Optical Properties Of Crystalline Amorphous Semiconductors Materials And Fundamental Principles

#optical properties semiconductors #crystalline amorphous materials #semiconductor physics principles #light matter interaction #optoelectronic materials

Explore the fundamental principles governing the optical properties of both crystalline and amorphous semiconductor materials. This overview delves into how their unique structures influence light absorption, emission, and transmission, providing essential insights for understanding their behavior in various photonic and optoelectronic applications.

Optical Properties of Crystalline and Amorphous Semiconductors

Optical Properties of Crystalline and Amorphous Semiconductors: Materials and Fundamental Principles presents an introduction to the fundamental optical properties of semiconductors. This book presents tutorial articles in the categories of materials and fundamental principles (Chapter 1), optical properties in the reststrahlen region (Chapter 2), those in the interband transition region (Chapters 3 and 4) and at or below the fundamental absorption edge (Chapter 5). Optical Properties of Crystalline and Amorphous Semiconductors: Materials and Fundamental Principles is presented in a form which could serve to teach the underlying concepts of semiconductor optical properties and their implementation. This book is an invaluable resource for device engineers, solid-state physicists, material scientists and students specializing in the fields of semiconductor physics and device engineering.

Optical Constants of Crystalline and Amorphous Semiconductors

Knowledge of the refractive indices and absorption coefficients of semiconductors is especially import in the design and analysis of optical and optoelectronic devices. The determination of the optical constants of semiconductors at energies beyond the fundamental absorption edge is also known to be a powerful way of studying the electronic energy-band structures of the semiconductors. The purpose of this book is to give tabulated values and graphical information on the optical constants of the most popular semiconductors over the entire spectral range. This book presents data on the optical constants of crystalline and amorphous semiconductors. A complete set of the optical constants are presented in this book. They are: the complex dielectric constant (E=e.+ieJ, complex refractive index (n*=n+ik), absorption coefficient (a.), and normal-incidence reflectivity (R). The semiconductor materials considered in this book are the group-IV elemental and binary, lll-V, IT-VI, IV-VI binary semiconductors, and their alloys. The reader will fmd the companion book "Optical Properties of

Crystalline and Amorphous Semiconductors: Materials and Fundamental Principles" useful since it emphasizes the basic material properties and fundamental prinCiples.

Optical Properties and Applications of Semiconductors

Semiconductors with optical characteristics have found widespread use in evolving semiconductor photovoltaics, where optical features are important. The industrialization of semiconductors and their allied applications have paved the way for optical measurement techniques to be used in new ways. Due to their unique properties, semiconductors are key components in the daily employed technologies in healthcare, computing, communications, green energy, and a range of other uses. This book examines the fundamental optical properties and applications of semiconductors. It summarizes the information as well as the optical characteristics and applicability of semiconductors through an in-depth review of the literature. Accomplished experts in the field share their knowledge and examine new developments. FEATURES Comprehensive coverage of all types of optical applications using semiconductors Explores relevant composite materials and devices for each application Addresses the optical properties of crystalline and amorphous semiconductors Describes new developments in the field and future potential applications Optical Properties and Applications of Semiconductors is a comprehensive reference and an invaluable resource for engineers, scientists, academics, and industry R&D teams working in applied physics.

Amorphous Semiconductors

Amorphous semiconductors are subtances in the amorphous solid state that have the properties of a semiconductor and which are either covalent or tetrahedrally bonded amorphous semiconductors or chelcogenide glasses. Developed from both a theoretical and experimental viewpoint Deals with, amongst others, preparation techniques, structural, optical and electronic properties, and light induced phenomena Explores different types of amorphous semiconductors including amorphous silicon, amorphous semiconducting oxides and chalcogenide glasses Applications include solar cells, thin film transistors, sensors, optical memory devices and flat screen devices including televisions

Amorphous Chalcogenide Semiconductors and Related Materials

"Amorphous Chalcogenide Semiconductors and Glasses" describes developments in the science and technology of this class of materials. This book offers an up-to-date treatment of chalcogenide glasses and amorphous semiconductors from basic principles to applications while providing the reader with the necessary theoretical background to understanding the material properties technology of this class of materials. This book offers an up-to-date treatment of chalcogenide glasses and amorphous semiconductors from basic principles to applications while providing the reader with the necessary theoretical background to understanding the material properties. Chalcogenides form a special class of materials, which have one or more of the elements from the chalcogen group, Group VI in the Periodic Table (S, Se. or Te) as a constituent; the chalcogen is mixed with other elements to form various "new" compounds and alloys. Chalcogenides are noncrystalline solids because their structure is "amorphous" or "glassy". Such structures have totally different properties than crystalline solids. Chalcogenide glasses have a number of very interesting and useful properties, which have been already exploited in the commercialization of new devices.

