Integrated Nanophotonic Resonators

Fundamentals, Devices, and Applications

edited by Ta Sha Yi



Dalia Nandi,Sandip Nandi,Angsuman Sarkar,Chandan Kumar Sarkar

Integrated Nanophotonic Resonators Ya Sha Yi,2015-09-08 The rapid advancement of integrated optoelectronics has been driven considerably by miniaturization Following the path taken in electronics of reducing devices to their ultimately fundamental forms for instance single electron transistors now optical devices have also been scaled down creating the increasingly active research fields of integrat Two-Dimensional Materials in Nanophotonics Yuerui Lu, 2019-10-31 Two dimensional 2D materials have attracted tremendous interest since the study of graphene in the early 21st century With their thickness in the angstrom to nanometer range 2D materials including graphene transition metal dichalcogenides phosphorene silicene and other inorganic and organic materials can be an ideal platform to study fundamental many body interactions because of reduced screening and can also be further engineered for nanophotonic applications This book compiles research outcomes of leading groups in the field of 2D materials for nanophotonic physics and devices It describes research advances of 2D materials for various nanophotonic applications including ultrafast lasers atomically thin optical lenses and gratings to inelastically manipulate light propagation their integrations with photonic nanostructures and light matter interactions. The book focuses on actual applications while digging into the physics underneath It targets advanced undergraduate and graduate level students of nanotechnology and researchers in nanotechnology physics and chemistry Fundamentals and Applications of Nonlinear Nanophotonics Nicolae C. especially those with an interest in 2D materials Panoiu, 2023-09-07 Fundamentals and Applications of Nonlinear Nanophotonics includes key concepts of nonlinear nanophotonics computational and modeling techniques to design these materials and the latest advances This book addresses the scientific literature on nanophotonics while most existing books focus almost exclusively on the linear aspects of light matter interaction at the nanoscale Sections cover nonlinear optics of sub wavelength photonic nanostructured materials review nonlinear optics of bound states in the continuum nonlinear optics of chiral plasmonic metasurfaces nonlinear hyperbolic nanomaterials nonlinear topological photonics plasmonic lattice solitons and more This book is suitable for academics and industry professionals working in the discipline of materials science engineering and nanotechnology Discusses advances in nonlinear optics research such as plasmonics topological photonics and emerging materials Reviews the latest computational methods to model and design nonlinear photonic materials Introduces key principles of advanced concepts in nonlinear optics of bound states in a continuum and symmetries in nonlinear nano optics Metamaterials -<u>Progress, Devices and Applications</u>, 2025-07-23 This book serves as a guide for students researchers and faculty members in the field of metamaterials based devices presenting recent advances and trends in this subject The book comprises a total of five chapters providing in depth knowledge on numerical methods and the various properties and applications of metamaterials The significant applications considered are metamaterial based absorbers and communications devices Each chapter comprises a detailed background on the considered application recent work in the area a possible solution and future

aspects **Integrated Ring Resonators** Dominik G. Rabus, 2007-04-26 The optical filter is resonator based The required passband shape of ring resonator filters can be custom designed by the use of configurations of various ring coupled resonators This book describes the current state of the art on these devices It provides an in depth knowledge of the simulation fabrication and characterization of ring resonators for use as example filters lasers sensors Nanomaterials Shadia Jamil Ikhmayies, 2022-09-29 This book covers synthesis characterization and applications of diverse types of nanomaterials Specifically it describes carbon graphene and graphene oxide based nanomaterials and their use for environmental remediation rare earth ions activated nanophosphors and their application lanthanide based oxides as advanced nanostructured materials for organic decontamination and advanced functional nanomaterials for pollutant sensing and water remediation The chapters explore the use of nanomaterials in solid phase extraction technique design of colorimetric sensor based on gold nanoparticles optical sources and waveguides based on flexible 1D nanomaterials synthesis and property characterization of 2D materials with applications and the scale effects on the value of the surface energy of a solid The developments of some nanomaterials such as zinc and nickel sulfides as photocatalysts and electrocatalysts effects of reducing size and incorporation of nanoadditives advanced carbon nanomaterials such as carbon nanotubes carbon nanofibers and graphene and its derivations as adsorbents and carbon spheres and carbon soot for tribological applications are also presented in this book In addition nanomaterials for concrete coating applications and advances in the processing of high entropy alloys by means of mechanical alloying are also covered Subsequently the use of nanomaterials in endodontics and the use of nanotechnology strategies to enhance restorative resin based dental nanomaterials are reported

