Design Fabrication And Optical Characterization Of TaO


This book collects chapters on different theoretical and experimental aspects of photonic crystals for Nanophotonics applications. It is divided in two parts - a theoretical section and an experimental and applicative section. The first part includes chapters developing several numerical methods for analysis and design of photonic crystal devices, such as 2D ring resonators for filters, single and coupled nanobeam cavities, birefringence in photonic crystal cavities, threshold analysis in photonic crystal lasers, gap solitons in photonic crystals, novel photonic atomics, dynamic characteristics of photonic crystal filters. The second part focuses on some aspects of photonic crystals fabrication and relevant applications, such as nitrogen defect technology in diamond, silicon nitride free standing membranes, photonic crystals structures in silicon, photonic crystals for optical sensing.

This comprehensive tutorial guide to silicon nanomaterials spans from fundamental properties, growth mechanisms, and processing of nanosilicon to electronic device, energy conversion and storage, biomedical, and environmental applications. It also presents core knowledge with basic mathematical equations, tables, and graphs in order to provide the reader with the tools necessary to understand the latest technology developments. From low-dimensional structures, quantum dots, and nanowires to hybrid materials, arrays, networks, and biomedical applications, this Sourcebook is a complete resource for anyone working with this materials: Covers fundamental concepts, properties, methods, and practical applications. Focusses on one important type of silicon nanomaterial in every chapter. Discusses formation, properties, and applications for each material. Written in a tutorial style with basic equations and fundamentals included in an extended introduction. Highlights materials that show exceptional properties as well as strong prospects for future applications. Klaus D. Sattler is professor physics at the University of Hawaii, Honolulu, having earned his PhD at the Swiss Federal Institute of Technology (ETH) in Zurich. He was honored with the Walter Schottky Prize from the German Physical Society, and is the editor of the sister work also published by Taylor & Francis, Carbon Nanomaterials Sourcebook, as well as the acclaimed multi-volume Handbook of Nanophysics.

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Design, Fabrication, and Characterization of Multifunctional Nanomaterials covers the major techniques for the design, synthesis and development of multifunctional nanomaterials. The book highlights the main characterization techniques, including, X-ray Diffraction, Scanning Electron Microscopy, High Resolution Transmission Electron Microscopy, Energy Dispersive X-ray Spectroscopy and Scanning Probe Microscopy. In addition, it explores functional studies, including Z-scan technique for non-linear optics, dielectric studies, magneto-electric coupling analysis to study coupling between magnetic and ferroelectric phases, and ferroelectric hysteresis loop tracer to probe the polarization effects in multiferroic systems. Additional sections discuss...
Vibration Sample Magnetometry, Superconducting Quantum Interference Device (SQUID) Interferometry for temperature dependent magnetic measurements, low temperature Raman spectroscopy to probe functional group analysis, Mossbauer Spectroscopy to investigate superparamagnetic doublets, Positron Annihilation Spectroscopy to probe defects in materials and Neutron diffraction to explore the minor defects, and much more. This is an important reference source for materials scientists and engineers who are looking to increase their understanding of design and fabrication techniques for a range of multifunctional nanomaterials. Explains the major design and fabrication techniques and processes for a range of multifunctional nanomaterials Demonstrates how ferromagnetics, multiferroics and carbon nanomaterials are designed for electronic and optical applications Assesses the major challenges of using multifunctional nanomaterials on a mass scale

This book, first published in 1999, provides a comprehensive description of the physics, design, fabrication, characterization, and applications of vertical-cavity surface-emitting lasers.

The majority of the contributions in this topically edited book stems from the priority program SPP 1113 "Photonische Kristalle" run by the Deutsche Forschungsgemeinschaft (DFG), resulting in a survey of the current state of photonic crystal research in Germany. The first part of the book describes methods for the theoretical analysis of their optical properties as well as the results. The main part is dedicated to the fabrication, characterization and modeling of two- and three-dimensional photonic crystals, while the final section presents a wide spectrum of applications: gas sensors, micro-lasers, and photonic crystal fibers. Illustrated in full color, this book is not only of interest to advanced students and researchers in physics, electrical engineering, and material science, but also to company R&D departments involved in photonic crystal-related technological developments.