Fundamentals of Amorphous Semiconductors

Ellipsometry is a powerful tool used for the characterization of thin films and multi-layer semiconductor structures. This book deals with fundamental principles and applications of spectroscopic ellipsometry (SE). Beginning with an overview of SE technologies the text moves on to focus on the data analysis of results obtained from SE, Fundamental data analyses, principles and physical backgrounds and the various materials used in different fields from LSI industry to biotechnology are described. The final chapter describes the latest developments of real-time monitoring and process control which have attracted significant attention in various scientific and industrial fields.

Spectroscopic Ellipsometry

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 proper ties of these materials and to possibly approach the present level of under standing 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.

Amorphous and Liquid Semiconductors

Amorphous materials differ significantly from their crystalline counterparts in several ways that create unique issues in their use. This book explores these issues and their implications, and provides a full treatment of both experimental and theoretical studies in the field. Advances in Amorphous Semiconductors covers a wide range of studies on hydrogenated amorphous silicon, amorphous chalcogenides, and some oxide glasses. It reviews structural properties, properties associated with the charge carrier-phonon interaction, defects, electronic transport, photoconductivity, and some applications of amorphous semiconductors. The book explains a number of recent advances in semiconductor research, including some of the editors' own findings. It addresses some of the problems associated with the validity of the effective mass approximation, whether K is a good quantum number, and the concepts of phonons and excitons. It also discusses recent progress made in understanding light-induced degradations in amorphous semiconductors, which is seen as the most limiting problem in device applications. The book presents a comprehensive review of both experimental and theoretical studies on amorphous semiconductors, which will be useful to students, researchers, and instructors in the field of amorphous solids.

Advances in Amorphous Semiconductors

The main purpose of this book is to provide a comprehensive treatment of the materials aspects of group-IV, III V and II VI semiconductor alloys used in various electronic and optoelectronic devices. The topics covered in this book include the structural, thermal, mechanical, lattice vibronic, electronic, optical and carrier transport properties of such semiconductor alloys. The book reviews not only commonly known alloys (SiGe, AlGaAs, GaInPAs, and ZnCdTe) but also new alloys, such as dilute-carbon alloys (CSiGe, CSiSn, etc.), III N alloys, dilute-nitride alloys (GaNAs and GaInNAs) and Mg- or Be-based II VI semiconductor alloys. Finally there is an extensive bibliography included for those who wish to find additional information as well as tabulated values and graphical information on the properties of semiconductor alloys.

Properties of Semiconductor Alloys

Knowledge of the refractive indices and absorption coefficients of semiconductors is especially important in the design and analysis of optical and photonic devices. This book presents data on the optical constants of various elemental and compound semiconductors. A complete set of the optical constants of the semiconductors are presented in tabular and graphical forms over the entire photon-energy range. They are: the complex dielectric constant μ(E)=μ1(E)+iμ2(E), the complex refractive index n*(E)=n(E)+ik(E), the absorption coefficient α(E), and the normal-incidence reflectivity R(E). The book will aid many who are interested to know the optical constants of the elemental and compound semiconductors in the course of their work.

The Handbook on Optical Constants of Semiconductors

This book constitutes the proceedings of the 16th International Conference on Remote Engineering and Virtual Instrumentation (REV), held at the BMS College of Engineering, Bangalore, India on 3–6 February 2019. Today, online technologies are at the core of most fields of engineering, as well as of society as a whole, and are inseparably connected with Internet of Things, cyber-physical systems, collaborative networks and grids, cyber cloud technologies, service architectures, to name but a few. Since it was first held in, 2004, the REV conference has focused on the increasing use of the Internet for engineering tasks and the problems surrounding it. The 2019 conference demonstrated and discussed the fundamentals, applications and experiences in the field of online engineering and virtual instrumentation. It also presented guidelines for university-level courses on these topics, in view

of the increasing globalization of education and the demand for teleworking, remote services and collaborative working environments.