Information Photonics Asit Kumar Datta, Soumika Munshi, 2016-11-25 The main aim of this book is to introduce the concept of photonic information processing technologies to the graduate and post graduate students researchers engineers and scientists It is expected to give the readers an insight into the concepts of photonic techniques of processing as a system the photonic devices as required components which are applied in the areas of communication computation and intelligent pattern recognition

Recent Advances and Trends in Photonic Crystal Technology Ajay Kumar, Amit Kumar

Goyal, 2024-03-06 This book presents recent advances and trends in photonic crystal technology making it a useful resource for students researchers and faculty in the field It consists of five chapters that present in depth knowledge of numerical methods and different applications of photonic crystal technology The chapters discuss photonic crystals for energy sensing and digital devices They also examine advanced applications of photonic crystals like holography and photonic spin hall effect Each chapter presents a detailed background on the considered application recent work in the area possible solutions to challenges and future aspects

Integrated Nanophotonics Peng Yu, Hongxing Xu, Zhiming Wang, 2023-05-31 Integrated Nanophotonics Helps readers understand the important advances in nanophotonics materials development and their latest applications. This book introduces the current state of and emerging trends in the development of integrated nanophotonics.

Written by three well qualified authors it systematically reviews the knowledge of integrated nanophotonics from theory to the most recent technological developments It also covers the applications of integrated nanophotonics in essential areas such as neuromorphic computing biosensing and optical communications Lastly it brings together the latest advancements in the key principles of photonic integrated circuits plus the recent advances in tackling the barriers in photonic integrated circuits Sample topics included in this comprehensive resource include Platforms for integrated nanophotonics including lithium niobate nanophotonics indium phosphide nanophotonics silicon nanophotonics and nonlinear optics for integrated photonics The devices and technologies for integrated nanophotonics in on chip light sources optical packaging of photonic integrated circuits optical interconnects and light processing devices Applications on neuromorphic computing biosensing LIDAR and computing for AI and artificial neural network and deep learning Materials scientists physicists and physical chemists can use this book to understand the totality of cutting edge theory research and applications in the field of integrated nanophotonics Optical Switching Dalia Nandi, Sandip Nandi, Angsuman Sarkar, Chandan Kumar Sarkar, 2022-08-02 OPTICAL SWITCHING Comprehensive coverage of optical switching technologies and their applications in optical networks Optical Switching Device Technology and Applications in Networks delivers an accessible exploration of the evolution of optical networks with clear explanations of the current state of the art in the field and modern challenges in the development of Internet of Things devices A variety of optical switches including MEMS based magneto photonic and SOA based are discussed as is the application of optical switches in networks The book is written in a tutorial style easily understood by both undergraduate and graduate students It describes the fundamentals and recent developments in optical switch networks and examines the architectural and design challenges faced by those who design and construct emerging optical switch networks as well as how to overcome those challenges. The book offers ways to assess and analyze systems and applications comparing a variety of approaches available to the reader It also provides A thorough introduction to switch characterization including optical electro optical thermo optical magneto optical and acoustic optic switches Comprehensive explorations of MEMS based SOA based liquid crystal photonic crystal and optical electrical optical OEO switches Practical discussions of quantum optical switches as well as nonlinear optical switches In depth examinations of the application of optical switches in networks including switch fabric control and optical switching for high performance computing Perfect for researchers and professionals in the fields of telecommunications Internet of Things and optoelectronics Optical Switching Device Technology and Applications in Networks will also earn a place in the libraries of advanced undergraduate and graduate students studying optical networks optical communications and sensor applications Center for Nanoscale Science and Technology 2010 Biennial Report, Terahertz Devices, Circuits and Systems Sudipta Das, Anveshkumar Nella, Shobhit K. Patel, 2022-09-26 This book is aimed to bring the emerging application aspects of THz technology and various modules used for its successful realization It gathers scientific technological novelties and advancements already

