Nonlinear Optical Materials Principles And Applications Proceedings Of The International School Of Physics

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Synthesis, Modelling and Characterization of 2D Materials and their Heterostructures - Eui-Hyeok Yang 2020-06-19
Synthesis, Modelling and Characterization of 2D Materials and Their Heterostructures provides a detailed discussion on the multiscale computational approach surrounding atomic, molecular and atomic-informed continuum models. In addition to a detailed theoretical description, this book provides example problems, sample code/script, and a discussion on how theoretical analysis provides insight into optimal experimental design. Furthermore, the book addresses the growth mechanism of these 2D materials, the formation of defects, and different lattice mismatch and interlayer interactions. Sections cover direct band gap, Raman scattering, extraordinary strong light matter interaction, layer dependent photoluminescence, and other physical properties. Explains multiscale computational techniques, from atomic to continuum scale, covering different time and length scales Provides fundamental theoretical insights, example problems, sample code and exercise problems Outlines major characterization and synthesis methods for different types of 2D materials
Proceedings of [the] First International Workshop on Optical Power Limiting - Francois Kajzar 1999

Nonlinear Optics - Alan C. Newell 1992-06-20
Nonlinear optics, the study of the nonlinear effects associated with the propagation of light through matter, is so scientifically rich and technologically promising that it is destined to become one of the most important areas of scientific research into the next century. This book is written for graduate students or anyone interested in getting a unified picture of this emerging field. Nonlinear Optics allows the reader to see all these manifestations of the light-matter interaction as part of the unified whole. Professors Newell and Moloney show how to use these simple equations both to gain a better understanding of the physical processes involved and to deal with the practical applications. Specific topics

include: the notion of the nonlinear refractive index and self-phase modulation, the propagation and use of nonlinear waves and solitons in optical fibers and waveguides, two-and-three lasers, optical bistability, the interaction of co- and counter-propagating beams, stimulated Raman and Brillouin scattering, and self-induced transparency. The final chapter discusses mathematical and computational methods such as multiple time scaling, linear and nonlinear wave propagation, solitons, numerical methods, and useful software packages.

Proceedings of the International Conference of Optically Nonlinear Organic Materials and Applications (4th IKETANI Conference) - Keisuke Sasaki 1995

Nonlinear Optical Materials - Jerome V. Moloney 1998-08-13

Mathematical methods play a significant role in the rapidly growing field of nonlinear optical materials. This volume discusses a number of successful or promising contributions. The overall theme of this volume is twofold: (1) the challenges faced in computing and optimizing nonlinear optical material properties; and (2) the exploitation of these properties in important areas of application. These include the design of optical amplifiers and lasers, as well as novel optical switches. Research topics in this volume include how to exploit the magnetooptic effect, how to work with the nonlinear optical response of materials, how to predict laser-induced breakdown in efficient optical devices, and how to handle electron cloud distortion in femtosecond processes.

Nonlinear Optical Materials: Principles and Applications - Società italiana di fisica 1995

Nonlinear optical materials play a pivotal role in the future evolution of nonlinear optics in general and its impact in technology and industrial applications in particular. The progress in nonlinear optics has been tremendous since the first demonstration of an all-optical nonlinear effect in the early sixties, but until recently the main visible emphasis was on the physical aspects of the nonlinear radiation matter interaction. In the last decade, however, this effort has also brought its fruits in applied aspects of nonlinear optics. This can be essentially traced to the improvement of the performances of the nonlinear optical materials. Our understanding of the nonlinear polarization mechanisms and their relation to the structural characteristics of the materials has been considerably improved. In addition, the new development of techniques for the fabrication and growth of artificial materials has dramatically contributed to this evolution. The goal is to find and develop materials presenting large nonlinearities and satisfying at the same time all the technological requirements for applications such as wide transparency range, fast response, high damage threshold but also processability, adaptability and interfacing with other materials. Improvements, besides rendering possible the implementation of nonlinear effects in devices, open the way to the study of new nonlinear optical effects and the introduction of new concepts. This book describes new concepts which are emerging in the field of nonlinear optical materials, concentrating the attention on materials which seem more promising for applications in the technology of information transmission and processing.

