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Theodor Tamir (Ed.)

Guided-Wave Optoelectronics

Second Edition

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Guided Wave Optoelectronics Springer Series In Electronics And Photonics

Azzedine Boudrioua



Guided Wave Optoelectronics Springer Series In Electronics And Photonics:

Guided-wave Optoelectronics R. C. Alferness,1996 Guided-wave Optoelectronics R. C. Alferness,1988 The first guided wave components that employed signals in the form of light beams traveling along thin films were fabricated a little more than two decades ago The parallel development of semiconductor lasers and the subsequent availability of low loss optical fibers made possible the implementation of completely optical systems for communications signal processing and other applications that had used only electronic circuitry in the past Referred to as integrated optics this technology has been reinforced by utilizing electronic components that act as controlling elements or perform other functions for which the optical counterparts are not as effective The broader area thus generated was aptly named optoelectronics and it currently represents a fascinating rapidly evolving and most promising technology Specifically the amalgamation of electronic and optics components into an integrated optoelectronics format is expected to provide a wide range of systems having miniaturized high speed broad band and reliable components for telecommunications data processing optical computing and other applications in the near and far future This book is intended to cover primarily the optical portion of the optoelectronics area by focusing on the theory and applications of components that use guided optical waves Hence all aspects of integrated optics are discussed but optoelectronic components having primarily electronic rather than optical functions have not been included Each chapter has been written by experts who have actively participated in developing the specific areas addressed by them **Guided-Wave Optoelectronics** Theodor Tamir,2013-03-08 The first guided wave components that employed signals in the form of light beams traveling along thin films were fabricated a little more than two decades ago The parallel development of semiconductor lasers and the subsequent availability of low loss optical fibers made possible the implementation of completely optical systems for communications signal processing and other applications that had used only electronic circuitry in the past Referred to as integrated optics this technology has been reinforced by utilizing electronic components that act as controlling elements or perform other functions for which the optical counterparts are not as effective The broader area thus generated was aptly named optoelectronics and it currently represents a fascinating rapidly evolving and most promising technology Specifically the amalgamation of electronic and optics components into an integrated optoelectronics format is expected to provide a wide range of systems having miniaturized high speed broad band and reliable components for telecommunications data processing optical computing and other applications in the near and far future This book is intended to cover primarily the optical portion of the optoelectronics area by focusing on the theory and applications of components that use guided optical waves Hence all aspects of integrated optics are discussed but optoelectronic components having primarily electronic rather than optical functions have not been included Each chapter has been written by experts who have actively participated in developing the specific areas addressed by them Guided-Wave Optoelectronics Theodor Tamir,Giora Griffel,Henry L. Bertoni,2013-06-29 In 1945 Dr Ernst Weber founded and was the first

Director of the Microwave Research Institute MRI at Polytechnic University at that time named the Polytechnic Institute of Brooklyn MRI gained worldwide recognition in the 50s and 60s for its research in electromagnetic theory antennas and radiation network theory and microwave networks microwave components and devices It was also known through its series of 24 topical symposia and the widely distributed hardbound MRI Symposium Proceedings Rededicated as the Weber Research Institute WRI in 1986 the institute currently conducts research in such areas as electromagnetic propagation and antennas ultrabroadband electromagnetics pulse power acoustics gaseous electronics plasma physics solid state materials quantum electronics electromagnetic launchers and networks Following MRI tradition WRI has launched its own series of in depth topical conferences with published proceedings Previous conferences in this series were Directions in Electromagnetic Wave Modeling October 1990 Ultra Wideband Short Pulse Electromagnetics October 1992 Ultra Wideband Short Pulse Electromagnetics II October 1994 The proceedings of these conferences were also published by Plenum Press This volume constitutes the proceedings of the fourth WRI International Conference dealing with Guided Wave Optoelectronics Device Characterization Analysis and Design The conference was held October 26 28 1994 at the Polytechnic University in Brooklyn New York in cooperation with the IEEE Lasers and Electro Optics Society and with the Optical Society of America Theodor Tamir Giora Griffel Henry L Bertoni v CONTENTS INTRODUCTORY Scanning the symposium 1 T Tamir and G Griffel Photonics in telecommunications 3 H Photonic Devices Jia-ming Liu, 2009-06-11 Photonic devices lie at the heart of the communications revolution and have become a large and important part of the electronic engineering field so much so that many colleges now treat this as a subject in its own right With this in mind the author has put together a unique textbook covering every major photonic device and striking a careful balance between theoretical and practical concepts The book assumes a basic knowledge of optics semiconductors and electromagnetic waves Many of the key background concepts are reviewed in the first chapter Devices covered include optical fibers couplers electro optic devices magneto optic devices lasers and photodetectors Problems are included at the end of each chapter and a solutions set is available The book is ideal for senior undergraduate and graduate courses but being device driven it is also an excellent engineers reference Guided Wave Nonlinear Optics D.B. Ostrowsky, R. Reinisch, 2012-12-06 The object of this school held at Cargese Corsica France from August 12th to 24th 1991 was the presentation of the field of guided wave nonlinear optics in a comprehensive coherent and heuristic fashion It seems appropriate that this school began with an historical introduction by Professor Nicolaas Bloembergen of Harvard the acknowledged father of nonlinear optics in general and concluded with a round table discussion headed by Dr Eric Spitz the Scientific Director of a multinational electronics company interested in developing industrial applications of guided wave nonlinear optics The lectures covered both the theoretical framework of the field and applications to basic scientific research optical communications and technical instrumentation Specific topics developed included materials for guided wave nonlinear optics nonlinear interactions using integrated optical guides nonlinear surface