developed or under development in the academic and research communities This book focuses on recent advances different research issues in terahertz technology and would also seek out theoretical methodological well established and validated empirical work dealing with these different topics In particular this textbook covers design considerations and current trends of THz antennas and antenna arrays to deal with the transmission and reception of THz EM waves It also presents a discussion on metamaterial structures meta surfaces and absorbers to be used for some kind of sensing and detection applications Furthermore it reports on THz wireless communication aspects 6G network issues and challenges advantages and disadvantages generation and detection of THz waves Signal and Communication Processing for THz communication reconfigurable low noise amplifier LNA design III Nitride HEMTs for THz Applications photonic crystal fiber for sensing applications THz Design Variable Estimation by Deep Optimization and THz Imaging issues Once the readers finish studying this book then they will learn about the importance of THz technology advancement in the field applications THz modules like antennas MIMO and DRAs communication aspects LNAs generation of THz waves etc and future scope It also leads to enhancement in their knowledge in THz technology gives a platform to future technology and novel applications realization

An Assessment of Four Divisions of the Physical Measurement Laboratory at the National Institute of Standards and Technology National Academies of Sciences, Engineering, and Medicine, Division on Engineering and Physical Sciences, Laboratory Assessments Board, Committee on NIST Technical Programs, Panel on Review of Four Divisions of the Physical Measurement Laboratory at the National Institute of Standards and Technology, 2018-10-31 An Assessment of Four Divisions of the Physical Measurement Laboratory at the National Institute of Standards and Technology Fiscal Year 2018 assesses the scientific and technical work performed by four divisions of the National Institute of Standards and Technology NIST Physical Measurement Laboratory This publication reviews technical reports and technical program descriptions prepared by NIST staff and summarizes the findings of the authoring panel Handbook of Laser Technology and Applications Chunlei Guo, Chandra Subhash Singh, 2021-06-23 This comprehensive handbook gives a fully updated guide to lasers and laser technologies including the complete range of their technical applications. This forth volume covers laser applications in the medical metrology and communications fields Key Features Offers a complete update of the original bestselling work including many brand new chapters Deepens the introduction to fundamentals from laser design and fabrication to host matrices for solid state lasers energy level diagrams hosting materials dopant energy levels and lasers based on nonlinear effects Covers new laser types including quantum cascade lasers silicon based lasers titanium sapphire lasers terahertz lasers bismuth doped fiber lasers and diode pumped alkali lasers Discusses the latest applications e.g. lasers in microscopy high speed imaging attosecond metrology 3D printing optical atomic clocks time resolved spectroscopy polarization and profile measurements pulse measurements and laser induced fluorescence detection Adds new sections on laser materials processing laser spectroscopy lasers in imaging lasers in environmental sciences and lasers in

