

Non Linear Optical Properties Of Semiconductors Iopscience

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Semiconductor Quantum Dots - Y. Masumoto 2013-04-17
Semiconductor quantum dots represent one of the fields of solid state physics that have experienced the greatest progress in the last decade. Recent years have witnessed the discovery of many striking new aspects of the optical

response and electronic transport phenomena. This book surveys this progress in the physics, optical spectroscopy and application-oriented research of semiconductor quantum dots. It focuses especially on excitons, multi-excitons, their dynamical relaxation behaviour

and their interactions with the surroundings of a semiconductor quantum dot. Recent developments in fabrication techniques are reviewed and potential applications discussed. This book will serve not only as an introductory textbook for graduate students but also as a concise guide for active researchers.

Scintillation Dosimetry - Sam Beddar 2016-04-06

Scintillation Dosimetry delivers a comprehensive introduction to plastic scintillation dosimetry, covering everything from basic radiation dosimetry concepts to plastic scintillating fiber optics. Comprised of chapters authored by leading experts in the medical physics community, the book:

Discusses a broad range of technical implementations, from point source dosimetry scaling to 3D-volumetric and 4D-scintillation dosimetry
Addresses a wide scope of clinical applications, from machine quality assurance to small-field and in vivo dosimetry
Examines related

optical techniques, such as optically stimulated luminescence (OSL) or Čerenkov luminescence. Thus, Scintillation Dosimetry provides an authoritative reference for detailed, state-of-the-art information on plastic scintillation dosimetry and its use in the field of radiation dosimetry.

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.

Theory of the Inhomogeneous Electron Gas - Stig Lundqvist

2013-11-11

The theory of the inhomogeneous electron gas had its origin in the Thomas Fermi statistical theory, which is discussed in the first chapter of this book. This already leads to significant physical results for the binding energies of atomic ions, though because it leaves out shell structure the results of such a theory cannot reflect the richness of the Periodic Table. Therefore, for a

long time, the earlier method proposed by Hartree, in which each electron is assigned its own personal wave function and energy, dominated atomic theory. The extension of the Hartree theory by Fock, to include exchange, had its parallel in the density description when Dirac showed how to incorporate exchange in the Thomas-Fermi theory. Considerably later, in 1951, Slater, in an important paper, showed how a result similar to but not identical with that of Dirac followed as a simplification of the Hartree-Fock method. It was Gombas and other workers who recognized that one could also incorporate electron correlation consistently into the Thomas-Fermi-Dirac theory by using uniform electron gas relations locally, and progress had been made along all these avenues by the 1950s.

Solid-State Mid-Infrared Laser Sources - Irina T. Sorokina

2003-07-10

The book describes the most advanced techniques for generating coherent light in

the mid-infrared region of the spectrum. These techniques represent diverse areas of photonics and include heterojunction semiconductor lasers, quantum cascade lasers, tunable crystalline lasers, fiber lasers, Raman lasers, and optical parametric laser sources. Offering authoritative reviews by internationally recognized experts, the book provides a wealth of information on the essential principles and methods of the generation of coherent mid-infrared light and on some of its applications. The instructive nature of the book makes it an excellent text for physicists and practicing engineers who want to use mid-infrared laser sources in spectroscopy, medicine, remote sensing and other fields, and for researchers in various disciplines requiring a broad introduction to the subject.

Nanoscale Semiconductor Lasers - Cunzhu Tong
2019-08-06

Nanoscale Semiconductor Lasers focuses on specific issues relating to laser

nanomaterials and their use in laser technology. The book presents both fundamental theory and a thorough overview of the diverse range of applications that have been developed using laser technology based on novel nanostructures and nanomaterials. Technologies covered include nanocavity lasers, carbon dot lasers, 2D material lasers, plasmonic lasers, spasers, quantum dot lasers, quantum dash and nanowire lasers. Each chapter outlines the fundamentals of the topic and examines material and optical properties set alongside device properties, challenges, issues and trends. Dealing with a scope of materials from organic to carbon nanostructures and nanowires to semiconductor quantum dots, this book will be of interest to graduate students, researchers and scientific professionals in a wide range of fields relating to laser development and semiconductor technologies. Provides an overview of the active field of nanostructured

lasers, illustrating the latest topics and applications
Demonstrates how to connect different classes of material to specific applications Gives an overview of several approaches to confine and control light emission and amplification using nanostructured materials and nano-scale cavities