Handbook of Laser Technology and Applications - Chunlei Guo 2021-05-04

This comprehensive handbook gives a fully updated guide to lasers and laser technologies, including the complete range of their technical applications. The first volume outlines the fundamental components of lasers, their properties, and working principles. 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.

Nano-Optics for Enhancing Light-Matter Interactions on a Molecular Scale - Baldassare Di Bartolo 2012-12-04

This volume presents a considerable number of interrelated contributions dealing with the new scientific ability to shape and control matter and electromagnetic fields on a sub-wavelength scale. The topics range from the fundamental ones, such as photonic metamateriials, plasmonics and sub-wavelength resolution to the more applicative, such as detection of single molecules, tomography on a micro-chip, fluorescence spectroscopy of biological systems, coherent control of biomolecules, biosensing of single proteins, terahertz spectroscopy of nanoparticles, rare earth ion-doped nanoparticles, random lasing, and nanocoax array architecture. The various subjects bridge over the disciplines of physics, biology and chemistry, making this volume of interest to people working in these fields. The emphasis is on the principles behind each technique and on examining the full potential of each technique. The contributions that appear in this volume were presented at a NATO Advanced Study Institute that was held in Erice, Italy, 3-18 July, 2011. The pedagogical aspect of the Institute is reflected in the topics presented in this volume.

Molecules in Physics, Chemistry, and Biology - J. Maruani 2012-12-06

Volume 1: General Introduction to Molecular Sciences Volume 2: Physical Aspects of Molecular Systems Volume 3: Electronic Structure and Chemical Reactivity Volume 4: Molecular Phenomena in Biological Sciences

Applications of Nonlinear Fiber Optics - Govind P. Agrawal 2001-01

Includes chapters that deal with three important fiber-optic components - fiber-based gratings, couplers, and interferometers - that serve as the building blocks of lightwave technology. This work aims to serve the need of the scientific community interested in such fields as ultrafast phenomena, optical amplifiers, and optical communications.

Characterization Techniques and Tabulations for Organic Nonlinear Optical Materials - Kuzyk 2018-05-11

""Furnishes table of nonlinear optical properties of organic substances as well as experimental procedures for measuring the nonlinearity of the elements tabulated, including composite materials-offering support for scientists and engineers involved in characterizing, optimizing, and producing materials for manufacturing optical devices.

Fiber Optics Yellow Pages -

Nonlinear Optical Materials - Shashi P. Karna 1996

Provides an overview of the theoretical aspects of nonlinear optical materials design. Examines the quantum mechanical theory of nonlinear optical phenomena. Discusses first principles and both semi-empirical and model Hamiltonian calculations of linear optical properties. Examines theoretical modeling of organic and polymeric nonlinear optical materials.

Atom Optics and Space Physics - E. Arimondo 2009

"The goal of this volume is to discuss the rapidly moving field of atom optics and interferometry with all its intricate aspects ranging from fundamental physics to

applications and the theory of relativity. The breathtaking success in manipulating atoms using lasers has encouraged these two so far disjunct communities to move closer together and begin collaborations. After an introduction to atom optics and Bose-Einstein condensation, the theoretical foundations of cold atom interferometers, their use to test gravity, and their implementation in laboratory measurements of the earth rotation and of Newton's gravitational constant are discussed. Several papers discuss the characteristics of gyroscopes and interferometers as sensors for inertial forces, starting from gyroscopes based on light waves and comparing their sensitivity to those based on matter waves. The final topic is the variation of fundamental constants, a subject that during the last years has attracted a lot of --

