Spins In Optically Active Quantum Dots Concepts A

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Digest 2000

Quantum Dots for Quantum Information Technologies Peter Michler 2017-06-01 This book highlights the most recent developments in quantum dot spin physics and the generation of deterministic superior non-classical light states with quantum dots. In particular, it addresses single quantum dot spin manipulation, spin-photon entanglement and the generation of single-photon and entangled photon pair states with nearly ideal properties. The role of semiconductor microcavities, nanophotonic interfaces as well as quantum photonic integrated circuits is emphasized. The latest theoretical and experimental studies of phonon-dressed light matter interaction, single-dot lasing and resonance fluorescence in QD cavity systems are also provided. The book is written by the leading experts in the field.

Quantum Optics and Nanophotonics Leticia F. Cugliandolo 2017-03-16 Quantum Optics and Nanophotonics consists of the lecture notes of the Les Houches Summer School 101 held in August 2013. Some of the most eminent experts in this flourishing area of research have contributed chapters lying at the intersection of basic quantum science and advanced nanotechnology. The book is part of the renowned series of tutorial books that contain the lecture notes of all the Les Houches Summer Schools since the 1950's and cover the latest developments in physics and related fields.

Quantum-dot Based Light-emitting Diodes Morteza Sasani Ghamsari 2017-10-25 Quantum dot-based light emitting diodes were assigned to bringing together the latest and most important progresses in light emitting diode (LED) technologies. In addition, they were dedicated to gain the perspective of LED technology for all of its advancements and innovations due to the employment of semiconductor nanocrystals. Highly selective, the primary aim was to provide a visual source for high-urgency work that will define the future directions relating to the organic light emitting diode (OLED), with the expectation for lasting scientific and technological impact. The editor hopes that the chapters verify the realization of the mentioned aims that have been considered for editing of this book. Due to the rapidly growing OLED technology, we wish this book to be useful for any progress that can be achieved in future.

Optical Orientation F. Meier 2012-12-02 This book comprises the first systematic exposition of various physical aspects of the orientation of electron and nuclear spins in semiconductors by optical means.

Handbook of Spintronics Yongbing Xu 2016-03-11 Over two volumes and 1500 pages, the Handbook of Spintronics will cover all aspects of spintronics science and technology, including fundamental physics, materials properties and processing, established and emerging device technology and applications. Comprising 60 chapters from a large international team of leading researchers across academia and industry, the Handbook provides readers with an up-to-date and comprehensive review of this dynamic field of research. The opening chapters focus on the fundamental physical principles of spintronics in metals and semiconductors, including an introduction to spin quantum computing. Materials systems are then considered, with sections on metallic thin films and multilayers, magnetic tunnelling structures, hybrids, magnetic semiconductors and molecular spintronic materials. A separate section reviews the various characterisation methods appropriate to spintronics materials, including STM, spin-polarised photoemission, x-ray diffraction techniques and spin-polarised SEM. The third part of the Handbook contains chapters on the state of the art in device technology and applications, including spin valves, GMR and MTJ devices, MRAM technology, spin transistors and spin logic devices, spin torque devices, spin pumping and spin dynamics and other topics such as spin caloritronics. Each chapter considers the challenges faced by researchers in that area and contains some indications of the direction that future work in the field is likely to take. This reference work will be an essential and long-standing resource for the spintronics community.

Self-Assembled Quantum Dots Zhiming M Wang 2007-11-29 This multidisciplinary book provides up-to-date coverage of carrier and spin dynamics and energy transfer and structural interaction among nanostructures. Coverage also includes current device applications such as quantum dot lasers and detectors, as well as future applications to quantum information processing. The book will serve as a reference for anyone working with or planning to work with quantum dots.

Magnetic Nanostructures Hartmut Zabel 2012-09-15 Nanomagnetism and spintronics is a rapidly expanding and increasingly important field of research with many applications already on the market and many more to be expected in the near future. This field started in the mid-1980s with the discovery of the GMR effect, recently awarded with the Nobel prize to Albert Fert and Peter Grünberg. The present volume covers the most important and most timely aspects of magnetic heterostructures, including spin torque effects, spin injection, spin transport, spin fluctuations, proximity effects, and electrical control of spin valves. The chapters are written by internationally recognized experts in their respective fields and provide an overview of the latest status.