Quantum Theory of the Optical and Electronic Properties of Semiconductors - Hartmut Haug 1994

This textbook presents the basic elements needed to understand and engage in research in semiconductor physics. It deals with elementary excitations in bulk and low-dimensional semiconductors, including quantum wells, quantum wires and quantum dots. The basic principles underlying optical nonlinearities are developed, including excitonic and many-body plasma effects. The fundamentals of optical bistability, semiconductor lasers, femtosecond excitation, optical Stark effect, semiconductor photon echo,

magneto-optic effects, as well as bulk and quantum-confined Franz-Keldysh effects are covered. The material is presented in sufficient detail for graduate students and researchers who have a general background in quantum mechanics.

Quantum Dot Heterostructures
- Dieter Bimberg 1999-03-17
Quantum Dot Heterostructures
Dieter Bimberg, Marius Grundmann and Nikolai N. Ledentsov Institute of Solid State Physics, Technische Universität Berlin, Germany
Quantum dots are nanometer-size semiconductor structures, and represent one of the most rapidly developing areas of current semiconductor research as increases in the speed and decreases in the size of semiconductor devices become more important. They present the utmost challenge to semiconductor technology, making possible fascinating novel devices. This important new reference book focuses on the key phenomena and principles. Chapter 1 provides a brief account of the history of

quantum dots, whilst the second chapter surveys the various fabrication techniques used in the past two decades, and introduces the concept of self-organized growth. This topic is expanded in the following chapter, which presents a broad review of self-organization phenomena at surfaces of crystals.

Experimental results on growth of quantum dot structures in many different systems and on their structural

characterization are presented in Chapter 4. Basic properties of the dots relate to their geometric structure and chemical composition.

Numerical modeling of the electronic and optical properties of real dots is presented in Chapter 5, together with general theoretical considerations on carrier capture, relaxation, recombination and properties of quantum dot lasers.

Chapters 6 and 7 summarize experimental results on electronic, optical and electrical properties. The book concludes by discussing highly

topical results on quantum-dot-based photonic devices - mainly quantum dot lasers. Quantum Dot Heterostructures is written by some of the key researchers who have contributed significantly to the development of the field, and have pioneered both the theoretical understanding of quantum dot related phenomena and quantum dot lasers. It is of great interest to graduate and postgraduate students, and to researchers in semiconductor physics and technology and optoelectronics.

Nonlinear Surface

Electromagnetic Phenomena -

H.-E. Ponath 2012-12-02

In recent years the physics of electromagnetic surface phenomena has developed rapidly, evolving into technologies for communications and industry, such as fiber and integrated optics. The variety of phenomena based on electromagnetism at surfaces is rich and this book was written with the aim of summarizing the available

knowledge in selected areas of the field. The book contains reviews written by solid state and optical physicists on the nonlinear interaction of electromagnetic waves at and with surfaces and films. Both the physical phenomena and some potential applications are dealt with. Included are discussions of nonlinear wave mixing on films and surfaces, second harmonic generation in waveguides and at surfaces, nonlinear waves guided by dielectric and semiconductor surfaces and films, surface gratings formed by high energy laser beams, and reflection and transmission switching of strong beams onto nonlinear surfaces. Chapters on light scattering from surface excitations and magnetic order-disorder and orientational phase transitions complete this essential contribution to the modern optics literature.

Colloidal Quantum Dot Optoelectronics and Photovoltaics - Gerasimos

Konstantatos 2013-11-07

Captures the most up-to-date research in the field, written in

an accessible style by the world's leading experts.

Contemporary Nonlinear Optics - Robert Boyd

2012-12-02

Contemporary Nonlinear Optics discusses the different activities in the field of nonlinear optics. The book is comprised of 10 chapters. Chapter 1 presents a description of the field of nonlinear guided-wave optics. Chapter 2 surveys a new branch of nonlinear optics under the heading optical solitons. Chapter 3 reviews recent progress in the field of optical phase conjugation. Chapter 4 discusses ultrafast nonlinear optics, a field that is growing rapidly with the ability of generating and controlling femtosecond optical pulses. Chapter 5 examines a branch of nonlinear optics that may be termed nonlinear quantum optics. Chapter 6 reviews the new field of photorefractive adaptive neural networks. Chapter 7 presents a discussion of recent successes in the development of nonlinear optical media based

on organic materials. Chapter 8 reviews the field of nonlinear optics in quantum confined structures. Chapter 9 reviews the field of nonlinear laser spectroscopy, with emphasis on advances made during the 1980s. Finally, Chapter 10 reviews the field of nonlinear optical dynamics by considering nonlinear optical systems that exhibit temporal, spatial, or spatio-temporal instabilities. This book is a valuable source for physicists and other scientists interested in optical systems and neural networks.