Nonlinear Optics and Applications, 2007 - Hossin A. Abdeldayem 2007-01-01

Nonlinear optics is a field of study resulting from laser beam interactions with materials which started with the advent of lasers in the early 60 s. This field of study is maturing dramatically while playing a major role in newly emerging photonic technologies. Nonlinear optics has spawned the development of numerous optical devices that have become indispensable in our daily lives. This exciting field has played a major role in the development of optical applications such as optical signal processing, optical computers, ultrafast switches, ultra-short pulsed lasers, sensors, laser amplifiers, and many others. This special review volume on Nonlinear Optics and Applications is intended for those who want to become more aware of some of the most recent developments in photonics and to provide a glimpse of the role of nonlinear optics in modern photonic technologies. It is also important to note that the vast quantity of research in nonlinear optics, optical materials, and nonlinear optical devices in the last five years alone is enormous, the totality of which is well beyond the scope of a single volume. This fact along with other constraints, such as communication and time, has made our efforts toward fair and comprehensive discussion of the most representative of modern advances in this vast field extremely difficult, and no doubt futile. Consequently, we apologize in advance to those whose high quality and equally significant work has been unavoidably left out. We are hopeful that similar volumes will follow, and that this dialogue will continue to expand. In this book, we give a survey on the recent advances of nonlinear optical applications. Emphasis will be on novel devices and materials, switching technology, optical computing, and important experimental results. We also include the recent developments in topics which are of historical interest to many researchers, and, at the same time, of potential use in the fields of all-optical communication and computing technologies. In addition, we enclosed a few new and unconventional related topics which might provoke new thinking and discussion. This review volume is designed to be of interest to a broad range of research scientists, engineers, and graduate students engaged in multidiscipline research areas such as optics, material science, chemistry, physics, lasers, fibers, semiconductors, computer and electrical engineering. The book is organized as follows: Chapter 1 provides an introduction and update to nonlinear optics and applications particularly as related to organic p-electron materials and devices fabricated from such materials. This chapter provides insight into the fundamental concepts and guiding principles leading to improved materials and devices. Chapter 2 gives a brief review of the nonlinear Schrodinger and associated equations that model spatio-temporal propagation in one and higher dimensions in nonlinear dispersive media. Fast adaptive numerical techniques were used to solve these equations. A unique variational approach is also outlined that helps in determining the ranges of nonlinearity and dispersion parameters. Chapter 3 is an update of the supercontinuum light source by professor Alfano, who observed the phenomenon for the first time in 1970. The phase change

induced by an intense ultrashort laser pulse propagating through a medium causes a frequency sweep within the pulse envelope, resulting in a well-defined temporal chirp. A look into the nonlinear mechanisms involved in producing such a system and its potential applications are presented. Chapter 4 demonstrates wideband ultrashort pulse fiber laser sources using optical fibers and ultrashort pulse fiber lasers and a wavelength tuning range from 0.78 to 2.0 mm. The generation process and characteristics have been analyzed both experimentally and numerically. Chapter 5 provides an overview of experimental demonstrations and theoretical understanding of lattice fabrication (including 1D lattices, 2D square lattices and ring lattices, and lattices with structured defects), as well as their linear and nonlinear light guiding properties. Discrete diffraction and self-trapping are demonstrated in a variety of settings, including fundamental discrete solitons, discrete vector solitons, discrete dipole solitons, discrete vortex solitons, and necklace-like solitons. In addition, the formation of 1D and 2D lattices with single-site negative defects, and linear bandgap guidance in these structures are demonstrated. Chapter 6 discusses the second-order EO (Pockels) effect, the third-order (Kerr) and thermo-optical effects in optical waveguides and their applications in optical communication. Chapter 7 presents a theoretical study and experimental data of beam combination using Stimulated Brillouin Scattering for improving upon beam quality in optical fibers. The study includes both coherent and incoherent combination as well as two-beam phasing using the unique polarization characteristics of stimulated Brillouin scattering. Chapter 8 demonstrates theoretical and experimental results of a double-functional interferometer, using holographic recording of a dynamic grating in CdTe:V crystal. The mechanisms involved were attributed to a slow electro-optical effect and a fast free-carrier grating. Chapter 9 represents the poling process of optical polymers to induce second and third order nonlinear optical effects. The chapter attributes the electro-optic effect in polymers to the presence of chromophore in the polymer matrix and explains the different approaches for incorporating the chromophore into the polymer matrix. This chapter also describes the different poling methods, and explains accompanying mechanisms. Chapter 10 treats the effects of a magnetic field on materials, and its role in nonlinear optics. The chapter presents a set of experimental results, which prompts reconsideration of the role of magnetization in optics and predictions of optical magnetic resonance, negative permeability, and magnetic birefringence at optical frequencies. Chapter 11 describes observations of Stokes and anti-Stokes emissions of gold nano-particles as a three step process involving single-photon or three-photon excitation of electron-hole pairs, relaxation of excited electrons and holes, and emission from electron-hole recombination. This chapter also presents quantitative analyses of the experimental data. Chapter 12 explores the use of linear optics and the reliance on detection to design a number of optical logic gates that perform operations in the complex domain of linear optics and are converted to Boolean operations by the act of detection. These logic gates have no energy cost and the bandwidth is strictly limited by the electronic modulation and demodulation rate and can be integrated on chips with the electronics. Chapter 13 presents an answer to the important question: Can the electric field of a light wave be assigned a definite polarity? In other words, can an optical field vector be more up than down? It also describes physical experiments and devices where this polar asymmetry is generated and detected and also connects the answer to the independently developed, Nobel Prize-winning technique of generating stabilized combs of mode-locked frequency components of light. Chapter 14 presents an excellent review of chalcopyrite materials and their potential as compact highly sensitive nonlinear optical sensors, of

