Device Applications Of Silicon Nanocrystals And Nanostructures Nanostructure Science And Technology

Plasma Nanoscience
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LDRD Final Report on Si Nanocrystal as Device Prototype for Spintronics Applications
Ion Beams in Nanoscience and Technology
Processing, Properties and Performance
Basic Principles, Present Status, and Perspectives, Second Edition
Physical Properties and Device Applications
Advances in Nanophotonics
Silicon Nanophotonics
Nanocrystals
Silicon and Silicide Nanowires
Nanocomposite Thin Films and Coatings
Quantum Dots
Silicon and Silicide Nanowires
Structural Integrity Considerations In. .
Light Energy Harvesting with Group IV Nanostructures
Silicon and Silicide Nanowires
A Variety of New Applications
Functional Properties
Semiconductor Nanocrystals and Metal Nanoparticles
Fundamentals, Synthesis and Applications
Nanoparticles and Occupational Health

Towards Intelligent Engineering and Information Technology
Silicon Nanocrystal Charging Dynamics and Memory Device Applications
ScholarlyBrief
Solid State Composites and Hybrid Systems
Semiconductor Nanocrystals and Metal Nanoparticles
Nanostructured Thin Films and Coatings
Handbook of Spin Transport and Magnetism
Applications, Fabrication, and Properties
Key Devices
Nanosilicon
Materials and Devices for Silicon-Based Optoelectronics:
Physical Models for Quantum Dots
Nitrogen Compounds—Advances in Research and Application: 2013 Edition
SILICON NANOCRYSTALS EMBEDDED IN SiO2 FOR LIGHT EMITTING DIODE (LED) APPLICATIONS.
Silicon Nanomaterials Sourcebook
Advancing Knowledge in the National Interest

GIOVANNA LAUREN

Plasma Nanoscience BoD – Books on Demand
Semiconductor nanocrystals and metal nanoparticles are the building blocks of the next generation of electronic, optoelectronic, and photonic devices. Covering this rapidly developing and interdisciplinary field, the book examines in detail the physical properties and device applications of semiconductor nanocrystals and metal nanoparticles. It begins with a review of the synthesis and characterization of various semiconductor nanocrystals and metal nanoparticles and goes on to discuss in detail their optical, light emission, and electrical properties. It then illustrates some exciting applications of nanoelectronic devices (memristors and single-electron devices) and optoelectronic devices (UV detectors, quantum dot lasers, and solar cells), as well as other applications (gas sensors and metallic nanopastes for power electronics packaging). Focuses on a new class of materials that exhibit fascinating physical properties and have many exciting device applications. Presents an overview of synthesis strategies and characterization techniques for various semiconductor nanocrystal and metal nanoparticles.

Examines in detail the optical/optoelectronic properties, light emission properties, and electrical properties of semiconductor nanocrystals and metal nanoparticles. Reviews applications in nanoelectronic devices, optoelectronic devices, and photonic devices.

Device Applications of Silicon Nanocrystals and Nanostructures Springer Science & Business Media

The book gives an in-depth description of key devices of current and next generation fibre optic communication networks. Devices treated include semiconductor lasers, optical amplifiers, modulators, wavelength filters and other passives, detectors, all-optical switches, but relevant properties of optical fibres and network aspects are included as well. The presentations include the physical principles underlying the various devices, technologies used for their realization, typical performance characteristics and limitations, but development trends towards more advanced components are also illustrated. This new edition of a successful book was expanded and updated extensively. The new edition covers among others lasers for optical communication, optical switches, hybrid integration, monolithic integration and silicon photonics. The main focus is on Indium phosphide-based structures but silicon photonics is included as well. The book covers relevant principles, state-of-the-art implementations, status of current research as well as expected future components.

Properties, Synthesis, Applications, Methods of Analysis and Control LAP Lambert Academic Publishing

Properties of nanosilicon in the form of nanoparticles, nanowires, nanotubes, and as porous material are of great interest. They can be used in finding suitable components for future miniature devices, and for the more exciting possibilities of novel optoelectronic applications due to bright luminescence from porous silicon, nanoparticles and nanowires. New findings from research into metal encapsulated clusters, silicon fullerenes and nanotubes have opened up a new paradigm in nanosilicon research and this could lead to large scale production of nanoparticles with control on size and shape as well as novel quasi one-dimensional structures. There are possibilities of using silicon as an optical material and in the development of a silicon laser. In Nanosilicon, leading experts cover state-of-the-art experimental and theoretical advances in the different forms of nanosilicon. Furthermore, applications of nanosilicon to single electron transistors, as photonic material, chemical and biological sensors at molecular scale, and silicon nanowire devices are also discussed. Self-assemblies of silicon nanoforms are important for applications. These developments are also related to cage structures of silicon in clathrates. With an interesting focus on the bottlenecks in the advancement of silicon based technology, this book provides a much-needed overview of the current state of understanding of nanosilicon research. Latest developments in nanoparticles, nanowires and nanotubes of silicon Focus on nanosilicon - a very timely subject attracting large interest Novel chapters on metal encapsulated silicon clusters and nanotubes