Semiconductor Nanocrystals Alexander L. Efros 2013-06-29 A physics book that covers the optical properties of quantum-confined semiconductor nanostructures from both the theoretical and experimental points of view together with technological applications. Topics to be reviewed include quantum confinement effects in semiconductors, optical adsorption and emission properties of group IV, III-V, II-VI semiconductors, deep-etched and self assembled quantum dots, nanoclusters, and laser applications in optoelectronics.

Quantum Coherence Correlation and Decoherence in Semiconductor Nanostructures Toshihide Takagahara 2003-02-10 Semiconductor nanostructures are attracting a great deal of interest as the most promising device with which to implement quantum information processing and quantum computing. This book surveys the present status of nanofabrication techniques, near field spectroscopy and microscopy to assist the fabricated nanostructures. It will be essential reading for academic and industrial researchers in pure and applied physics, optics, semiconductors and microelectronics. The first up-to-date review articles on various aspects on quantum coherence, correlation and decoherence in semiconductor nanostructures

Physics of Semiconductors 2002 J.H Davies 2003-05-01 The 26th International Conference on the Physics of Semiconductors was held from 29 July to 2 August 2002 at the Edinburgh International Conference Centre. It is the premier meeting in the field of semiconductor physics and attracted over 1000 participants from leading academic, governmental and industrial institutions in some 50 countries around the world. Plenary and invited papers (34) have been printed in the paper volume, and all submitted papers (742) are included on the CD-ROM. These proceedings provide an international perspective on the latest research and a review of recent developments in semiconductor physics. Topics range from growth and properties of bulk semiconductors to the optical and transport properties of semiconductor nanostructures. There are 742 papers, mostly arranged in chapters on Bulk, dynamics, defects and impurities, growth (147); Heterostructures, quantum wells, superlattices - optical (138); Heterostructures, quantum wells, superlattices - transport (97); Quantum nanostructures - optical (120); Quantum nanostructures - transport (85); New materials and concepts (52); Novel devices (43); and Spin and magnetic effects (48). A number of trends were identified in setting up the overall programme of the conference. There were significant contributions from new directions of research such as nanostructures and one-dimensional physics; spin effects and ferromagnetism; and terahertz and subband physics. These complemented areas in which the conference has traditional strengths, such as defects and bulk materials; crystal growth; quantum transport; and optical properties. As a record of a conference that covers the whole range of semiconductor physics, this book is an essential reference for researchers working on semiconductor physics, device physics, materials science, chemistry, and electronic and electrical engineering.

Nanostructures Christophe Jean Delerue 2013-06-29 Provides the theoretical background needed by physicists, engineers and students to simulate nano-devices, semiconductor quantum dots and molecular devices. It presents in a unified way the theoretical concepts, the more recent semi-empirical and ab initio methods, and their application to experiments. The topics include quantum confinement, dielectric and optical properties, non-radiative processes, defects and impurities, and quantum transport. This guidebook not only provides newcomers with an accessible overview (requiring only basic knowledge of quantum mechanics and solid-state physics) but also provides active researchers with practical simulation tools.

Quantum State Transfer and Network Engineering Georgios M. Nikolopoulos 2013-10-05 Faithful communication is a necessary precondition for large-scale quantum information processing and networking, irrespective of the physical platform. Thus, the problems of quantum-state transfer and quantum-network engineering have attracted enormous interest over the last years, and constitute one of the most active areas of research in quantum information processing. The present volume introduces the reader to fundamental concepts and various aspects of this exciting research area, including links to other related areas and problems. The implementation of state-transfer schemes and the engineering of quantum networks are discussed in the framework of various quantum optical and condensed matter systems, emphasizing the interdisciplinary character of the research area. Each chapter is a review of theoretical or experimental achievements on a particular topic, written by leading scientists in the field. The volume aims at both newcomers as well as experienced researchers.