Optical and Wireless Technologies - Vijay Janyani
2018-02-12

This book presents selected papers from 1st International Conference on Optical and Wireless Technologies, providing insights into the analytical, experimental, and developmental aspects of systems, techniques, and devices in these spheres. It explores the combined use of various optical and wireless technologies in next-generation networking applications, and

discusses the latest developments in applications such as photonics, high-speed communication systems and networks, visible light communication, nanophotonics, and wireless and multiple-input-multiple-output (MIMO) systems. The book will serve as a valuable reference resource for academics and researchers across the globe.

Electronic Processes in Organic Semiconductors -

Anna Köhler 2015-04-22

The first advanced textbook to provide a useful introduction in a brief, coherent and comprehensive way, with a focus on the fundamentals. After having read this book, students will be prepared to understand any of the many multi-authored books available in this field that discuss a particular aspect in more detail, and should also benefit from any of the textbooks in photochemistry or spectroscopy that concentrate on a particular mechanism. Based on a successful and well-proven lecture course given by one of the authors for many

years, the book is clearly structured into four sections: electronic structure of organic semiconductors, charged and excited states in organic semiconductors, electronic and optical properties of organic semiconductors, and fundamentals of organic semiconductor devices.

Optical Resonance and Two-

Level Atoms - L. Allen

2012-05-04

Clear, comprehensive graduate-level account of basic principles involved in all quantum optical resonance phenomena, hailed in Contemporary Physics as "a valuable contribution to the literature of non-linear optics." 53 illustrations.

Ultrafast Phenomena in Semiconductors - Kong-Thon

Tsen 2012-12-06

There are many books in the market devoted to the review of certain fields. This book is different from those in that authors not only provide reviews of the fields but also present their own important contributions to the fields in a tutorial way. As a result,

researchers who are already in the field of ultrafast dynamics in semiconductors and its device applications as well as researchers and graduate students just entering the field will benefit from it. This book is made up of recent new developments in the field of ultrafast dynamics in semiconductors. It consists of nine chapters. Chapter 1 reviews a microscopic many-body theory which allows one to compute the linear and non-linear optical properties of semiconductor superlattices in the presence of homogeneous electric fields. Chapter 2 deals with ultrafast intersubband dynamics in quantum wells and device structures. Chapter 3 is devoted to Bloch oscillations in semiconductors and their applications. Chapter 4 discusses transient electron transport phenomena, such as electron ballistic transport and electron velocity overshoot phenomena as well as non-equilibrium phonon dynamics in nanostructure semiconductors. Chapter 5 reviews experimental and theoretical

work on the use of the phase properties of one or more ultrashort optical pulses to generate and control electrical currents in semiconductors.

Semiconductors - Otfried Madelung 2012-12-06

This Data Handbook is a updated and largely extended new edition of the book "Semiconductors: Basic Data". The data of the former edition have been updated and a complete representation of all relevant basic data is now given for all known groups of semiconducting materials.

Functionalization of Graphene - Vasilios Georgakilas 2014-04-03

All set to become the standard reference on the topic, this book covers the most important procedures for chemical functionalization, making it an indispensable resource for all chemists, physicists, materials scientists and engineers entering or already working in the field. Expert authors share their knowledge on a wide range of different functional groups, including organic functional groups, hydrogen,

halogen, nanoparticles and polymers.

Handbook of Nonlinear Optics - Richard L. Sutherland 2003-04-22

Examining classic theories, experimental methods, and practical formulas for exploration of the core topics in nonlinear optics, the second edition of this acclaimed text was extensively revised to reflect recent advances in the analysis and modification of material properties for application in frequency conversion, optical switching and limiting,