LDRD Final Report on Si Nanocrystal as Device Prototype for Spintronics Applications Springer

Nanoscale materials are showing great promise in various electronic, optoelectronic, and energy applications. Silicon (Si) has especially captured great attention as the leading material for microelectronic and nanoscale device applications. Recently, various silicides have garnered special attention for their pivotal role in Si device engineering and for the vast potential they possess in fields such as thermoelectricity and magnetism. The fundamental understanding of Si and silicide material processes at nanoscale plays a key role in achieving device structures and performance that meet real-world requirements and, therefore, demands investigation and exploration of nanoscale device applications. This book comprises the theoretical and experimental analysis of various properties of silicon nanocrystals, research methods and techniques to prepare them, and some of their promising applications.

Ion Beams in Nanoscience and Technology CRC Press

Silicon is an abundant element and is produced in large quantities for the electronic industry. The falling price of this commodity also feeds the growth of solar photovoltaics (PV). However, solar cells (SCs) based on bulk semiconductors have quite limited maximum attainable performance. Therefore, new principles and materials are being investigated to build the third generation of SCs with improved conversion efficiency achieved by the optimized harvesting of the solar spectrum, improved carrier generation, better light management, etc. The unique properties of semiconductor nanostructures (tuning of optoelectronic properties by the quantum confinement effect, stronger interaction with light, etc.) can be exploited to fabricate novel types of high-efficiency solar cells. Here, again, silicon along with carbon and germanium (group IV elements) is about to play a major role. In view of the increasing research effort devoted to nanostructures' applications in PV, this book aims to provide a background to students and newcomer researchers as well as to point out some open questions and promising directions for future development. It presents a useful overview of group IV nanostructures for PV, which includes the theoretical background, presentation of main solar cell principles, technological aspects, and nanostructure characterization techniques, and finishes with the design and testing of prototype devices. It is not intended to be just a review of the most up-to-date literature, but the authors aim to provide an educative background of the field. All authors are renowned researchers and experienced teachers in the field of semiconductor nanostructures and photovoltaics.

Processing, Properties and Performance Imperial College Press

The papers included in this issue of ECS Transactions were originally presented in the symposium ¿Nanocrystal Embedded Dielectric for Electronic and Photonic Devices¿, held during the 215th meeting of The Electrochemical Society, in San Francisco, California from May 24 to 29, 2009.

Basic Principles, Present Status, and Perspectives, Second Edition Elsevier

Filling the need for a single work specifically addressing how to use plasma for the fabrication of nanoscale structures, this book is the first to cover plasma deposition in sufficient depth. The author has worked with numerous R&D

institutions around the world, and here he begins with an introductory overview of plasma processing at micro- and nanoscales, as well as the current problems and challenges, before going on to address surface preparation, generation and diagnostics, transport and the manipulation of nano units.

Physical Properties and Device Applications Springer Science & Business Media

Since the early 1990s, quantum dots have become an integral part of research in solid state physics for their fundamental properties that mimic the behavior of atoms and molecules on a larger scale. They also have a broad range of applications in engineering and medicines for their ability to tune their electronic properties to achieve specific functions. This book is a compilation of articles that span 20 years of research on comprehensive physical models developed by their authors to understand the detailed properties of these quantum objects and to tailor them for specific applications. Far from being exhaustive, this book focuses on topics of interest for solid state physicists, materials scientists, engineers, and general readers, such as quantum dots and nanocrystals for single-electron charging with applications in memory devices, quantum dots for electron-spin manipulation with applications in quantum information processing, and finally self-assembled quantum dots for applications in nanophotonics.

Advances in Nanophotonics Walter de Gruyter GmbH & Co KG

Presents recent developments in theoretical and experimental research of nanophotonics Discusses properties and features of nanophotonic devices, e.g. scanning near-field optical microscopy, nanofi ber/nanowire based photonic devices Illustrates the most promising nanophotonic devices and instruments and their application Suits well for researchers and graduates in nanophotonics field Contents Scanning near-field optical microscopy Nanofibers/nanowires and their applications in photonic components and devices Micro/nano-optoelectronic devices based on photonic crystal

Silicon Nanophotonics Cambridge University Press

Nanoscale materials are showing great promise in various electronic, optoelectronic, and energy applications. Silicon (Si) has especially captured great attention as the leading material for microelectronic and nanoscale device applications. Recently, various silicides have garnered special attention for their pivotal role in Si device engineering and for the vast potential they possess in fields such as thermoelectricity and magnetism. The fundamental understanding of Si and silicide material processes at nanoscale plays a key role in achieving device structures and performance that meet real-world requirements and, therefore, demands investigation and exploration of nanoscale device applications. This book comprises the theoretical and experimental analysis of various properties of silicon nanocrystals, research methods and techniques to prepare them, and some of their promising applications.