The Physics and Engineering of Compact Quantum Dot-based Lasers for Biophotonics Edik U. Rafailov 2013-12-30 Written by a team of European experts in the field, this book addresses the physics, the principles, the engineering methods, and the latest developments of efficient and compact ultrafast lasers based on novel quantum-dot structures and devices, as well as their applications in biophotonics. Recommended reading for physicists, engineers, students and lecturers in the fields of photonics, optics, laser physics, optoelectronics, and biophotonics.

Towards Solid-State Quantum Repeaters Kristiaan De Greve 2013-04-16 Towards Solid-State Quantum Repeaters: Ultrafast, Coherent Optical Control and Spin-Photon Entanglement in Charged InAs Quantum Dots summarizes several state-of-the-art coherent spin manipulation experiments in III-V quantum dots. Both high-fidelity optical manipulation, decoherence due to nuclear spins and the spin coherence extraction are discussed, as is the generation of entanglement between a single spin qubit and a photonic qubit. The experimental results are analyzed and discussed in the context of future quantum technologies, such as quantum repeaters. Single spins in optically active semiconductor host materials have emerged as leading candidates for quantum information processing (QIP). The quantum nature of the spin allows for encoding of stationary, memory quantum bits (qubits), and the relatively weak interaction with the host material preserves the spin coherence. On the other hand, optically active host materials permit direct interfacing with light, which can be used for all-optical qubit manipulation, and for efficiently mapping matter qubits into photonic qubits that are suited for long-distance quantum communication.

Quantum Computing with Nuclear Spins in Semiconductors Thaddeus D. Ladd 2005

Single Quantum Dots Peter Michler 2003-12-09 Special focus is given to the optical and electronic properties of single quantum dots due to their potential applications in devices operating with single electrons and/or single photons. This includes quantum dots in electric and magnetic fields, cavity-quantum electrodynamics, nonclassical light generation, and coherent optical control of excitons.

Handbook of Self Assembled Semiconductor Nanostructures for Novel Devices in Photonics and Electronics Mohamed Henini 2011-07-28 The self-assembled nanostructured materials described in this book offer a number of advantages over conventional material technologies in a wide range of sectors. World leaders in the field of self-organisation of nanostructures review the current status of research and development in the field, and give an account of the formation, properties, and self-organisation of semiconductor nanostructures. Chapters on structural, electronic and optical properties, and devices based on self-organised nanostructures are also included. Future research work on self-assembled nanostructures will connect diverse areas of material science, physics, chemistry, electronics and optoelectronics. This book will provide an excellent starting point for workers entering the field and a useful reference to the nanostructured materials research community. It will be useful to any scientist who is involved in nanotechnology and those wishing to gain a view of what is possible with modern fabrication technology. Mohamed Henini is a Professor of Applied Physics at the University of Nottingham. He has authored and co-authored over 750 papers in international journals and conference proceedings and is the founder of two international conferences. He is the Editor-in-Chief of Microelectronics Journal and has edited three previous Elsevier books. Contributors are world leaders in the field Brings together all the factors which are essential in self-organisation of quantum nanostructures Reviews the current status of research and development in self-organised nanostructured materials Provides a ready source of information on a wide range of topics Useful to any scientist who is involved in nanotechnology Excellent starting point for workers entering the field Serves as an excellent reference manual

Colloidal Quantum Dot Optoelectronics and Photovoltaics Gerasimos Konstantatos 2013-11-07 Captures the most up-to-date research in the field, written in an accessible style by the world's leading experts.

Summaries of Papers Presented at the Quantum Electronics and Laser Science Conference 2001

Semiconductor Quantum Bits Oliver Benson 2009 This book highlights state-of-the-art qubit

implementations in semiconductors and provides an extensive overview of this newly emerging field. Semiconductor nanostructures have huge potential as future quantum information devices as they provide various ways of qubit implementation (electron spin, electronic excitation) as well as a way to transfer quantum information from stationary qubits to flying qubits (photons). Therefore, this book unites contributions from leading experts in the field, reporting cutting-edge results on spin qubit preparation, read-out and transfer. The latest theoretical as well as experimental studies of decoherence in these quantum information systems are also provided. Novel demonstrations of complex flying qubit states and first applications of semiconductor-based quantum information devices are given, too.