Physics of Organic Semiconductors - Wolfgang Brütting 2006-05-12

Filling the gap in the literature currently available, this book presents an overview of our knowledge of the physics behind organic semiconductor devices. Contributions from 18 international research groups cover various aspects of this field, ranging from the growth of organic layers and crystals, their electronic properties at interfaces, their photophysics and electrical transport

properties to the application of these materials in such different devices as organic field-effect transistors, photovoltaic cells and organic light-emitting diodes. From the contents: * Excitation Dynamics in Organic Semiconductors * Organic Field-Effect Transistors * Spectroscopy of Organic Semiconductors * Interfaces between Organic Semiconductors and Metals * Analysis and Modeling of Devices * Exciton Formation and Energy Transfer in Organic Light Emitting Diodes * Deposition and Characterization *Quantum Wells, Wires and Dots* - Paul Harrison 2005-10-31 *Quantum Wells, Wires and Dots* Second Edition: Theoretical and Computational Physics of Semiconductor Nanostructures provides all the essential information, both theoretical and computational, for complete beginners to develop an understanding of how the electronic, optical and

transport properties of quantum wells, wires and dots are calculated. Readers are lead through a series of simple theoretical and computational examples giving solid foundations from which they will gain the confidence to initiate theoretical investigations or explanations of their own. Emphasis on combining the analysis and interpretation of experimental data with the development of theoretical ideas Complementary to the more standard texts Aimed at the physics community at large, rather than just the low-dimensional semiconductor expert The text present solutions for a large number of real situations Presented in a lucid style with easy to follow steps related to accompanying illustrative examples **Amorphous and Liquid Semiconductors** - J. Tauc 2012-12-06 Solid state physics after solving so successfully many fundamental problems in perfect or slightly imperfect crystals, tried in recent years

to attack problems associated with large disorder with the aim to understand the consequences of the lack of the long-range order.

Semiconductors are much more changed by disorder than metals or insulators, and appear to be the most suitable materials for fundamental work. Considerable exploratory work on amorphous and liquid semiconductors was done by the Leningrad School since the early fifties. In recent years, much research in several countries was directed to deepen the understanding of the structural, electronic, optical, vibrational, magnetic and other properties of these materials and to possibly approach the present level of understanding of crystalline semiconductors. This effort was stimulated not only by purely scientific interest but also by the possibility of new applications from which memory devices in the general sense are perhaps the most challenging. The research met with serious difficulties which are absent in crystals.

Radiative Properties of Semiconductors - N.M.

Ravindra 2017-08-21

Optical properties, particularly in the infrared range of wavelengths, continue to be of enormous interest to both material scientists and device engineers. The need for the development of standards for data of optical properties in the infrared range of wavelengths is very timely considering the on-going transition of nano-technology from fundamental R&D to manufacturing.

Radiative properties play a critical role in the processing, process control and manufacturing of semiconductor materials, devices, circuits and systems. The design and implementation of real-time process control methods in manufacturing requires the knowledge of the radiative properties of materials. Sensors and imagers operate on the basis of the radiative properties of materials. This book reviews the optical properties of various semiconductors in the infrared range of wavelengths.

Theoretical and experimental studies of the radiative properties of semiconductors are presented. Previous studies, potential applications and future developments are outlined. In Chapter 1, an introduction to the radiative properties is presented. Examples of instrumentation for measurements of the radiative properties is described in Chapter 2. In Chapters 3-11, case studies of the radiative properties of several semiconductors are elucidated. The modeling and applications of these properties are explained in Chapters 12 and 13, respectively. In Chapter 14, examples of the global infrastructure for these measurements are illustrated.

Behaviour of Electromagnetic Waves in Different Media and Structures - Ali Akdagli
2011-07-05

This comprehensive volume thoroughly covers wave propagation behaviors and computational techniques for electromagnetic waves in different complex media. The chapter authors describe

powerful and sophisticated analytic and numerical methods to solve their specific electromagnetic problems for complex media and geometries as well. This book will be of interest to electromagnetics and microwave engineers, physicists and scientists.

Concepts and Applications of Nonlinear Terahertz Spectroscopy - Thomas

Elsaesser 2019-02-22

Terahertz (THz) radiation with frequencies between 100 GHz and 30 THz has developed into an important tool of science and technology, with numerous applications in materials characterization, imaging, sensor technologies, and telecommunications. Recent progress in THz generation has provided ultrashort THz pulses with electric field amplitudes of up to several megavolts/cm. This development opens the new research field of nonlinear THz spectroscopy in which strong light-matter interactions are exploited to induce quantum excitations and/or charge transport and follow their nonequilibrium dynamics

in time-resolved experiments. This book introduces methods of THz generation and nonlinear THz spectroscopy in a tutorial way, discusses the relevant theoretical concepts, and presents prototypical, experimental, and theoretical results in condensed matter physics. The potential of nonlinear THz spectroscopy is illustrated by recent research, including an overview of the relevant literature.