waves solitons fiber nonlinear optics ultra fast coupler switching as well as the related topic of fiber and integrated optical lasers and amplifiers Lectures have also been devoted to squeezed states chaos and strange attractors The subjects covered by the school underlines one of the major ways in which this field has evolved over the past thirty some odd years The path from the original experiments with materials requiring mega watt power lasers to the recent developments in guided wave configurations using milliwatt power diode lasers is marked by the conjunction of ever improving fundamental scientific comprehension and continuing technological developments

Photonic Waveguides Azzedine Boudrioua, 2013-03-01 This book presents the principles of non linear integrated optics The first objective is to provide the reader with a thorough understanding of integrated optics so that they may be able to develop the theoretical and experimental tools to study and control the linear and non linear optical properties of waveguides The potential use of these structures can then be determined in order to realize integrated optical components for light modulation and generation The theoretical models are accompanied by experimental tools and their setting in order to characterize the studied phenomenon The passage from theory to practice makes the comprehension of the physical phenomena simple and didactic The book also gives a presentation of the industrial applications of the integrated optical components The studied topics range from the theory of waveguides and the linear and non linear optical characterization techniques to photonic crystals This last field constitutes a major challenge of photonic technologies of the 21st century

Handbook of Nitride Semiconductors and Devices, GaN-based Optical and Electronic Devices Hadis Morkoç, 2009-07-30 The three volumes of this handbook treat the fundamentals technology and nanotechnology of nitride semiconductors with an extraordinary clarity and depth They present all the necessary basics of semiconductor and device physics and engineering together with an extensive reference section Volume 3 deals with nitride semiconductor devices and device technology Among the application areas that feature prominently here are LEDs lasers FETs and HBTs detectors and unique issues surrounding solar blind detection

Guided-Wave Acousto-Optics Chen S. Tsai, 2013-12-01 The field of integrated or guided wave optics has experienced significant and continuous growth since its inception in the late 1960s There has been a considerable increase in research and development activity in this field worldwide and some significant advances in the realization of working in tegrated optic devices and modules have been made in recent years In fact there have already been some commercial manufacturing and technical ap plications of such devices and modules The guided wave acoustooptics involving Bragg interactions between guided optical waves and surface acoustic waves is one of the areas of in tegrated optics that has reached some degree of scientific and technological maturity This topical volume is devoted to an in depth treatment of this emerging branch of science and technology Presented in this volume are concise treatments on bulk wave acoustooptics guided wave optics and surface acoustic waves and detailed studies of guided wave acoustooptic Bragg diffraction in three promising material substrates namely LiNbO₃ ZnO SiO₂ and GaAs the resulting wide band modulators and deflectors 2 and applications The

chapters cover not only the basic principles and the oretical analysis but also the design fabrication and measurement of the resulting devices and modules and their applications

Lasers Charles Blain,2002 Developments in lasers continue to enable progress in many areas such as eye surgery the recording industry and dozens of others This book presents citations from the book literature for the last 25 years and groups them for ease of access which is also provided by subject author and titles indexes