Spintronics Puja Dey 2021-04-13 This book highlights the overview of Spintronics, including What is Spintronics ?; Why Do We Need Spintronics ?; Comparative merit-demerit of Spintronics and Electronics ; Research Efforts put on Spintronics ; Quantum Mechanics of Spin; Dynamics of magnetic moments : Landau-Lifshitz-Gilbert Equation; Spin-Dependent Band Gap in Ferromagnetic Materials; Functionality of 'Spin' in Spintronics; Different Branches of Spintronics etc. Some important notions on basic elements of Spintronics are discussed here, such as – Spin Polarization, Spin Filter Effect, Spin Generation and Injection, Spin Accumulation, Different kinds of Spin Relaxation Phenomena, Spin Valve, Spin Extraction, Spin Hall Effect, Spin Seebeck Effect, Spin Current Measurement Mechanism, Magnetoresistance and its different kinds etc. Concept of Giant Magnetoresistance (GMR), different types of GMR, qualitative and quantitative explanation of GMR employing Resistor Network Theory are presented here. Tunnelling Magnetoresistance (TMR), Magnetic Junctions, Effect of various parameters on TMR, Measurement of spin relaxation length and time in the spacer layer are covered here. This book highlights the concept of Spin Transfer Torque (STT), STT in Ferromagnetic Layer Structures, STT driven Magnetization Dynamics, STT in Magnetic Multilayer Nanopillar etc. This book also sheds light on Magnetic Domain Wall (MDW) Motion, Ratchet Effect in MDW motion, MDW motion velocity measurements, Current-driven MDW motion, etc. The book deals with the emerging field of spintronics, i.e., Opto-spintronics. Special emphasis is given on ultrafast optical controlling of magnetic states of antiferromagnet, Spin-photon interaction, Faraday Effect, Inverse Faraday Effect and outline of different all-optical spintronic switching. One more promising branch i.e., Terahertz Spintronics is also covered. Principle of operation of spintronic terahertz emitter, choice of materials, terahertz writing of an antiferromagnetic magnetic memory device is discussed. Brief introduction of Semiconductor spintronics is presented that includes dilute magnetic semiconductor, feromagnetic semiconductor, spin polarized semiconductor devices, three terminal spintronic devices, Spin transistor, Spin-LED, and Spin-Laser. This book also emphasizes on several modern spintronics devices that includes GMR Read Head of Modern Hard Disk Drive, MRAM, Position Sensor, Biosensor, Magnetic Field sensor, Three Terminal Magnetic Memory Devices, Spin FET, Race Track Memory and Quantum Computing.

Confined Electrons and Photons Elias Burstein 2012-12-06 The optical properties of semiconductors have played an important role since the identification of semiconductors as "small" bandgap materials in the thinies, due both to their fundamental interest as a class of solids baving specific optical propenies and to their many important applications. On the former aspect we can cite the fundamental edge absorption and its assignment to direct or indirect transitions, many-body effects as revealed by exciton formation and photoconductivity. On the latter aspect, large-scale applications sucb as LEDs and lasers, photovoltaic converters, photodetectors, electro-optics and non-linear optic devices, come to mind. The eighties saw a revitalization of the whole field due to the advent of heterostructures of lower-dimensionality, mainly two-dimensional quantum wells, which through their enhanced photon-matter interaction yielded new devices with unsurpassed performance. Although many of the basic phenomena were evidenced through the seventies, it was this impact on applications which in turn led to such a

massive investment in fabrication tools, thanks to which many new structures and materials were studied, yielding funher advances in fundamental physics.

Magnetism Beyond 2000 Arthur J. Freeman 1999 Hardbound. The large and growing numbers of publications and patents in magnetism show that the last decade has witnessed a number of impressive discoveries important to both basic science and technology, and that magnetism is now in a new golden age. It is therefore an ideal time to provide an historical perspective of these developments, to identify the most important issues and to provide a perspective for developments anticipated in the beginning of the next century.The forty-six review articles in this book, while not exhaustive, summarize the most significant recent and ongoing exciting scientific and technological developments and provide both the flavor and meaning of magnetism as a vital field of importance to both basic science and device applications. The authors are all well known and respected authorities in their specific areas of expertise. The table of contents reflects the vitality and richness of the field.