potential for many remote sensing devices. The chapter also touches on the integration of miniaturized photonic nonlinear bandgap structures, which enhances the nonlinearity and minimizes problems associated with walk-off effects, and outlines a theoretical analysis of nonlinear propagation in these structures. Chapter 15 presents the status of the ultimate device, the development of which can be achieved within the time-frame of this 21st century through photonic technologies: optical computing. This chapter lists the different components of which the optical computer might consist of and lists the most recent advances in their development to date, along with a substantial list of the recent literature on each component. The chapter concludes with a discussion of obstacles yet to be overcome to enable building of such a system.

Optical Materials and Applications - Moriaki Wakaki 2017-12-19

The definition of optical material has expanded in recent years, largely because of IT advances that have led to rapid growth in optoelectronics applications. Helping to explain this evolution, Optical Materials and Applications presents contributions from leading experts who explore the basic concepts of optical materials and the many typical applications in which they are used. An invaluable reference for readers ranging from professionals to technical managers to graduate engineering students, this book covers everything from traditional principles to more cutting-edge topics. It also details recent developmental trends, with a focus on basic optical properties of material. Key topics include: Fundamental optical properties of solids Fundamental optical materials (including thin films) from both linear and nonlinear perspectives Use of bulk materials in the design of various modifications Application of optical thin films in artificial components Formation of artificial structures with sub-wavelength dimensions Use of physical or chemical techniques to control lightwave phase One-, two-, and three-dimensional structures used to control dispersion of materials for nanophotonics Progress of the optical waveguide, which makes optical systems more compact and highly efficient This book carefully balances coverage of theory and application of typical optical materials for ultraviolet, visible and infrared, non-linear optics, solid state lasers, optical waveguides, optical thin films and nanophotonics. It addresses both basic ideas and more advanced topics, making it an equally invaluable resource for beginners and active researchers in this growing field.