Current Research On Optical Materials, Devices And Systems In Taiwan, Selected Topics In Electronics Sien Chi,Tien Pei Lee,1998-06-06 The electronics industry in Taiwan has shifted its emphasis from consumer to information based products It is enjoying the bulk of the world market in computer motherboards keyboards scanners and PC monitors Optoelectronics is a growing sub group within information based electronics In addition to the established areas other technologies such as optical storage optical signal processing optical switching and transmission are emerging Research efforts at universities and research institutions are strongly supported by the official bodies of the government The articles collected in this volume are contributed by the most active researchers in the area of optics and photonics in Taiwan The subject areas covered such as Optical Materials Devices and Systems are by no means representative of the breadth nor depth of optical research in Taiwan Instead they offer a snapshot of the ongoing work that will lead to success in the commercial world in future

Silicon Photonics M. Jamal Deen,Prasanta Kumar Basu,2012-03-30 The creation of affordable high speed optical communications using standard semiconductor manufacturing technology is a principal aim of silicon photonics research This would involve replacing copper connections with optical fibres or waveguides and electrons with photons With applications such as telecommunications and information processing light detection spectroscopy holography and robotics silicon photonics has the potential to revolutionise electronic only systems Providing an overview of the physics technology and device operation of photonic devices using exclusively silicon and related alloys the book includes Basic Properties of Silicon Quantum Wells Wires Dots and Superlattices Absorption Processes in Semiconductors Light Emitters in Silicon Photodetectors Photodiodes and Phototransistors Raman Lasers including Raman Scattering Guided Lightwaves Planar Waveguide Devices Fabrication Techniques and Material Systems Silicon Photonics Fundamentals and Devices outlines the basic principles of operation of devices the structures of the devices and offers an insight into state of the art and future developments

Integrated Optics, Microstructures, and Sensors Massood Tabib-Azar,2013-11-27 Controlling the mechanical electrical magnetic and optical properties of materials by advanced fabrication methods Le Molecular Beam Epitaxy and Metal Organic Chemical Vapor Deposition has become the new paradigm in our research era Sensors being the most vital part of the electronic data processing and decision making machines stand to gain the most from engineering of the properties of materials Microfabrication technology has already contributed significantly to the batch fabrication of micro sensors with higher over all qualities compared to their counterparts that are fabricated using other methods Batch fabrication of micro sensors i results in more uniform properties of co fabricated devices ii nearly eliminates

the need for characterization of individual sensors and iii eliminates a need for laborious alignment procedures A less obvious benefit of using microfabrication methods is the possibility of precise control over the dimensions of the sensor This control enables engineering of some of the properties of the material which affect the sensor's operation There are many examples of this in the literature Optical sensors are known to have superior properties over their counterparts that use other i e electrostatic and magnetic means of detection To name a few these advantages are i immunity to electromagnetic interferences ii higher sensitivities compared to the other types of sensors iii simplicity of operation principles and iv simplicity of overall construction

Integrated Optics: Theory and Technology Robert G. Hunsperger, 2013-06-05 Professor Hunsperger's Integrated Optics is one of the few texts that is comprehensive and thorough enough for use both as a classroom text practice problems are included and as a specialist's reference The gratifying success of the first two editions and the continuing rapid development of the field necessitated the writing of this third edition All chapters have been revised and updated and a new chapter on quantum well devices has been added As in the previous editions detailed descriptions of the phenomena devices and technology used in optical integrated circuits and their relationship to fiber optics are presented The trend of telecommunications toward the use of single mode systems operating at the longer wavelengths of 1.3 and 1.55 μm is explained and documented with illustrations of recently developed devices and systems Broader coverage of GaInAsP devices and optical integrated circuits is provided and the new growth techniques of molecular beam epitaxy MBE and metal organic chemical vapor deposition MOCVD are described A discussion of the extensive development of hybrid optical integrated circuits in lithium niobate is also included From the reviews I never had the opportunity of using Hunsperger as a text to teach from but after reading the present third edition I think it must be a pleasure to do so It is a good book because of its precise language and its didactic organization with many clear tables it is exhaustive in its details and rigorous in its background it is well suited for a graduate level course

Nonlinear Photonics Hyatt M. Gibbs, Galina Khitrova, Nasser Peyghambarian, 2012-12-06 Nonlinear photonics is the name given to the use of nonlinear optical devices for the generation communication processing or analysis of information This book is a progress report on research into practical applications of such devices At present modulation switching routing decision making and detection in photonic systems are all done with electronics and linear optoelectronic devices However this may soon change as nonlinear optical devices e g picosecond samplers and switches begin to complement optoelectronic devices The authors succinctly summarize past accomplishments in this field and point to hopes for the future making this an ideal book for newcomers or seasoned researchers wanting to design and perfect nonlinear optical devices and to identify applications in photonic systems