Optical Properties of Semiconductor Nanocrystals S. V. Gaponenko 1998-10-28 Examines the optical properties of low-dimensional semiconductor structures, a hot research area - for graduate students and researchers.

Smart Optical Inorganic Structures and Devices Steponas Ašmontas 2001

Quantum Dots Alexander Tartakovskii 2012-07-19 A comprehensive review of cutting-edge solid state research, focusing on quantum dot nanostructures, for graduate students and researchers.

Single Semiconductor Quantum Dots Peter Michler 2009-06-13 This book reviews recent advances in the field of semiconductor quantum dots via contributions from prominent researchers in the scientific community. Special focus is given to optical, quantum optical, and spin properties of single quantum dots.

Spin Physics in Semiconductors Mikhail I. Dyakonov 2008-07-18 The purpose of this collective book is to present a non-exhaustive survey of sp- related phenomena in semiconductors with a focus on recent research. In some sense it may be regarded as an updated version of theOpticalOrientation book, which was entirely devoted to spin physics in bulk semiconductors. During the 24 years that have elapsed, we have witnessed, on the one hand, an extraordinary development in the wonderful semiconductor physics in two dim- sions with the accompanying revolutionary applications. On the other hand, during the last maybe 15 years there was a strong revival in the interest in spin phen- ena, in particular in low-dimensional semiconductor structures. While in the 1970s and 1980s the entire world population of researchers in the ?eld never exceeded 20 persons, now it can be counted by the hundreds and the number of publications by the thousands. This explosive growth is stimulated, to a large extent, by the hopes that the electron and/or nuclear spins in a semiconductor will help to accomplish the dream of factorizing large numbers by quantum computing and eventually to develop a new spin-based electronics, or “spintronics”. Whether any of this will happen or not, still remains to be seen. Anyway, these ideas have resulted in a large body of interesting and exciting research, which is a good thing by itself. The ?eld of spin physics in semiconductors is extremely rich and interesting with many spectacular effects in optics and transport.

Conference Digest 2000

Recent Advances in Nanophotonics Mojtaba Kahrizi 2020-11-26 This volume brings together several

recent research articles in the field of nanophotonics. The editors have arranged the chapters in three main parts: quantum devices, photonic devices, and semiconductor devices. The chapters cover a wide variety of scopes in those areas including principles of plasmonic, SPR, LSPR and their applications, graphene-based nanophotonic devices, generation of entangled photon and quantum dots, perovskite solar cells, photo-detachment and photoionization of two-electrons systems, diffusion and intermixing of atoms in semiconductor crystals, lattice and molecular elastic and inelastic scattering including surface-enhanced Raman Scattering and their applications. It is our sincerest hope that science and engineering students and researchers could benefit from the new ideas and recent advances in the field that are covered in this book.

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.

Condensed Matter Physics in the Prime of 21st Century Janusz Jedrzejewski 2008 This is a collection of lectures by 11 active researchers, renowned specialists in a number of modern, promising, dynamically-developing research directions in condensed matter/solid state theory. The lectures are concerned with phenomena, materials and ideas, discussing theoretical and experimental features, as well as with methods of calculation.Readers will find up-to-date presentations of the methods of carrying out efficient calculations for electronic systems and quantum spin systems, together with applications to describe phenomena and to design new materials. These applications include systems of quantum dots, quantum gates, semiconductor materials for spintronics, and the unusual characteristics of warm dense matter.

Optics Letters 2007

Semiconductors 1998

Concepts in Spin Electronics Sadamichi Maekawa 2006-01-26 Nowadays information technology is based on semiconductor and ferromagnetic materials. Information processing and computation are based on electron charge in semiconductor transistors and integrated circuits, and information is stored on magnetic high-density hard disks based on the physics of the electron spins. Recently, a new branch of physics and nanotechnology, called magneto-electronics, spintronics, or spin electronics, has emerged, which aims at simultaneously exploiting both the charge and the spin of electrons in the same device. A broader goal is to develop new functionality that does not exist separately in a ferromagnet or a semiconductor. The aim of this book is to present new directions in the development of spin electronics in both the basic physics and the technology which will become the foundation of future electronics.