Introduction to Applied Solid State Physics - R. Dalven 1990-04-30

In addition to the topics discussed in the First Edition, this Second Edition contains introductory treatments of superconducting materials and of ferromagnetism. I think the book is now more balanced because it is divided perhaps 60% - 40% between devices (of all kinds) and materials (of all kinds). For the physicist interested in solid state applications, I suggest that this ratio is reasonable. I have also rewritten a number of sections in the interest of (hopefully) increased clarity. The aims remain those stated in the Preface to the First Edition; the book is a survey of the physics of a number of solid state devices and ma terials. Since my object is a discussion of the basic ideas in a number of fields, I have not tried to present the "state of the art," especially in semi conductor devices. Applied solid state physics is too vast and rapidly changing to cover completely, and there are many references available to recent developments. For these reasons, I have not treated a number of interesting areas. Among the lacunae are superiattices, heterostructures, compound semiconductor devices, ballistic transistors, integrated optics, and light wave communications. (Suggested references to those subjects are given in an appendix.) I have tried to cover some of the recent revolutionary developments in superconducting materials.

New Nonlinear Optical Materials - 2007

Optical materials with large values of non-linear susceptibilities and fast responses are in great demand in industrial applications, such as non-linear optical switching devices

for use in photonics and real-time coherent optical signal processors, optical limiters, and so on. In general, many applications of non-linear optics that have been demonstrated under controlled laboratory conditions could become practical for technological uses if such materials were available. It is usually believed that an effective enhanced non-linear optical response can appear in a composite material in which at least one component should possess an inherent non-linear optical response. Thus, the common way to develop new non-linear optical materials is to seek materials in which the components possess an inherently large non-linear optical response. In contrast, the author has theoretically exploited some new non-linear optical materials, e.g., colloidal nanocrystals with strong lattice effects, metallic films with inhomogeneous microstructures adjusted by ion doping or temperature gradient, composites of graded (and/or shape-anisotropic) nanoparticles, etc. The proposed materials are difficult or impossible to achieve with conventional, naturally occurring materials or random composites widely discussed in the literature. This book presents a first-hand review of the latest developments in this field.

Nonlinear Optics of Organic Molecules and Polymers - Hari Singh Nalwa 2020-07-09

The field of nonlinear optics emerged three decades ago with the development of the first operating laser and the demonstration of frequency doubling phenomena. These milestone discoveries not only generated much interest in laser science, but also set the stage for future work on nonlinear optics. This book presents an excellent overview of the exciting new advances in nonlinear optical (NLO) materials and their applications in emerging photonics technologies. It is the first reference source available to cover every NLO material published through 1995. All theoretical approaches, measurement techniques, materials, technologies, and applications are covered. With more than 1,800 bibliographic citations, 324 figures, 218 tables, and 812 equations, this book is an invaluable reference source for graduate and undergraduate students, researchers, scientists and engineers working in academia and industries in chemistry, solid-state physics, materials science, optical and polymer engineering, and computational science.

Nonlinear Optics - Robert W. Boyd 1992

Nonlinear Optics is an advanced textbook for courses dealing with nonlinear optics, quantum electronics, laser physics, contemporary and quantum optics, and electrooptics. Its pedagogical emphasis is on fundamentals rather than particular, transitory applications. As a result, this textbook will have lasting appeal to a wide audience of electrical engineering, physics, and optics students, as well as those in related fields such as materials science and chemistry. Key Features * The origin of optical nonlinearities, including dependence on the polarization of light * A detailed treatment of the quantum theory of the nonlinear susceptibility * An explication of dressed-atomic states of two-level atoms * A complete development of spontaneous and stimulated light scattering * A clear discussion of the photorefractive effect * An introduction to applications including laser frequency modification, optical phase conjugation, optical bistability, and propagation of optical soliton

Molecular Electronics and Molecular Electronic Devices - Kristof Sienicki 1993-09-27

Molecular Electronics and Molecular Electronic Devices is a book that provides a comprehensive review of current problems and information regarding aspects of molecular electronics and molecular electronic devices. Experimental and theoretical aspects of molecular electronics and molecular electronic devices are reviewed by distinguished researchers working in chemistry, physics, computer science, and various areas of biology. These books will be an excellent reference for physicists, chemists, electronics engineers and researchers interested in molecular

electronics and molecular electronic devices.