Nanocrystals National Academies Press

Porous silicon is rapidly attracting increasing interest from various fields, including optoelectronics, microelectronics, photonics, medicine, sensor and energy technologies,

chemistry, and biosensing. This nanostructured and biodegradable material has a range of unique properties that make it ideal for many applications. This book, the third of a

Silicon and Silicide Nanowires John Wiley & Sons

This volume, a reprint from a special issue of the Journal of Nanoparticle Research, draws on work presented at The Second International Symposium on Nanotechnology and Occupational Health, held in Minnesota in 2005. It presents an interdisciplinary approach to nanotechnology and occupational health and offers an overview of recent developments toward assessment and management of hazards and risks associated with engineered nanomaterials.

Nanocomposite Thin Films and Coatings CRC Press

Authored by leading experts from around the world, the three-volume Handbook of Nanostructured Thin Films and Coatings gives scientific researchers and product engineers a resource as dynamic and flexible as the field itself. The first two volumes cover the latest research and application of the mechanical and functional properties of thin films and coatings, while the third volume explores the cutting-edge organic nanostructured devices used to produce clean energy. This second volume, Nanostructured Thin Films and Coatings: Functional Properties, focuses on functional properties (i.e., optical, electronic, and electrical) and related devices and applications. It also addresses topics such as: Large-scale fabrication of functional thin films using nanoarchitecture via chemical routes Fabrication and characterization of SiC nanostructured/nanocomposite films Low-dimensional nanocomposite fabrication and its applications Optical and optoelectronic properties of silicon nanocrystals embedded in SiO2 matrix Electrical properties of silicon nanocrystals embedded in amorphous SiO2 matrix Optical aspects of properties and applications of sol-gel-derived nanostructured thin films Controllably micro/nanostructured films and devices Thin-film shape memory alloy for microsystem applications A complete resource, this handbook provides the detailed explanations that newcomers need, as well as the latest cutting-edge research and data for experts. Covering a wide range of mechanical and functional technologies, including those used in clean energy, these books also feature figures, tables, and images that will aid research and help professionals acquire and maintain a solid grasp of this burgeoning field. The Handbook of Nanostructured Thin Films and Coatings is composed of this volume and two others: Nanostructured Thin Films and Coatings: Mechanical Properties Organic Nanostructured Thin Film Devices and Coatings for Clean Energy

Quantum Dots CRC Press

Nanosilicon: Properties, Synthesis, Applications, Methods of Analysis and Control examines the latest developments on the physics and chemistry of nanosilicon. The book focuses on methods for producing nanosilicon, its electronic and optical properties, research methods to characterize its spectral and structural properties, and its possible applic

Silicon and Silicide Nanowires CRC Press

Biomedical sensors are an essential tool in the detection and monitoring of a wide range of medical conditions from cancer to Parkinson’s disease. Biosensors for

medical applications provides a comprehensive review of established, cutting edge and future trends in biomedical sensors and their applications. Part one focuses on key principles and transduction approaches, reviewing electrochemical, piezoelectric and nano-sized biosensors. Impedence interrogated affinity biosensors for medical applications and practical applications of enzyme biosensors are explored, before part two goes on to review specific medical applications. Biosensors for DNA and RNA detection and characterization, disease biomarker detection, and the use of affibodies as an alternative to antibodies in cancer marker biosensors are investigated, along with biosensors for drug testing and discovery, non-invasive measurements, and wearable biosensors for medical applications. With its distinguished editor and international team of expert contributors, Biosensors for medical applications is an essential guide for all those involved in the research, design, production and use of medical biosensors. Provides a comprehensive review of established, cutting edge and future trends in biomedical sensors and their applications Examines key principles and transduction approaches, reviewing electrochemical, piezoelectric and nano-sized biosensors Reviews biosensors for DNA and RNA detection and characterisation, disease biomarker detection, and the use of affibodies as an alternative to antibodies in cancer marker biosensors