The Quantum Hall Effect -

Daijiro Yoshioka 2013-03-09

The fractional quantum Hall effect has opened up a new paradigm in the study of strongly correlated electrons and it has been shown that new concepts, such as fractional statistics, anyon, chiral Luttinger liquid and composite particles, are realized in two-dimensional electron systems. This book explains the quantum Hall effects together with these new concepts starting from elementary quantum mechanics.

Terahertz Spectroscopy -

Susan L. Dexheimer

2017-12-19

The development of new sources and methods in the terahertz spectral range has generated intense interest in terahertz spectroscopy and its application in an array of fields. Presenting state-of-the-art terahertz spectroscopic techniques, *Terahertz Spectroscopy: Principles and Applications* focuses on time-domain methods based on femtosecond laser sources and important recent applications in physics, materials science, chemistry, and biomedicine. The first section of the book examines instrumentation and methods for terahertz spectroscopy. It provides a comprehensive treatment of time-domain terahertz spectroscopic measurements, including methods for the generation and detection of terahertz radiation, methods for determining optical constants from time-domain measurements, and the use of femtosecond time-resolved techniques. The last two sections explore a variety of applications of terahertz spectroscopy in physics,

materials science, chemistry, and biomedicine. With chapters contributed by leading experts in academia, industry, and research, this volume thoroughly discusses methods and applications, setting it apart from other recent books in this emerging terahertz field.

Optical Bistability: Controlling Light With Light - Hyatt Gibbs
2012-12-02

Optical Bistability: Controlling Light with Light focuses on optical bistability in nonlinear optical systems. Emphasis is on passive (non-laser) systems that exhibit reversible bistability with input intensity as the hysteresis variable, along with the physics and the potential applications of such systems for nonlinear optical signal processing. This book consists of seven chapters and begins with a historical overview of optical bistability in lasers and passive systems. The next chapter describes steady-state theories of optical bistability, including the Bonifacio-Lugiato model, as well as the boundary conditions

of an optical cavity and the coupled Maxwell-Bloch equations. Both intrinsic and hybrid experiments are then described, along with light-by-light control, pulse reshaping, and external switching. The transient phenomena that arise either from instabilities in the bistable systems themselves or from fluctuations in the number of nonlinear atoms or in the number of intracavity photons are also considered. The final chapter examines the characteristics and fundamental limitations of an ideal device, the prospect of improving devices by identifying giant nonlinearities, and the utilization of the full power of optics by parallel processing. This monograph is intended for new entrants and active workers in the field of optical bistability.

Handbook of Nonlinear Optics -
Kristie Ames 2015-02-27

Major aspects of nonlinear optics have been discussed in this book. Characterization of properties of light traversal in non-linear media has always intrigued scientists and

researchers. Accelerated advancement of laser techniques and optoelectronic devices account for a crucial task of formulating and analyzing the structures capable of efficiently transforming, modulating, and recording optical data in a wide spectrum of radiation energy densities and frequencies at one hand, and novel approaches and schemes capable of activating and stimulating the contemporary features on the other. It is a known fact that the phenomena and materials of nonlinear optics have an assuring place in dealing with these intricate technical tasks. The state-of-the-art ideas, approaches, and information presented in this book will be beneficial to the readers in developing a sustainable solution in basic analysis as well as industrial approach. The aim of this book is to serve as a useful source of information for students, researchers, engineers and technical officers of optoelectronic universities and companies.

Resonant Tunneling Diode Photonics - Charlie Ironside 2019-11-11

This book brings together two broad themes that have generated a great deal of interest and excitement in the scientific and technical community in the last 100 years or so: quantum tunnelling and nonlinear dynamical systems. It applies these themes to nanostructured solid state heterostructures operating at room temperature to gain insight into novel photonic devices, systems and applications.

Optical Coherence Tomography - Wolfgang Drexler 2008-12-10
Optical coherence tomography (OCT) is the optical analog of ultrasound imaging and is emerging as a powerful imaging technique that enables non-invasive, in vivo, high resolution, cross-sectional imaging in biological tissue. This book introduces OCT technology and applications not only from an optical and technological viewpoint, but also from biomedical and

clinical perspectives. The chapters are written by leading research groups, in a style comprehensible to a broad audience.