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Photonic MEMS devices represent the next major breakthrough in the silicon revolution. While many quality resources exist on the optic and photonic aspect of device physics, today's researchers are in need of a reference that goes beyond to include all aspects of engineering innovation. An extension on traditional design and analysis, Photonic MEMS Devices: Design, Fabrication, and Control describes a broad range of optical and photonic devices, from MEMS optical switches and bandgap crystal switches to optical variable attenuators (VOA) and injection locked tunable lasers. It deals rigorously with all these technologies at a fundamental level, systematically introducing critical nomenclature. Each chapter also provides analysis techniques, equations, and experimental results. The book focuses not only on traditional design analysis, but also provides extensive background on realistic simulation and fabrication processes. With a clear attention to experimental relevance, this book provides the fundamental knowledge needed to take the next step in integrating photonic MEMS devices into commercial products and technology.

This is the first book dedicated to wavelength filters for fibre optics. It provides a comprehensive account of the principles and applications of such filters, including their technological realizations. It explains the relevant performance parameters, the particular advantages and shortcomings of the various concepts and components, and the preferred applications. There is also in-depth information on the characteristics of commercially available devices.

This hands-on introduction to silicon photonics engineering equips students with everything they need to begin creating foundry-ready designs.

Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database.

This book constitutes the refereed proceedings of the 23rd International IFIP conference on Optical Network Design and Modeling, ONDM 2019, held in Athens, Greece, in May 2019. The 39 revised full papers were carefully reviewed and selected from 87 submissions. The papers focus on cutting-edge research in established areas of optical networking as well as their adoption in support of a wide variety of new services and applications. This involves the most recent trends in networking including 5G and beyond, big data and network data analytics, cloud/edge computing, autonomic networking, artificial intelligence assisted networks, secure and resilient networks, that drive the need for increased capacity, efficiency, exibility and adaptability in the functions that the network can perform. In this context new disaggregated optical network architectures were discussed, exploiting and integrating novel multidimensional photonic technology solutions as well as adopting open hardware and software platforms relying on software defined networking (SDN), and network function virtualization (NFV) to allow support of new business models and opportunities.
This research was an investigation into the suitability of a recently developed polymer, polyphenylene, as a material for integrated optical circuits (IOCs). Polymers show great promise in the area of IOCs because of material processing advantages, compatibility with most existing integrated circuit technology, and relatively strong nonlinear optical characteristics. This thesis contains an overview of: dielectric waveguides, linear and nonlinear directional coupler theory; various models useful in the design and analysis of optical waveguides; the fabrication of three different waveguide designs; the experimental apparatus and procedure used to optically characterize the waveguides; and the experimental results of the characterization. Waveguiding of near infrared light through polyphenylene, in both a slab waveguide and strip-loaded guides, was observed for the first time in this polymer. Coupling of light between guides of a multi-channel directional coupler was also observed. No definitive conclusions concerning nonlinear effects are possible due to the non-identical, multi-channel nature of the fabricated waveguides. The results of this research indicate that polyphenylene is a candidate for use in IOCs and that the polymer should be the topic of further research.

*Given the many different applications and uses of diffractive optics, the importance of this field cannot be underestimated. This book supplements the available literature on diffractive optic elements (DOEs) by equipping readers with the skills to begin designing, simulating, and fabricating diffractive optics. The design of DOEs is presented with simple equations and step-by-step procedures for simulation—from the simplest 1D grating to the more complex multifunctional DOEs—and analyzing their diffraction patterns using MATLAB. The fundamentals of fabrication techniques such as photolithography, electron beam lithography, and focused ion beam lithography with basic instructions for the beginner are presented. Basic error analysis and error-correction techniques for a few cases are also discussed. The contents of all the chapters are supported throughout by practical exercises and clearly commented MATLAB® codes (the codes are also on an accompanying CD), making this book useful even to a novice programmer*--

This book contains a selection of papers presented at the 16th AISEM (“Associazione Italiana Sensori e M icrosistemi”) National Conference on Sensors and Microsystems, held in Rome 7-9 February 2011. The conference highlighted updated results from both theoretical and applied research in the field of sensors and microsystems. This book presents material in an interdisciplinary approach, covering many aspects of the disciplines related to sensors and microsystems, including physics, chemistry, materials science, biology and applications.