Cyber-physical Systems and Digital Twins

This book presents data on the optical constants of metal elements (Na, Au, Mg, Hg, Sc, Al, Ti, -Sn, V, Cr, Mn, Fe, La, Th, etc.) semimetal elements (graphite, Sb, etc.), metallic compounds (TiN, VC, TiSi 2, CoSi 2, etc.) and high-temperature superconducting materials (YBa 2 Cu 3 O 7-, MgB 2, etc.). A complete set of the optical constants are presented in tabular and graphical forms over the entire photon-energy range. They are: the complex dielectric constant A(E)=A 1 (E)+iA 2 (E), the complex refractive index n *(E)= n (E)+i k (E), the absorption coefficient (E) and the normal-incidence reflectivity R (E). The book will aid many who are interested to know the optical constants of the metals, semimetals, metallic compounds and high-temperature superconducting materials in the course of their work. Sample Chapter(s). Chapter 1: Introduction (1,081 KB). Chapter 2: Metals and Semimetal Elements (268 KB). Chapter 3: Transition Metal-Carbides and Nitrides (261 KB). Chapter 5: High-Tc Superconductors (129 KB). Contents: Introduction; Metal and Semimetal Elements; Transition-Metal Carbides and Nitrides; Metallic Silicides; High- T c Superconductors. Readership: Physicists, material scientists, engineers, undergraduate and postgraduate students who work in the field of Optics, especially high energy optics."

Optical Properties of Organic Semiconductors

This book presents data on the optical constants of metal elements (Na, Au, Mg, Hg, Sc, Al, Ti, ²Sn, V, Cr, Mn, Fe, La, Th, etc.) semimetal elements (graphite, Sb, etc.), metallic compounds (TiN, VC, TiSi2, CoSi2, etc.) and high-temperature superconducting materials (YBa2Cu3O7-´,MgB2, etc.). A complete set of the optical constants are presented in tabular and graphical forms over the entire photon-energy range. They are: the complex dielectric constant μ(E)=μ1(E)+iμ2(E), the complex refractive index n*(E)=n(E)+ik(E), the absorption coefficient ±(E) and the normal-incidence reflectivity R(E). The book will aid many who are interested to know the optical constants of the metals, semimetals, metallic compounds and high-temperature superconducting materials in the course of their work.

The Handbook on Optical Constants of Metals

This second edition, edited by the world-renowned Dr. Rointain Bunshah, is an extensive update of the many improvements in deposition technologies, mechanisms, and applications. Considerably more material was added in Plasma Assisted Vapor Deposition processes, as well as Metallurgical Coating Applications.

Handbook On Optical Constants Of Metals, The: In Tables And Figures

The Handbook of Ellipsometry is a critical foundation text on an increasingly critical subject. Ellipsometry, a measurement technique based on phase and amplitude changes in polarized light, is becoming popular in a widening array of applications because of increasing miniaturization of integrated circuits and breakthroughs in knowledge of biological macromolecules deriving from DNA and protein surface research. Ellipsometry does not contact or damage samples, and is an ideal measurement technique for determining optical and physical properties of materials at the nano scale. With the acceleration of new instruments and applications now occurring, this book provides an essential foundation for the current science and technology of ellipsometry for scientists and engineers in industry and academia at the forefront of nanotechnology developments in instrumentation, integrated circuits, biotechnology, and pharmaceuticals. Divided into four parts, this comprehensive handbook covers the theory of ellipsometry, instrumentation, applications, and emerging areas. Experts in the field contributed to its twelve chapters, covering various aspects of ellipsometry.

Handbook of Deposition Technologies for Films and Coatings

This second edition, edited by the world-renowned Dr. Rointain Bunshah, is an extensive update of the many improvements in deposition technologies, mechanisms, and applications. Considerably more material was added in Plasma Assisted Vapor Deposition processes, as well as Metallurgical Coating Applications.