Laser Physics and Technology - Pradeep Kumar Gupta 2014-11-06

The book, ‘Laser Physics and Technology’, addresses fundamentals of laser physics, representative laser systems and techniques, and some important applications of lasers. The present volume is a collection of articles based on some of the lectures delivered at the School on ‘Laser Physics and Technology’ organized at Raja Ramanna Centre for Advanced Technology during March, 12-30, 2012. The objective of the School was to provide an in-depth knowledge of the important aspects of laser physics and technology to doctoral students and young researchers and motivate them for further work in this area. In keeping with this objective, the fourteen chapters, written by leading Indian experts, based on the lectures delivered by them at the School, provide along with class room type coverage of the fundamentals of the field, a brief review of the current status of the field. The book will be useful for doctoral students and young scientists who are embarking on a research in this area as well as to professionals who would be interested in knowing the current state of the field particularly in Indian context.

Nanostructured Nonlinear Optical Materials - Rashid A. Ganeev 2018-06-29

Nanostructured Nonlinear Optical Materials: Formation and Fabrication covers the analysis of the formation, characterization and optical nonlinearities of various nanostructures using different methods. It addresses many areas of research in the field, including the modification of the surfaces of materials for the formation of various nanostructures, transmission electron microscopy and time-of-flight mass spectroscopy studies of ablated bulk and nanoparticle targets, the low-order nonlinearities of metal and semiconductor nanoparticles, the nonlinear refraction and nonlinear absorption of carbon-contained nanoparticles, and low- and high-order harmonic generation in nanoparticle-contained plasmas, amongst other topics. The book is an essential reference for all nanomaterials researchers in the fields of photonics, materials, physics, chemistry and nanotechnology. Present complete coverage of the formation, characterization and optical nonlinearities of nanostructures Builds on basic theory, showing the strengths of the application of nanostructures in optical materials Written by a leading expert in the subject

Index of Conference Proceedings - British Library. Document Supply Centre 2002

Fundamentals of Optical Parametric Processes and Oscillations - Alice M. Tang 2020-11-26

This study looks at the basic principles of optical parametric processes and recent results on the rapidly developing optical parametric device technology. The theoretical basis of stimulated and spontaneous optical parametric processes and detailed design considerations of optical parametric oscillators and amplifiers are discussed, followed by a review of the materials properties of the most important nonlinear optical crystals for such applications. It concludes with a review of the recent developments on practical low-repetition rate nanosecond optical parametric oscillators and broadly tunable high-repetition rate continuous-pulse-train femtosecond optical parametric oscillations from the uv to the mid ir.

Books in Print - 1991

Scientific and Technical Aerospace Reports - 1995

Advanced Photonics with Second-Order Optically Nonlinear Processes - A.D. Boardman 2012-12-06

Although it took some time to establish the word, photonics is both widely accepted and used throughout the world and a major area of activity concerns nonlinear materials. In these the nonlinearity mainly arises from second-order or third-order nonlinear optical processes. A restriction is that second-order processes only occur in media that do not

possess a centre of symmetry. Optical fibres, on the other hand, being made of silica glass, created by fusing SiO molecules, are made of material with a centre of z symmetry, so the bulk of all processes are governed by third-order nonlinearity. Indeed, optical fibre nonlinearities have been extensively studied for the last thirty years and can be truly hailed as a success story of nonlinear optics. In fact, the fabrication ofsuch fibres, and the exploitation oftheir nonlinearity, is in an advanced stage - not least being their capacity to sustain envelope solitons. What then ofsecond-order nonlinearity? This is also well-known for its connection to second-harmonic generation. It is an immediate concern, however, to understand how waves can mix and conserve both energy and momentum ofthe photons involved. The problem is that the wave vectors cannot be made to match without a great deal of effort, or at least some clever arrangement has to be made - a special geometry, or crystal arrangement. The whole business is called phase matching and an inspection ofthe state-of-the-art today, reveals the subject to be in an advanced state.