communications This handbook is the ideal companion for scientists engineers and students working with lasers including those in optics electrical engineering physics chemistry biomedicine and other relevant areas **Phosphor Handbook** Ru-Shi Liu, Xiaojun Wang, 2022-01-31 A benchmark publication the first edition of the Phosphor Handbook published in 1998 set the standard for references in the field The second edition updated and published in 2007 began exploring new and emerging fields However in the last 14 years since the second edition was published many notable advances and broader phosphor applications have occurred Completely revised updated and expanded into three separate volumes this third edition of the Handbook covers the most recent developments in phosphor research characterization and applications This volume on Fundamentals of Luminescence elucidates the theoretical background and fundamental properties of luminescence as applied to solid state phosphor materials. The book includes the chapters that cover Basic principles of luminescence the principal phosphor materials and their optical properties New developments in principal phosphors in nitrides perovskite and silicon carbide Revised lanthanide level locations and its impact on phosphor performance Detailed descriptions of energy transfer and upconversion processes in bulk and nanoscaled particles and core shell structures Rapid developing organic and polymer luminescent materials and devices Resonant MEMS Oliver Brand, Isabelle Dufour, Stephen Heinrich, Fabien Josse, 2015-04-28 Part of the AMN book series this book covers the principles modeling and implementation as well as applications of resonant MEMS from a unified viewpoint It starts out with the fundamental equations and phenomena that govern the behavior of resonant MEMS and then gives a detailed overview of their implementation in capacitive piezoelectric thermal and organic devices complemented by chapters addressing the packaging of the devices and their stability. The last part of the book is devoted to the cutting edge applications of resonant MEMS such as inertial chemical and biosensors fluid properties sensors timing devices and energy harvesting systems Beams Ioana Voiculescu, Mona Zaghloul, 2015-12-23 This book focuses on the fabrication and applications of cantilever beams with nanoscale dimensions Nanometer size mechanical structures show exceptional properties generated by their reduced dimensions These properties enable new sensing concepts and transduction mechanisms that will allow the enhancement of Advancements in Optoelectronics Dr. M. Irshad Ahamed ,Dr. N. Prathap ,Dr. A. the performance of devices to their f Karthikeyan, Mrs. H. Umamaheswari, 2025-03-10 Silicon Photonics for High-Performance Computing and Beyond Mahdi Nikdast, Sudeep Pasricha, Gabriela Nicolescu, Ashkan Seyedi, Di Liang, 2021-11-16 Silicon photonics is beginning to play an important role in driving innovations in communication and computation for an increasing number of applications from health care and biomedical sensors to autonomous driving datacenter networking and security In recent years there has been a significant amount of effort in industry and academia to innovate design develop analyze optimize and fabricate systems employing silicon photonics shaping the future of not only Datacom and telecom technology but also high performance computing and emerging computing paradigms such as optical computing and artificial intelligence Different from existing

books in this area Silicon Photonics for High Performance Computing and Beyond presents a comprehensive overview of the current state of the art technology and research achievements in applying silicon photonics for communication and computation It focuses on various design development and integration challenges reviews the latest advances spanning materials devices circuits systems and applications Technical topics discussed in the book include Requirements and the latest advances in high performance computing systems Device and system level challenges and latest improvements to deploy silicon photonics in computing systems Novel design solutions and design automation techniques for silicon photonic integrated circuits Novel materials devices and photonic integrated circuits on silicon Emerging computing technologies and applications based on silicon photonics Silicon Photonics for High Performance Computing and Beyond presents a compilation of 19 outstanding contributions from academic and industry pioneers in the field The selected contributions present insightful discussions and innovative approaches to understand current and future bottlenecks in high performance computing systems and traditional computing platforms and the promise of silicon photonics to address those challenges It is ideal for researchers and engineers working in the photonics electrical and computer engineering industries as well as academic researchers and graduate students M S and Ph D in computer science and engineering electronic and electrical engineering applied physics photonics and optics Fundamentals of Optical Waveguides Katsunari Okamoto, 2021-11-12 Now in its Third Edition Fundamentals of Optical Waveguides continues to be an essential resource for any researcher professional or student involved in optics and communications engineering Any reader interested in designing or actively working with optical devices must have a firm grasp of the principles of lightwave propagation Katsunari Okamoto continues to present this difficult technology clearly and concisely with several illustrations and equations Optical theory encompassed in this reference includes coupled mode theory nonlinear optical effects finite element method beam propagation method staircase concatenation method along with several central theorems and formulas Silicon photonics devices such as coupled resonator optical waveguides CROW lattice form filters and AWGs are also fully described This new edition gives readers not only a thorough understanding the silicon photonics devices for on chip photonic network but also the capability to design various kinds of devices Features recent advances in PLC and silicon photonic devices Provides an understanding of silicon photonics and how to apply this knowledge to system design Describes numerical analysis methods such as BPM and FEM

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