Handbook of Ellipsometry

Almost all the semiconductors of practical interest are the group-IV, III-V and II-VI semiconductors and the range of technical applications of such semiconductors is extremely wide. The purpose of this book is twofold: * to discuss the key properties of the group-IV, III-V and II-VI semiconductors * to systemize these properties from a solid-state physics aspect The majority of the text is devoted to the description of the lattice structural, thermal, elastic, lattice dynamic, electronic energy-band structural, optical and carrier transport properties of these semiconductors. Some corrective effects and related properties, such as piezoelectric, elastooptic and electrooptic properties, are also discussed. The book contains convenient tables summarizing the various material parameters and the definitions of important semiconductor properties. In addition, graphs are included in order to make the information more quantitative and intuitive. The book is intended not only for semiconductor device engineers, but also physicists and physical chemists, and particularly students specializing in the fields of semiconductor synthesis, crystal growth, semiconductor device physics and technology.

Handbook of Deposition Technologies for Films and Coatings

The present book is a definitive review in the field of Infrared (IR) and Near Infrared (NIR) Spectroscopies, which are powerful, non invasive imaging techniques. This book brings together multidisciplinary chapters written by leading authorities in the area. The book provides a thorough overview of progress in the field of applications of IR and NIR spectroscopy in Materials Science, Engineering and Technology. Through a presentation of diverse applications, this book aims at bridging various disciplines and provides a platform for collaborations among scientists.

Properties of Group-IV, III-V and II-VI Semiconductors

The applications of nanoparticulate drug delivery have gained significant attention in cancer diagnosis and treatment. Owing to their unique features and design, nanomedicines have made remarkable progress in eliminating dreadful tumors. Research in cancer nanomedicine spans multitudes of drug-delivery systems that include high tumor-targeting ability, sensitivity toward tumor microenvironments, and improved efficacy. Various nanocarriers have been developed and approved for anti-tumor drug targeting. These nanocarriers, such as liposomes, micelles, nanotubes, dendrimers, and peptides, offer several advantages including high selectivity, multifunctionality, specificity, biocompatibility, and precise control of drug release. This book provides complete information about each aspect of nanomaterials and nanotherapeutics, including synthesis, analysis, disease diagnosis, mechanistic insight, targeted drug delivery, and clinical implications in a concise and informative way. It presents simple and reader-friendly representations of the mechanisms of action of nanomaterials on cellular targets and highlights the challenges in targeted drug delivery with ongoing chemotherapeutic drugs.

Optical Properties of Amorphous Semiconductors

This book provides a basic understanding of spectroscopic ellipsometry, with a focus on characterization methods of a broad range of solar cell materials/devices, from traditional solar cell materials (Si, CuInGaSe2, and CdTe) to more advanced emerging materials (Cu2ZnSnSe4, organics, and hybrid perovskites), fulfilling a critical need in the photovoltaic community. The book describes optical constants of a variety of semiconductor light absorbers, transparent conductive oxides and metals that are vital for the interpretation of solar cell characteristics and device simulations. It is divided into four parts: fundamental principles of ellipsometry; characterization of solar cell materials/structures; ellipsometry applications including optical simulations of solar cell devices and online monitoring of film processing; and the optical constants of solar cell component layers.

Infrared Spectroscopy

The collection focuses on the advancements of characterization of minerals, metals, and materials and the applications of characterization results on the processing of these materials. Advanced characterization methods, techniques, and new instruments are emphasized. Areas of interest include, but are not limited to: · Novel methods and techniques for characterizing materials across a spectrum of systems and processes. · Characterization of mechanical, thermal, electrical, optical, dielectric, magnetic, physical, and other properties of materials. · Characterization of structural, morphological, and topographical natures of materials at micro- and nano- scales. · Characterization of extraction and processing including process development and analysis. · Advances in instrument developments for microstructure analysis and performance evaluation of materials, such as computer tomography (CT), X-ray and neutron diffraction, electron microscopy (SEM, FIB, TEM), and spectroscopy (EDS, WDS,

EBSD) techniques. · 2D and 3D modelling for materials characterization. The book explores scientific processes to characterize materials using modern technologies, and focuses on the interrelationships and interdependence among processing, structure, properties, and performance of materials.