Heisenberg's Uncertainty Principle and the Electron Statistics in Quantized Structures - Kamakhya Prasad Ghatak 2022-03-25

This book highlights the importance of Electron Statistics (ES), which occupies a singular position in the arena of solid state sciences, in heavily doped (HD) nanostructures by applying Heisenberg's Uncertainty Principle directly without using the complicated Density-of-States function approach as given in the literature. The materials considered are HD quantum confined nonlinear optical, III-V, II-VI, IV-VI, GaP, Ge, PtSb2, stressed materials, GaSb, Te, II-V, Bi2Te3, lead germanium telluride, zinc and cadmium diphosphides, and quantum confined III-V, IV-VI, II-VI and HgTe/CdTe super-lattices with graded interfaces and effective mass super-lattices. The presence of intense light waves in optoelectronics and strong electric field in nano-devices change the band structure of materials in fundamental ways, which have also been incorporated in the study of ES in HD quantized structures of optoelectronic compounds that control the studies of the HD quantum effect devices under strong fields. The influence of magnetic quantization, magneto size quantization, quantum wells, wires and dots, crossed electric and quantizing fields, intense electric field, and light waves on the ES in HD quantized structures and superlattices are discussed. The content of this book finds six different applications in the arena of nano-science and nanotechnology and the various ES dependent electronic quantities, namely the effective mass, the screening length, the Einstein relation and the elastic constants have been investigated. This book is useful for researchers, engineers and professionals in the fields of Applied Sciences, solid state and materials science, nano-science and technology, condensed matter physics, and allied fields, including courses in semiconductor nanostructures.

Physics of Nonlinear Optics - Guangsheng He 1999

Nonlinear optics has been a rapidly growing field in recent decades. It is based on the study of effects and phenomena related to the interaction of intense coherent light radiation with matter. Physics of Nonlinear Optics describes various major nonlinear optical effects, including physical principles, experimental techniques, up-to-date research achievements, and current or potential applications. This book features clear conceptual descriptions, concise formulations, and emphasizes both theoretical and experimental aspects of nonlinear optics. The readability of this book is particularly enhanced by a series of color photographs showing the spectacular appearances of various nonlinear optical effects. Both authors of this book are outstanding research scientists renowned in their professional areas. Their major research achievements in nonlinear optics include the pioneering studies of two-wave-coupled refractive-index change, Raman-enhanced self-focusing, optical-frequency

Pockels effect, stimulated Kerr scattering, optical phase-conjugation via backward stimulated emission, and two-photon-absorption based optical limiting, stabilization and reshaping.

Three-Dimensional Partonic Structure of the Nucleon - Mauro Anselmino 2012

The three-dimensional nucleon structure is central to many theoretical and experimental activities, and research in this field has seen many advances in the last two decades, addressing fundamental questions such as the orbital motion of quarks and gluons inside the nucleons, their spatial distribution, and the correlation between spin and intrinsic motion. A real three-dimensional imaging of the nucleon as a composite object, both in momentum and coordinate space, is slowly emerging.This book presents lectures and seminars from the Enrico Fermi School Three-Dimensional Partonic Structure of the Nucleon, held in Varenna,

Nuovo Cimento - 1996

Handbook of Nonlinear Optical Crystals - Gagik Grigorevich Gurzadian (Physiker) 1997

Intended as a reference source, this text provides a complete description of the properties and applications of all non-linear crystals reported to be in the literature up to the beginning of 1990. It also includes important equations for calculating parameters of non-linear frequency converters.

