and practitioners in the fields of Semiconductors and Optoelectronics Contains full account of the advances made in the dilute nitrides providing an excellent starting point for workers entering the field Gives the reader easier access and better evaluation of future trends conveying important results and current ideas Includes a generous list of references at the end of each chapter providing a useful reference to the III V N based semiconductors research community

Compound Semiconductors 1996, Proceedings of the Twenty-Third INT Symposium on Compound Semiconductors held in St Petersburg, Russia, 23-27 September 1996 M.S. Shur, 2020-10-29 Providing a comprehensive overview of developments to both the academic and industrial communities Compound Semiconductors 1996 covers all types of compound semiconducting materials and devices The book includes results on blue and green lasers heterostructure devices nanoelectronics and novel wide band gap semiconductors With invited review papers and research results in current topics of interest this volume is part of a well known series of conferences for the dissemination of research results in the field

Physics and Properties of Narrow Gap Semiconductors Junhao Chu, Arden Sher, 2007-11-21 Narrow gap semiconductors obey the general rules of semiconductor science but often exhibit extreme features of these rules because of the same properties that produce their narrow gaps Consequently these materials provide sensitive tests of theory and the opportunity for the design of innovative devices For example narrow gap semiconductors are the most important materials for the preparation of advanced modern infrared systems In this book the authors offer clear descriptions of crystal growth and the fundamental structure and properties of these unique materials Topics covered include band structure optical and transport properties and lattice vibrations and spectra A thorough treatment of the properties of

low dimensional systems and their relation to infrared applications is provided In addition to covering the technology of photoconductive detectors photovoltaic detectors metal insulator semiconductor devices quantum well infrared photodetectors infrared lasers and single photon detectors Physics and Properties of Narrow Gap Semiconductors helps readers to understand semiconductor physics and related areas of materials science and how they relate to advanced optoelectronic devices

Comprehensive Semiconductor Science and Technology, 2024-11-28 Semiconductors are at the heart of modern living Almost everything we do be it work travel communication or entertainment all depend on some feature of semiconductor technology Comprehensive Semiconductor Science and Technology Second Edition Three Volume Set captures the breadth of this important field and presents it in a single source to the large audience who study make and use semiconductor devices Written and edited by a truly international team of experts and newly updated to capture key advancements in the field this work delivers an objective yet cohesive review of the semiconductor world The work is divided into three sections fully updated and expanded from the first edition The first section is concerned with the fundamental physics of semiconductors showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low dimensional structure and further to a nanometer size Throughout this section there is an emphasis on the full understanding of the underlying physics especially quantum phenomena The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of high purity or doped bulk and epitaxial materials with low defect density and well controlled electrical and optical properties The third section is devoted to design fabrication and assessment of discrete and integrated semiconductor devices It will cover the entire spectrum of devices we see all around us for telecommunications computing automation displays illumination and consumer electronics Provides a comprehensive global picture of the semiconductor world Written and Edited by an international team of experts Compiles the most important semiconductor knowledge into one comprehensive resource Moves from fundamentals and theory to more advanced knowledge such as applications allowing readers to gain a deeper understanding of the field

Effect of Static Electric Fields on The Electronic And Optical Properties of Layered Semiconductor Nanostructures Volodya A. Harutyunyan, 2015-11-04 This volume investigates the theory of the effect of static electric fields on one electron states in nanocylindrical and nanospherical heterolayers and quantized semiconductor films Homogeneous external electrostatic field for all these structures has been considered as a universal modulating factor For structures with radial symmetry a study on the influence of radial static field and the electric field of a charged ring on one electron states is presented Chapters focusing on homogeneous field effect on low dimensional excitonic states in the quantized films and quantum wires in both wide bandgap and narrowband semiconductors are also included Other contents include calculations weak moderate and strong electric fields quantum mechanical approximation and perturbation theory the quasi classical approximation WKB method Readers will benefit from the varied methodological to the subject which

gives them a concrete analytical framework to solve problems related to nanoscale semiconductor design. The reference should prove to be useful to academics and professionals working in semiconductor nanoelectronics research and development.

Point and Extended Defects in Semiconductors Giorgio Benedek, 2013-06-29. The systematic study of defects in semiconductors began in the early fifties. From that time on many questions about the defect structure and properties have been answered but many others are still a matter of investigation and discussion. Moreover during these years new problems arose in connection with the identification and characterization of defects, their role in determining transport and optical properties of semiconductor materials and devices as well as from the technology of the ever increasing scale of integration. This book presents to the reader a view into both basic concepts of defect physics and recent developments of high resolution experimental techniques. The book does not aim at an exhaustive presentation of modern defect physics; rather it gathers a number of topics which represent the present time research in this field. The volume collects the contributions to the Advanced Research Workshop Point Extended and Surface Defects in Semiconductors held at the Ettore Majorana Centre at Erice, Italy, from 2 to 7 November 1988 in the framework of the International School of Materials Science and Technology. The workshop has brought together scientists from thirteen countries. Most participants are currently working on defect problems in either silicon submicron technology or in quantum wells and superlattices where point defects, dislocations, interfaces and surfaces are closely packed together.