*Freeform optical surfaces are creating exciting new opportunities in optics for design, fabrication, metrology, and assembly. While the term freeform is currently being applied over a broad range of surface shapes, in our research on imaging with freeform optical surfaces, a freeform is a surface whose sag varies not only with the radial component but also with the azimuthal component, \( \phi \rangle, also known as a [\phi]-polynomial optical surface. Interestingly, these surfaces are readily fabricated with techniques like single point diamond turning; however, challenges remain in their optimization during optical design and characterization after fabrication. In this dissertation, we propose a more effective optical design approach based in nodal aberration theory that considers the aberrations induced by a [\phi]-polynomial optical surface up to sixth order. Specifically, when a [\phi]-polynomial overlay is placed on a surface away from the aperture stop, there is both a field constant and field dependent contribution to the net aberration field. These findings are validated through the design, implementation, and wavefront measurement of an aberration generating Schmidt telescope that employs a custom fabricated [\phi]-polynomial plate. The measured wavefront behavior is in good agreement with the theoretical predictions of nodal aberration theory throughout the field of view. The design methods are also applied to a specific example: a wide field, fast focal ratio, long wave infrared, unobscured reflective imager. The system employs three, tilted [\phi]-polynomial surfaces to provide diffraction limited performance throughout the field of view. The surfaces were fabricated with diamond turning and a novel metrology approach based on an interferometric null is proposed for characterizing the figure error of the fabricated surfaces. A mechanical design is also presented for the housing structure that simplifies the system assembly. The as-built optical system maintains diffraction limited performance throughout the field of view. The work conducted in this dissertation provides a foundation for the efficient design of optical systems employing freeform surfaces and demonstrates that a system based on freeform surfaces is realizable in the long wave infrared and may be extended to shorter wavelength regimes*--Pages v-vi.

Semiconductor lasers have important applications in numerous fields, including engineering, biology, chemistry and medicine. They form the backbone of the optical telecommunications infrastructure supporting the internet, and are used in information storage devices, bar-code scanners, laser printers and many other everyday products. Semiconductor lasers: Fundamentals and applications is a comprehensive review of this vital technology. Part one introduces the fundamentals of semiconductor lasers, beginning with key principles before going on to discuss photonic crystal lasers, high power semiconductor lasers and laser beams, and the use of semiconductor lasers in ultrafast pulse generation. Part two then reviews applications of visible and near-infrared emitting lasers. Nonpolar and semipolar GaN-based lasers, advanced self-assembled InAs quantum dot lasers and vertical cavity surface emitting lasers are all considered, in addition to semiconductor disk and hybrid silicon lasers. Finally, applications of mid- and far-infrared emitting lasers are the focus of part three. Topics covered include GaSb-based type I quantum well diode lasers, interband cascade and terahertz quantum cascade lasers, whispering gallery mode lasers and tunable mid-infrared laser absorption spectroscopy. With its distinguished editors and international team of expert contributors, Semiconductor lasers is a
valuable guide for all those involved in the design, operation and application of these important lasers, including laser and telecommunications engineers, scientists working in biology and chemistry, medical practitioners, and academics working in this field. Provides a comprehensive review of semiconductor lasers and their applications in engineering, biology, chemistry and medicine. Discusses photonic crystal lasers, high power semiconductor lasers and laser beams, and the use of semiconductor lasers in ultrafast pulse generation. Reviews applications of visible and near-infrared emitting lasers and mid- and far-infrared emitting lasers.

With the continuous advancement of nanoscale-based data storage and memory technologies, a significant reduction in the dimensions of various materials and devices lead to an array of advancement-hindering phenomenon. The roadblock for these technologies is to find nanomaterials that can support the operation and progression with reducing scales. The focus of the presented research is to create new thin film compositions that take advantage of already optimized conventional materials. We explore layering different thin films in a way that uses the strength of each material while minimizing their weaknesses. These multilayer thin films are tailor-made to the specific functionality of a device or technology. In this work, design, fabrication, and characterization solutions relating to optical-based and magnetic-based futuristic nanotechnologies are explored.

This book presents invited reviews and original short notes of recent results obtained in studies concerning the fabrication and application of nanostructures, which hold great promise for the next generation of electronic, optoelectronic and energy conversion devices. Covering exciting and relatively new topics such as fast-progressing nanoelectronics and optoelectronics, molecular electronics and spintronics, nanophotonics, nanosensors and nanoenergetics as well as nanotechnology and quantum processing of information, this book gives readers a more complete understanding of the practical uses of nanotechnology and nanostructures. Contents: Physics of Nanostructures, Nanoelectromagnetics, Chemistry of Nanostructures, Nanotechnology, Frontiers of Nanotechnologies and Nanomaterials for Renewable Energy Conversion and Storage, Nanomaterials for Electronics and Photonics, Nanostructure Based Devices. Readership: Graduate students and researchers of nanoscience and nanotechnology specifically nanostructures (applications).

Keywords: Nanostructures; Nanotechnology; Nanoelectronics; Spintronics; Nanophotonics; Nanosensors; Nanoenergetics

Features: It is the latest collection of recent results. The areas covered are not presented in any other competing title. Most of the contributors are well-known specialists in the field. All papers contain new experimental and/or theoretical results.