Spins in Optically Active Quantum Dots Oliver Gywat 2010-02-22 Filling a gap in the literature, this up-to-date introduction to the field provides an overview of current experimental techniques, basic theoretical concepts, and sample fabrication methods. Following an introduction, this monograph deals with optically active quantum dots and their integration into electro-optical devices, before looking at the theory of quantum confined states and quantum dots interacting with the radiation field. Final chapters cover spin-spin interaction in quantum dots as well as spin and charge states, showing how to

use single spins for break-through quantum computation. A conclusion and outlook round off the volume. The result is a primer providing the essential basic knowledge necessary for young researchers entering the field, as well as semiconductor and theoretical physicists, PhD students in physics and material sciences, electrical engineers and materials scientists.

Electron & Nuclear Spin Dynamics in Semiconductor Nanostructures M. M. Glazov 2018-09-05 In recent years, the physics community has experienced a revival of interest in spin effects in solid state systems. On one hand, the solid state systems, particularly, semiconductors and semiconductor nanosystems, allow us to perform benchtop studies of quantum and relativistic phenomena. On the other hand, this interest is supported by the prospects of realizing spin-based electronics, where the electron or nuclear spins may play a role of quantum or classical information carriers. This book looks in detail at the physics of interacting systems of electron and nuclear spins in semiconductors, with particular emphasis on low-dimensional structures. These two spin systems naturally appear in practically all widespread semiconductor compounds. The hyperfine interaction of the charge carriers and nuclear spins is particularly prominent in nanosystems due to the localization of the charge carriers, and gives rise to spin exchange between these two systems and a whole range of beautiful and complex physics of manybody and nonlinear systems. As a result, understanding of the intertwined spin systems of electrons and nuclei is crucial for in-depth studying and controlling the spin phenomena in semiconductors. The book addresses a number of the most prominent effects taking place in semiconductor nanosystems including hyperfine interaction, nuclear magnetic resonance, dynamical nuclear polarization, spin-Faraday and spin-Kerr effects, processes of electron spin decoherence and relaxation, effects of electron spin precession mode-locking and frequency focussing, as well as fluctuations of electron and nuclear spins.

Handbook of Crystal Growth Tom Kuech 2014-11-02 Volume IIIA Basic Techniques Handbook of Crystal Growth, 2nd Edition Volume IIIA (Basic Techniques), edited by chemical and biological engineering expert Thomas F. Kuech, presents the underpinning science and technology associated with epitaxial growth as well as highlighting many of the chief and burgeoning areas for epitaxial growth. Volume IIIA focuses on major growth techniques which are used both in the scientific investigation of crystal growth processes and commercial development of advanced epitaxial structures. Techniques based on vacuum deposition, vapor phase epitaxy, and liquid and solid phase epitaxy are presented along with new techniques for the development of three-dimensional nano-and micro-structures. Volume IIIB Materials, Processes, and Technology Handbook of Crystal Growth, 2nd Edition Volume IIIB (Materials, Processes, and Technology), edited by chemical and biological engineering expert Thomas F. Kuech, describes both specific techniques for epitaxial growth as well as an array of materials-specific growth processes. The volume begins by presenting variations on epitaxial growth process where the kinetic processes are used to develop new types of materials at low temperatures. Optical and physical characterizations of epitaxial films are discussed for both in situ and exit to characterization of epitaxial materials. The remainder of the volume presents both the epitaxial growth processes associated with key technology materials as well as unique structures such as monolayer and two dimensional materials. Volume IIIA Basic Techniques Provides an introduction to the chief epitaxial growth processes and the underpinning scientific concepts used to understand and develop new processes. Presents new techniques and technologies for the development of three-dimensional structures such as quantum dots, nano-wires, rods and patterned growth Introduces and utilizes basic concepts of thermodynamics, transport, and a wide cross-section of kinetic processes which form the atomic level text of growth process Volume IIIB Materials, Processes, and Technology Describes atomic level epitaxial deposition and other low temperature growth techniques Presents both the development of thermal and lattice mismatched streams as the techniques used to characterize the structural

properties of these materials Presents in-depth discussion of the epitaxial growth techniques associated with silicone silicone-based materials, compound semiconductors, semiconducting nitrides, and refractory materials

Physics Briefs 1994