Nanotherapeutics in Cancer

This book presents and introduces ellipsometry in nanoscience and nanotechnology making a bridge between the classical and nanoscale optical behaviour of materials. It delineates the role of the non-destructive and non-invasive optical diagnostics of ellipsometry in improving science and technology of nanomaterials and related processes by illustrating its exploitation, ranging from fundamental studies of the physics and chemistry of nanostructures to the ultimate goal of turnkey manufacturing control. This book is written for a broad readership: materials scientists, researchers, engineers, as well as students and nanotechnology operators who want to deepen their knowledge about both basics and applications of ellipsometry to nanoscale phenomena. It starts as a general introduction for people curious to enter the fields of ellipsometry and polarimetry applied to nanomaterials and progresses to articles by experts on specific fields that span from plasmonics, optics, to semiconductors and flexible electronics. The core belief reflected in this book is that ellipsometry applied at the nanoscale offers new ways of addressing many current needs. The book also explores forward-looking potential applications.

Spectroscopic Ellipsometry for Photovoltaics

Basic theory, applications, and recent trends in analytical techniques used in crude oil and related products analysis This book covers the application of different spectroscopic methods to characterize crude oil and related products. Its topics are presented in a pedagogical manner so that those new to the subject can better understand the content. The book begins by familiarizing the reader with the rheological characterization of crude oil and related products. Subsequent chapters are directed towards the current trends of different spectroscopic methods for the characterization of crude oil. Analytical Characterization Methods for Crude Oil and Related Products features chapters on: optical interrogation of petroleum asphaltenes (myths and reality); ESR characterization of organic free radicals in petroleum products; high-field, pulsed, and double resonance studies of crude oils and their derivatives; NMR spectroscopy in bitumen characterization; applications of Raman spectroscopy in crude oil and bitumen characterization; and more. Uses a bottom-up approach—starting from the basic theory of the technique followed by its applications and recent trends in crude oil analysis Includes informative content so as to take a technician to the level of using a particular analytical method Covers relevany information so as to enable a manager in the industry to make purchasing decisions Analytical Characterization Methods for Crude Oil and Related Products is aimed at researchers in academia as well as technicians and developers of new analytical methods in the oil industry and related areas. It will also be of interest to professionals, scientists, and graduate students in analytical sciences dealing with oil and environmental analysis.

Characterization of Minerals, Metals, and Materials 2021

The second, updated edition of this essential reference book provides a wealth of detail on a wide range of electronic and photonic materials, starting from fundamentals and building up to advanced topics and applications. Its extensive coverage, with clear illustrations and applications, carefully selected chapter sequencing and logical flow, makes it very different from other electronic materials handbooks. It has been written by professionals in the field and instructors who teach the subject at a university or in corporate laboratories. The Springer Handbook of Electronic and Photonic Materials, second edition, includes practical applications used as examples, details of experimental techniques, useful tables that summarize equations, and, most importantly, properties of various materials, as well as an extensive glossary. Along with significant updates to the content and the references, the second edition includes a number of new chapters such as those covering novel materials and selected applications. This handbook is a valuable resource for graduate students, researchers and practicing professionals working in the area of electronic, optoelectronic and photonic materials.

Ellipsometry at the Nanoscale

The Workshop on Physics and Application of Non-crystalline Semiconductors in Optoelectronics was held from 15 to 17 October 1996 in Chisinau. republic of Moldova and was devoted to the problems of non-crystalline semiconducting materials. The reports covered two mjlin topics: theoretical basis of physics of non -crystalline materials and experimental results. In the framework of these major topics

there were treated many subjects. concerning the physics of non-crystalline semiconductors and their specific application: -optical properties of non-crystalline semiconductors; -doping of glassy semiconductors and photoinduced effects in chalcogenide glasses and their application for practical purposes; -methods for investigation of the structure in non-crystalline semiconductors -new glassy materials for IR trasmittance and optoelectronics. Reports and communications were presented on various aspects of the theory. new physical principles. studies of the atomic structure. search and development of optoelectronics devices. Special attention was paid to the actual subject of photoinduced transformations and its applications. Experimental investigations covered a rather wide spectrum of materials and physical phenomena. As a novel item it is worth to mention the study of nonlinear optical effects in amorphous semiconducting films. The third order optical non linearities. fast photoinduced optical absorption and refraction. acusto-optic effects recently discovered in non-crystalline semiconductors could potentially be utilised for optical signal processing. The important problems of photoinduced structural transformations and related phenomena. which are very attractive and actual both from the scientific and practical points of view. received much attention in discussions at the conference.