Progress in Optics, 1991-10-24 This volume presents five authoritative review articles on optics and related subjects The first article deals with important components of many optoelectronic systems namely waveguide diffraction gratings It presents an account of the use of waveguide gratings as well as a quantitative review of the properties of optical waveguides The second article

discusses the phenomenon of enhanced backscattering which has attracted a good deal of attention in recent years. It contains an account of research carried out mainly but not exclusively in the U S S R. The generation and propagation of ultrashort optical pulses as well as some linear and non linear effects which arise when such pulses propagate in free space or in material media is dealt with in the next article. It also includes accounts of the use of ultrashort pulses in the fields of optical communications and data processing. The fourth article presents a brief review of several interferometric methods for overcoming the degradation of image quality caused by atmospheric fluctuations including the so called speckle masking method, speckle spectroscopy methods and optical long baseline interferometry with arrays of large telescopes. The concluding article deals with non linear optical properties of semiconductors and metal crystallites in dielectric matrices. A good understanding of these properties is required when choosing the most appropriate materials for manufacturing devices which utilize several non linear optical effects. Such devices would be particularly useful in connection with processing and transmission of information and their performance might eventually surpass those of present day electronics.

Physics of Quantum Electron Devices Federico Capasso, 2013-03-07 The ability to engineer the bandstructure and the wavefunction over length scales previously inaccessible to technology using artificially structured materials and nanolithography has led to a new class of electron semiconductor devices whose operation is controlled by quantum effects. These structures not only represent exciting tools for investigating new quantum phenomena in semiconductors but also offer exciting opportunities for applications. This book gives the first comprehensive treatment of the physics of quantum electron devices. This interdisciplinary field at the junction between material science, physics and technology has witnessed an explosive growth in recent years. This volume presents a detailed coverage of the physics of the underlying phenomena and their device and circuit applications together with fabrication and growth technology.

Principles of Photonic Integrated Circuits Richard Osgood jr., Xiang Meng, 2021-05-21 This graduate level textbook presents the principles, design methods, simulation and materials of photonic circuits. It provides state of the art examples of silicon, indium phosphide and other materials frequently used in these circuits and includes a thorough discussion of all major types of devices. In addition, the book discusses the integrated photonic circuits chips that are currently increasingly employed on the international technology market in connection with short range and long range data communication. Featuring references from the latest research in the field as well as chapter end summaries and problem sets, Principles of Photonic Integrated Circuits is ideal for any graduate level course on integrated photonics or optical technology and communication.

Electrophotography and Development Physics Lawrence B. Schein, 2013-03-07 Electrophotography and Development Physics focuses on the complicated and increasingly important technology found in photocopiers and laser printers. An introduction chapter acquaints the reader with the technical history of electrophotography, its current and projected markets and also alternative related copying and printing technologies. A concise description of the physics of the complete electrophotographic process is

followed by an in depth treatment of static electricity The three types of developmentsystems two component monocomponent and liquid and their associated charging mechanisms In this second edition a discussion of the new color copiers and a chapter updating the original material have been added On mastering this material which is presented in a manner suitable for both the newcomer and the established expert the reader will have a workingknowledge of the electrophotographic process and a detailed knowledge of its important subsystem development

Springer Handbook of Lasers and Optics Frank Träger, 2012-05-05 This new edition features numerous updates and additions Especially 4 new chapters on Fiber Optics Integrated Optics Frequency Combs and Interferometry reflect the changes since the first edition In addition major complete updates for the chapters Optical Materials and Their Properties Optical Detectors Nanooptics and Optics far Beyond the Diffraction Limit Features Contains over 1000 two color illustrations Includes over 120 comprehensive tables with properties of optical materials and light sources Emphasizes physical concepts over extensive mathematical derivations Chapters with summaries detailed index Delivers a wealth of up to date references

The Enigmatic Realm of **Guided Wave Optoelectronics Springer Series In Electronics And Photonics**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing in short supply of extraordinary. Within the captivating pages of **Guided Wave Optoelectronics Springer Series In Electronics And Photonics** a literary masterpiece penned with a renowned author, readers embark on a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book's core themes, assess its distinct writing style, and delve into its lasting affect the hearts and minds of people who partake in its reading experience.

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