Semiconductor Nanowires - J Arbiol 2015-03-31

Semiconductor nanowires promise to provide the building blocks for a new generation of nanoscale electronic and optoelectronic devices.

Semiconductor Nanowires: Materials, Synthesis, Characterization and Applications covers advanced materials for nanowires, the growth and synthesis of semiconductor nanowires—including methods such as solution growth, MOVPE, MBE, and self-organization. Characterizing the properties of semiconductor nanowires is covered in chapters describing studies using TEM, SPM, and Raman scattering. Applications of semiconductor nanowires are discussed in chapters focusing on solar cells, battery electrodes, sensors, optoelectronics and biology. Explores a selection of

advanced materials for semiconductor nanowires. Outlines key techniques for the property assessment and characterization of semiconductor nanowires. Covers a broad range of applications across a number of fields.

Properties of Aluminium Gallium Arsenide - Sadao Adachi 1993

AlGaAs is the most widely studied and applied of the ternary semiconductors. An international array of 30 experts have contributed under the editorship of a world authority on AlGaAs, Dr. S. Adachi of Gunma University, Japan. Subjects covered: structural, mechanical, elastic, lattice vibrational and thermal properties; band structure; optical properties; electro-optical properties; carrier transport; surfaces, interfaces and contacts; impurity and defect centres; lattice dislocations, 2D carrier transport, real space transfer band offsets and electro-optic effects in AlGaAs/GaAs heterostructures.

Third-Generation Femtosecond Technology -

Hanieh Fattahi 2015-08-28

This thesis offers a thorough and informative study of high-power, high-energy optical parametric chirped pulse amplifications systems, the foundation of the next generation of femtosecond laser technology. Starting from the basics of the linear processes involved and the essential design considerations, the author clearly and systematically describes the various prerequisites of the nonlinear optical systems expected to drive attosecond physics in the coming decade. In this context, he gives an overview of methods for generating the broadband and carrier-envelope-phase stable seed pulses necessary for producing controlled electric-field waveforms in the final system; provides a guide to handling the high-power, high-energy pump lasers required to boost the pulse energy to the desired operating range; describes the design of the nonlinear optical

system used to perform the amplification, including modes of operation for ultra-broadband infrared-visible pulses or narrowband (yet still ultrafast) pulses tunable over multiple octaves; and finally presents a prospective high-energy field synthesizer based upon these techniques. As such, this work is essential reading for all scientists interested in utilizing the newest generation of ultrafast systems.

2D Monoelemental Materials (Xenes) and Related Technologies -

Zongyu Huang 2022

Monoelemental 2D materials called Xenes have a graphene-like structure, intra-layer covalent bond, and weak van der Waals forces between layers. Materials composed of different groups of elements have different structures and rich properties, making Xenes materials a potential candidate for the next generation of 2D materials. 2D Monoelemental Materials (Xenes) and Related Technologies: Beyond Graphene describes the

structure, properties, and applications of Xenon by classification and section. The first section covers the structure and classification of single-element 2D materials, according to the different main groups of mono-elemental materials of different components and includes the properties and applications with detailed description. The second section discusses the structure, properties, and applications of advanced 2D Xenon materials, which are composed of heterogeneous structures, produced by defects, and regulated by the field. Features include:

- Systematically detailed single element materials according to the main groups of the constituent elements
- Classification of the most effective and widely studied 2D Xenon materials
- Expounding upon changes in properties and improvements in applications by different regulation mechanisms
- Discussion of the significance of 2D single-element materials where structural characteristics are

closely combined with different preparation methods and the relevant theoretical properties complement each other with practical applications. Aimed at researchers and advanced students in materials science and engineering, this book offers a broad view of current knowledge in the emerging and promising field of 2D mono-elemental materials.

Thin Film Materials Technology - Kiyotaka Wasa
2004-05-10

An invaluable resource for industrial science and engineering newcomers to sputter deposition technology in thin film production applications, this book is rich in coverage of both historical developments and the newest experimental and technological information about ceramic thin films, a key technology for nano-materials in high-speed information applications and large-area functional coating such as automotive or decorative painting of plastic parts, among other topics. In seven concise chapters, the book thoroughly reviews basic

thin film technology and deposition processes, sputtering processes, structural control of compound thin films, and microfabrication by sputtering.