Evaluation of Advanced Semiconductor Materials by Electron Microscopy David Cherns, 2012-12-06. The last few years have seen rapid improvements in semiconductor growth techniques which have produced an expanding range of high quality heterostructures for new semiconductor devices. As the dimensions of such structures approach the nanometer level it becomes increasingly important to characterise materials properties such as composition, uniformity, strain, interface sharpness and roughness and the nature of defects as well as their influence on electrical and optical properties. Much of this information is being obtained by electron microscopy and this is also an area of rapid progress. There have been advances for thin film studies across a wide range of techniques including for example convergent beam electron diffraction, X-ray and electron energy loss microanalysis and high spatial resolution cathodoluminescence as well as by conventional and high resolution methods. Important developments have also occurred in the study of surfaces and film growth phenomena by both microscopy and diffraction techniques. With these developments in mind an application was made to the NATO Science Committee in late summer 1987 to fund an Advanced Research Workshop to review the electron microscopy of advanced semiconductors. This was subsequently accepted for the 1988 programme and became the NATO Advanced Research Workshop on the Evaluation of Advanced Semiconductor Materials by Electron Microscopy. The Workshop took place in the pleasant and intimate surroundings of Wills Hall, Bristol, UK during the week 11-17 September 1988 and was attended by fifty-five participants from fourteen countries.

Spectroscopy of Semiconductor Microstructures Gerhard Fasol, Annalisa Fasolino, Paolo Lugli, 2013-06-29. Proceedings of a NATO ARW held in

Venice Italy May 9 13 1989 **Semiconductor Spintronics** Thomas Schäpers, 2021-05-10 This revised and expanded edition of the first comprehensive introduction to the rapidly evolving field of spintronics covers ferromagnetism in nano electrodes spin injection spin manipulation and the practical use of these effects in next generation electronics Moreover the book now also includes spin based optics topological materials and insulators and the quantum spin Hall effect

Reviewing **Low Dimensional Structures In Semiconductors From Basic Physics To Applications**: Unlocking the Spellbinding Force of Linguistics

In a fast-paced world fueled by information and interconnectivity, the spellbinding force of linguistics has acquired newfound prominence. Its capacity to evoke emotions, stimulate contemplation, and stimulate metamorphosis is really astonishing. Within the pages of "**Low Dimensional Structures In Semiconductors From Basic Physics To Applications**," an enthralling opus penned by a very acclaimed wordsmith, readers set about an immersive expedition to unravel the intricate significance of language and its indelible imprint on our lives. Throughout this assessment, we shall delve into the book's central motifs, appraise its distinctive narrative style, and gauge its overarching influence on the minds of its readers.

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Table of Contents Low Dimensional Structures In Semiconductors From Basic Physics To Applications

1. Understanding the eBook Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - The Rise of Digital Reading Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Advantages of eBooks Over Traditional Books
2. Identifying Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - User-Friendly Interface
4. Exploring eBook Recommendations from Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Personalized Recommendations

- Low Dimensional Structures In Semiconductors From Basic Physics To Applications User Reviews and Ratings
- Low Dimensional Structures In Semiconductors From Basic Physics To Applications and Bestseller Lists
- 5. Accessing Low Dimensional Structures In Semiconductors From Basic Physics To Applications Free and Paid eBooks
 - Low Dimensional Structures In Semiconductors From Basic Physics To Applications Public Domain eBooks
 - Low Dimensional Structures In Semiconductors From Basic Physics To Applications eBook Subscription Services
 - Low Dimensional Structures In Semiconductors From Basic Physics To Applications Budget-Friendly Options
- 6. Navigating Low Dimensional Structures In Semiconductors From Basic Physics To Applications eBook Formats
 - ePub, PDF, MOBI, and More
 - Low Dimensional Structures In Semiconductors From Basic Physics To Applications Compatibility with Devices
 - Low Dimensional Structures In Semiconductors From Basic Physics To Applications Enhanced eBook Features
- 7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Highlighting and Note-Taking Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Interactive Elements Low Dimensional Structures In Semiconductors From Basic Physics To Applications
- 8. Staying Engaged with Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Low Dimensional Structures In Semiconductors From Basic Physics To Applications
- 9. Balancing eBooks and Physical Books Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Low Dimensional Structures In Semiconductors From Basic Physics To Applications
- 10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time

11. Cultivating a Reading Routine Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Setting Reading Goals Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Fact-Checking eBook Content of Low Dimensional Structures In Semiconductors From Basic Physics To Applications
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning
 - Utilizing eBooks for Skill Development
 - Exploring Educational eBooks
14. Embracing eBook Trends
 - Integration of Multimedia Elements
 - Interactive and Gamified eBooks

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