Nonlinear Optical and Electroactive Polymers - Paras N. Prasad 2012-12-06

This treatise is a compendium of papers based on invited talks presented at the American Chemical Society Symposium on Electroactive Polymers which covered nonlinear optical polymers and conducting polymers, the common denominator being the correlated pi-electron structures. The improved understanding of the consequences of pi-electron delocalization upon nonlinear optical properties and charge carrier dynamics has laid the foundation for the rapid development and application of the electroresponse of conjugated polymers. As a result, the area of electroactive and nonlinear optical polymers is emerging as a frontier of sCience and technology. It is a multidisciplinary field that is bringing together scientists and engineers of varied background to interface their expertise. The recent explosion of interest in this area stems from the prospect of utilizing nonlinear optical effects for optical switching and logic operations in optical computing, optical signal processing, optical sensing and optical fiber communications. Polymers and organic are rapidly becoming one of the major material classes for nonlinear optical applications along with multiple quantum wells, ferroelectrics and other oxides, and direct band-gap semiconductors. The reasons for this lie in the unique molecular structures of polymers and organics and the ability to molecularly engineer the architecture of these structures through chemical synthesis.

Il Nuovo cimento della Società italiana di fisica - 1996

Nonlinear Optics - Chunfei Li 2016-08-26

This book reflects the latest advances in nonlinear optics. Besides the simple, strict mathematical deduction, it also discusses the experimental verification and possible future applications, such as the all-optical switches. It consistently uses the practical unit system throughout. It employs simple physical images, such as "light waves" and "photons" to systematically explain the main principles of nonlinear optical effects. It uses the first-order nonlinear wave equation in frequency domain under the condition of “slowly varying amplitude approximation" and the classical model of the interaction between the light and electric dipole. At the same time, it also uses the rate equations based on the energy-level transition of particle systems excited by photons and the energy and momentum conservation principles to explain the nonlinear optical phenomenon. The book is intended for researchers, engineers and graduate students in the field of optics, optoelectronics, fiber communication,

information technology and materials etc.

Polymers for Electronic & Photonic Application - C. P. Wong 2013-10-22

The most recent advances in the use of polymeric materials by the electronic industry can be found in Polymers for Electronic and Photonic Applications. This book provides in-depth coverage of photoresis for micro-lithography, microelectronic encapsulants and packaging, insulators, dielectrics for multichip packaging, electronic and photonic applications of polymeric materials, among many other topics. Intended for engineers and scientists who design, process, and manufacture microelectronic components, this book will also prove useful for hybrid and systems packaging managers who want to be informed of the very latest developments in this field. * Presents most recent advances in the use of polymeric materials by the electronic industry * Contributions by foremost experts in the field

Principles and Applications of Nonlinear Optical Materials - R.W. Munn 2012-12-06

Nonlinear optics is a topic of much current interest that exhibits a great diversity. Some publications on the subject are clearly physics, while others reveal an engineering bias; some appear to be accessible to the chemist, while others may appeal to biological understanding. Yet all purport to be non linear optics so where is the underlying unity? The answer is that the unity lies in the phenomena and the devices that exploit them, while the diversity lies in the materials used to express the phenomena. This book is an attempt to show this unity in diversity by bringing together contributions covering an unusually wide range of materials, preceded by accounts of the main phenomena and important devices. Because ofthe diversity, individual materials are treated in separate chapters by different expert authors, while as editors we have shouldered the task of providing the unifying initial chapters. Most main classes of nonlinear optical solids are treated: semiconductors, glasses, ferroelectrics, molecular crystals, polymers, and Langmuir-Blodgett films. (However, liquid crystals are not covered.) Each class of material is enough for a monograph in itself, and this book is designed to be an introduction suitable for graduate students and those in industry entering the area of nonlinear optics. It is also suitable in parts for final-year undergraduates on project work. It aims to provide a bridge between traditional fields of expertise and the broader field of nonlinear optics.

Nonlinear Optical Materials - 1995

Nonlinear Optical Materials and Devices for Applications in Information Technology - A. Miller 2013-04-17

Nonlinear Optical Materials and Devices for Applications in Information Technology takes the reader from fundamental interactions of laser light in materials to the latest developments of digital optical information processing. The book emphasises nonlinear optical interactions in bulk and low-dimensional semiconductors, liquid crystals and optical fibres. After establishing the basic laser--material interactions in these materials, it goes on to assess applications in soliton propagation, integrated optics, smart pixel arrays and digital optical computing.