Lithium Niobate-based Heterostructures - Maxim Sumets 2018

With the use of ferroelectric materials in memory devices and the need for high speed integrated optics devices, the interest in ferroelectric thin films continues to grow. With their remarkable properties such as energy nonvolatility, fast switching, radiative stability, and unique optoacoustic and optoelectronic properties, Lithium Niobate-Based Heterostructures: Synthesis, properties and electron phenomena, discusses why Lithium Niobate (LiNbO_3) is one of the most promising of all ferroelectric materials. Based on years of study, this book presents the systematic characterization of substructure and electronic properties of a heterosystem formed in the deposition

process of lithium niobate films onto the surface of silicon wafers.

Nonlinear Optical Crystals: A Complete Survey - David N. Nikogosyan 2006-03-21

Nonlinear Optical Crystals contains the most complete and up-to-date reference material on properties of nonlinear optical crystals including: Traditional and specific applications The mathematical formulas necessary for the calculation of the frequency conversion process A survey of 63 nonlinear optical crystals containing more than 1500 different references with full titles Recent applications of common and novel nonlinear materials, including quasi-phase matching Special consideration for periodically-poled and self-frequency-doubling materials Significant amount of crystallophysical, thermophysical, spectroscopic, electro-optic and magneto-optic information

Semiconductor Integrated Optics for Switching Light - Charlie Ironside 2017-09-12

This book covers the technology of switching or modulating light in semiconductor optical waveguides. Currently a key function for optical communications systems is the conversion of data from an electrical signal to an optical signal for transmission in very low loss optical fibres and the converse process of optical to electrical conversion the O/E/O data conversion. This conversion between electronic and photonic signals imposes an energy consumption overhead on optical communication systems. So many research workers have been attracted to ultrafast all-optical switching of data in different formats. As a way of introduction to all-optical switching in semiconductor waveguides the book covers the electro-optic effect, electroabsorption and electrorefraction; effects that can be used in semiconductor optical modulation devices. But the book focuses on all-optical switching using second and third order optical

nonlinearities in AlGaAs optical waveguides. It covers a variety of device configurations including integrated nonlinear couplers and Mach-Zehnder interferometers. Further, it provides design software in suit of Mathematica notebooks that can be used to explore the device design.

Optical Solitons - Yuri S. Kivshar 2003-06-12

The current research into solitons and their use in fiber optic communications is very important to the future of communications. Since the advent of computer networking and high speed data transmission technology people have been striving to develop faster and more reliable communications media. Optical pulses tend to broaden over relatively short distances due to dispersion, but solitons on the other hand are not as susceptible to the effects of dispersion, and although they are subject to losses due to attenuation they can be amplified without being received and re-transmitted.

This book is the first to provide

a thorough overview of optical solitons. The main purpose of this book is to present the rapidly developing field of Spatial Optical Solitons starting from the basic concepts of light self-focusing and self-trapping. It will introduce the fundamental concepts of the theory of nonlinear waves and solitons in non-integrated but physically realistic models of nonlinear optics including their stability and dynamics. Also, it will summarize a number of important experimental verification of the basic theoretical predictions and concepts covering the observation of self-focusing in the earlier days of nonlinear optics and the most recent experimental results on spatial solitons, vortex solitons, and soliton interaction & spiraling. * Introduces the fundamental concepts of the theory of nonlinear waves and solitons through realistic models * Material is based on authors' years of experience actively working in and researching the field * Summarizes the most

important experimental verification of the basic theories, predictions and concepts of this ever evolving field from the earliest studies to the most recent

Electronic Structure of Organic Semiconductors -

Luís Alcácer 2018-12-07

Written in the perspective of an experimental chemist, this book puts together some fundamentals from chemistry, solid state physics and quantum chemistry, to help with understanding and predicting the electronic and optical properties of organic semiconductors, both polymers and small molecules. The text is intended to assist graduate students and researchers in the field of organic electronics to use theory to design more efficient materials for organic electronic devices such as organic solar cells, light emitting diodes and field effect transistors. After addressing some basic topics in solid state physics, a comprehensive introduction to molecular orbitals and band theory leads to a description of

computational methods based on Hartree-Fock and density functional theory (DFT), for predicting geometry conformations, frontier levels and energy band structures. Topological defects and

transport and optical properties are then addressed, and one of the most commonly used transparent conducting polymers, PEDOT:PSS, is described in some detail as a case study.