Analytical Characterization Methods for Crude Oil and Related Products

Master electronic properties with precision using this comprehensive MCQ mastery guide on semiconductor physics. Tailored for students, engineers, and researchers, this resource offers a curated selection of practice questions covering key concepts, band theory, and semiconductor devices. Delve deep into carrier dynamics, PN junctions, and transistor operation while enhancing your problem-solving skills. Whether you're preparing for exams or seeking to reinforce your practical knowledge, this guide equips you with the tools needed to excel. Master semiconductor physics and understand the foundation of modern electronic devices with confidence using this indispensable resource.

Springer Handbook of Electronic and Photonic Materials

Examines the optical properties of low-dimensional semiconductor structures, a hot research area - for graduate students and researchers.

Physics and Applications of Non-Crystalline Semiconductors in Optoelectronics

This volume contains the Proceedings of the NATO Advanced Research Workshop on "Growth and Optical Properties of Wide Gap II-VI Low Dimensional Semiconductors\

SEMICONDUCTOR PHYSICS

This handbook gives a complete and detailed survey of the field of semiconductor physics. It addresses every fundamental principle, the most important research topics and results, as well as conventional and emerging new areas of application. Additionally it provides all essential reference material on crystalline bulk, low-dimensional, and amorphous semiconductors, including valuable data on their optical, transport, and dynamic properties. This updated and extended second edition includes essential coverage of rapidly advancing areas in semiconductor physics, such as topological insulators, quantum optics, magnetic nanostructures and spintronic systems. Richly illustrated and authored by a duo of internationally acclaimed experts in solar energy and semiconductor physics, this handbook delivers in-depth treatment of the field, reflecting a combined experience spanning several decades as both researchers and educators. Offering a unique perspective on many issues, Semiconductor Physics is an invaluable reference for physicists, materials scientists and engineers throughout academia and industry.

Optical Properties of Semiconductor Nanocrystals

Handbook of Optical Metrology: Principles and Applications begins by discussing key principles and techniques before exploring practical applications of optical metrology. Designed to provide beginners with an introduction to optical metrology without sacrificing academic rigor, this comprehensive text: Covers fundamentals of light sources, lenses, prisms, and mirrors, as well as optoelectronic sensors, optical devices, and optomechanical elements Addresses interferometry, holography, and speckle methods and applications Explains Moiré metrology and the optical heterodyne measurement method Delves into the specifics of diffraction, scattering, polarization, and near-field optics Considers applications for measuring length and size, displacement, straightness and parallelism, flatness, and three-dimensional shapes This new Second Edition is fully revised to reflect the latest developments.

It also includes four new chapters—nearly 100 pages—on optical coherence tomography for industrial applications, interference microscopy for surface structure analysis, noncontact dimensional and profile metrology by video measurement, and optical metrology in manufacturing technology.

Growth and Optical Properties of Wide-Gap II–VI Low-Dimensional Semiconductors

Optical Properties of Solids covers the important concepts of intrinsic optical properties and photoelectric emission. The book starts by providing an introduction to the fundamental optical spectra of solids. The text then discusses Maxwell's equations and the dielectric function; absorption and dispersion; and the theory of free-electron metals. The quantum mechanical theory of direct and indirect transitions between bands; the applications of dispersion relations; and the derivation of an expression for the dielectric function in the self-consistent field approximation are also encompassed. The book further tackles current-current correlations; the fluctuation-dissipation theorem; and the effect of surface plasmons on optical properties and photoemission. People involved in the study of the optical properties of solids will find the book invaluable.