Structural Integrity Considerations In. . Springer

In this study, silicon nanocrystals (NC) were synthesized in silicon dioxide matrix by ion implantation followed by high temperature annealing. Annealing temperature and duration were varied to study their effect on the nanocrystal formation and optical properties. Implantation of silicon ions was performed with different energy and dose depending on the oxide thickness on the silicon substrate. Before device fabrication, photoluminescence (PL) measurement was performed for each sample. From PL measurement it was observed that, PL emission depends on nanocrystal size determined by the parameters of implantation and annealing process. The peak position of PL emission was found to shifts toward higher wavelength when the dose of implanted Si increased. Two PL emission bands were observed in most cases. PL emission around 800 nm originated from Si NC in oxide matrix. Other emissions can be attributed to the luminescent defects in oxide or oxide/NC interface. In order to see electroluminescence properties Light Emitting Devices (LED) were fabricated by using metal oxide semiconductor structure, current-voltage (I-V) and electroluminescence (EL) measurements were conducted. I-V results revealed that, current passing through device depends on both implanted Si dose and annealing parameters. Current increases with increasing dose as one might expect due to the increased amount of defects in the matrix. The current however decreases with increasing annealing temperature and duration, which imply that, NC in oxide behave like a well controlled trap level for charge transport. From EL measurements, few differences were observed between EL and PL results. These differences can be attributed to the different excitation and emission mechanisms in PL and EL process. Upon

comparision, EL emission was found to be inefficient due to the asymmetric charge injection from substrate and top contact. Peak position of EL emission was blue shifted with respect to PL one, and approached tow.

Light Energy Harvesting with Group IV Nanostructures Device Applications of Silicon Nanocrystals and Nanostructures Nitrogen Compounds—Advances in Research and Application: 2013 Edition is a ScholarlyBrief™ that delivers timely, authoritative, comprehensive, and specialized information about ZZZAdditional Research in a concise format. The editors have built Nitrogen Compounds—Advances in Research and Application: 2013 Edition on the vast information databases of ScholarlyNews.™ You can expect the information about ZZZAdditional Research in this book to be deeper than what you can access anywhere else, as well as consistently reliable, authoritative, informed, and relevant. The content of Nitrogen Compounds—Advances in Research and Application: 2013 Edition has been produced by the world's leading scientists, engineers, analysts, research institutions, and companies. All of the content is from peer-reviewed sources, and all of it is written, assembled, and edited by the editors at ScholarlyEditions™ and available exclusively from us. You now have a source you can cite with authority, confidence, and credibility. More information is available at http://www.ScholarlyEditions.com/.

Silicon and Silicide Nanowires CRC Press The primary focus of this book is on basic device concepts, memory cell design, and process technology integration. The first part provides in-depth coverage of conventional nonvolatile memory devices, stack structures from device physics, historical perspectives, and identifies limitations of conventional devices. The second part reviews advances made in reducing and/or eliminating existing limitations of NVM device parameters from the standpoint of device scalability, application extendibility, and reliability. The final part proposes multiple options of silicon based unified (nonvolatile) memory cell concepts and stack designs (SUMs). The book provides Industrial R&D personnel with the knowledge to drive the future memory technology with the established silicon FET-based establishments of their own. It explores application potentials of memory in areas such as robotics, avionics, health-industry, space vehicles, space sciences, bio-imaging, genetics etc.

A Variety of New Applications Elsevier Recent developments in the technology of silicon nanocrystals and silicon nanostructures, where quantum-size effects are important, are systematically described including examples of device applications. Due to the strong quantum confinement effect, the material properties are freed from the usual indirect- or direct-bandgap regime, and the optical, electrical, thermal, and chemical properties of these nanocrystalline and nanostructured semiconductors are drastically changed from those of bulk silicon. In addition to efficient visible luminescence, various other useful material functions are induced in nanocrystalline silicon and periodic silicon nanostructures. Some novel devices and applications, in fields such as photonics (electroluminescence diode, microcavity, and waveguide), electronics (single-electron device, spin

transistor, nonvolatile memory, and ballistic electron emitter), acoustics, and biology, have been developed by the use of these quantum-induced functions in ways different from the conventional scaling principle for ULSI.
Functional Properties Springer
Energetic ion beam irradiation is the basis of a wide plethora of powerful research- and fabrication-techniques for materials characterisation and processing on a nanometre scale. Materials with tailored optical, magnetic and electrical properties can be fabricated by synthesis of nanocrystals by ion implantation, focused ion beams can be used to machine away and deposit material on a scale of nanometres and the scattering of energetic ions is a unique and quantitative tool for process development in high speed electronics and 3-D nanostructures with extreme aspect radios for tissue engineering and nano-fluidics lab-on-a-chip may be machined using proton beams. This book will benefit practitioners, researchers and graduate students working in the field of ion beams and application and more generally everyone concerned with the broad field of nanoscience and technology.