Semiconductor Physics

Provides a semi-quantitative approach to recent developments in the study of optical properties of condensed matter systems Featuring contributions by noted experts in the field of electronic and optoelectronic materials and photonics, this book looks at the optical properties of materials as well as their physical processes and various classes. Taking a semi-quantitative approach to the subject, it presents a summary of the basic concepts, reviews recent developments in the study of optical properties of materials and offers many examples and applications. Optical Properties of Materials and Their Applications, 2nd Edition starts by identifying the processes that should be described in detail and follows with the relevant classes of materials. In addition to featuring four new chapters on optoelectronic properties of organic semiconductors, recent advances in electroluminescence, perovskites, and ellipsometry, the book covers: optical properties of disordered condensed matter and glasses; concept of excitons; photoluminescence, photoinduced changes, and electroluminescence in noncrystalline semiconductors; and photoinduced bond breaking and volume change in chalcogenide glasses. Also included are chapters on: nonlinear optical properties of photonic glasses; kinetics of the persistent photoconductivity in crystalline III-V semiconductors; and transparent white OLEDs. In addition, readers will learn about excitonic processes in quantum wells; optoelectronic properties and applications of quantum dots; and more. Covers all of the fundamentals and applications of optical properties of materials Includes theory, experimental techniques, and current and developing applications Includes four new chapters on optoelectronic properties of organic semiconductors, recent advances in electroluminescence, perovskites, and ellipsometry Appropriate for materials scientists, chemists, physicists and electrical engineers involved in development of electronic materials Written by internationally respected professionals working in physics and electrical engineering departments and government laboratories Optical Properties of Materials and Their Applications, 2nd Edition is an ideal book for senior undergraduate and postgraduate students, and teaching and research professionals in the fields of physics, chemistry, chemical engineering, materials science, and materials engineering.

Handbook of Optical Metrology

This is an exciting stage in the development of organic electronics. It is no longer an area of purely academic interest as increasingly real applications are being developed, some of which are beginning to come on-stream. Areas that have already been commercially developed or which are under intensive development include organic light emitting diodes (for flat panel displays and solid state lighting), organic photovoltaic cells, organic thin film transistors (for smart tags and flat panel displays) and sensors. Within the family of organic electronic materials, liquid crystals are relative newcomers. The first electronically conducting liquid crystals were reported in 1988 but already a substantial literature has developed. The advantage of liquid crystalline semiconductors is that they have the easy processability of amorphous and polymeric semiconductors but they usually have higher charge carrier mobilities. Their mobilities do not reach the levels seen in crystalline organics but they circumvent all of the difficult issues of controlling crystal growth and morphology. Liquid crystals self-organise, they can be aligned by fields and surface forces and, because of their fluid nature, defects in liquid crystal structures readily self-heal. With these matters in mind this is an opportune moment to bring together a volume on the subject of ‘Liquid Crystalline Semiconductors’. The field is already too large to cover in a comprehensive manner so the aim has been to bring together contributions from

leading researchers which cover the main areas of the chemistry (synthesis and structure/function relationships), physics (charge transport mechanisms and optical properties) and potential applications in photovoltaics, organic light emitting diodes (OLEDs) and organic field-effect transistors (OFETs). This book will provide a useful introduction to the field for those in both industry and academia and it is hoped that it will help to stimulate future developments.

Optical Properties of Solids

Optical Properties and Band Structure of Semiconductors, Volume 1 presents the experimental studies of the fundamental energy band structure of semiconductors and insulators. This book provides detailed information of the available measurement methods and results for a large number of both cubic and non-cubic materials. Comprised of 10 chapters, this volume begins with an overview of the fundamental band structure of semiconductors. This text then discusses the instrumentation and methods available for the measurement of absorption coefficient, absolute reflection coefficient, and other optica ...

Optical Properties of Materials and Their Applications

Systematically describes the physical and materials properties of copper-based quaternary chalcogenide semiconductor materials, enabling their potential for photovoltaic device applications. Intended for scientists and engineers, in particular, in the fields of multinary semiconductor physics and a variety of photovoltaic and optoelectronic devices.

Liquid Crystalline Semiconductors

Combining robotics with nanotechnology, this ready reference summarizes the fundamentals and emerging applications in this fascinating research field. This is the first book to introduce tools specifically designed and made for manipulating micro- and nanometer-sized objects, and presents such examples as semiconductor packaging and clinical diagnostics as well as surgery. The first part discusses various topics of on-chip and device-based micro- and nanomanipulation, including the use of acoustic, magnetic, optical or dielectrophoretic fields, while surface-driven and high-speed microfluidic manipulation for biophysical applications are also covered. In the second part of the book, the main focus is on microrobotic tools. Alongside magnetic micromanipulators, bacteria and untethered, chapters also discuss silicon nano- and integrated optical tweezers. The book closes with a number of chapters on nanomanipulation using AFM and nanocoils under optical and electron microscopes. Exciting images from the tiniest robotic systems at the nano-level are used to illustrate the examples throughout the work. A must-have book for readers with a background ranging from engineering to nanotechnology.

Optical Properties and Band Structure of Semiconductors

Earth-Abundant Materials for Solar Cells