Optical Constants Of Crystalline And Amorphous Semiconductors Numerical Data And Graphical Information

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Handbook of Optical Constants of Solids Optical Constants of Crystalline and Amorphous Semiconductors This handbook--a sequel to the widely used Handbook of Optical Constants of Solids--contains critical reviews and tabulated values of indexes of refraction (n) and extinction coefficients (k) for almost 50 materials that were not covered in the original handbook. For each material, the best known n and k values have been carefully tabulated, from the x-ray to millimeter-wave region of the spectrum by expert optical scientists. In addition, the handbook features thirteen introductory chapters that discuss the determination of n and k by various techniques. * Contributors have decided the best values for n and k * References in each critique allow the reader to go back to the original data to examine and understand where the values have come from * Allows the reader to determine if any data in a spectral region needs to be filled in * Gives a wide and detailed view of experimental techniques for measuring the optical constants n and k * Incorporates and describes crystal structure, space-group symmetry, unit-cell dimensions, number of optic and acoustic modes, frequencies of optic modes, the irreducible representation, band gap, plasma frequency, and static dielectric constant

Optical Properties of Photonic Crystals World Scientific

This book presents data on the optical constants of metal elements (Na, Au, Mg, Hg,

Sc, Al, Ti, β -Sn, 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- δ , 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 ε (E)= ε 1(E)+i ε 2(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 metals, semimetals, metallic compounds and high-temperature superconducting materials in the course of their work.

The Optical Constants of Crystals of Selenium and Tellirium for Wave Lengths from 3000 to 5000 Angstroms

Academic Press

This book presents data on the optical constants of metal elements (Na, Au, Mg, Hg, Sc, Al, Ti, β -Sn, 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- δ , 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 ε (E)= ε 1(E)+i ε 2(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 metals, semimetals, metallic compounds and high-temperature

superconducting materials in the course of their work.

Optical Properties of Solids Springer Science & Business Media

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 e(E)=e1(E)+ie2(E), the complex refractive index n*(E)=n(E)+ik(E), the absorption coefficient a(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.

Optical Constants of Minerals and Other Materials from the Millimeter to the Ultraviolet Trans Tech Publications Ltd

This book is devoted to the problem of the frequency dispersion of optical constants of inorganic glasses. It is the only source providing a

comprehensive discussion of this topic on a unified physical and analytical basis. Optical Constants of Inorganic Glasses presents thorough descriptions of the underlying physical phenomena, analytical models for the optical constants dispersion, and detailed information on the optical constants and related optical characteristics of glasses. The broad scope of the book includes such topics as general relationships for the response of a solid to the effect of an electromagnetic field, and specific features of optical spectrum formation for a glass and the resulting constants. The text details methods for reconstructing the spectra of optical constants from raw experimental spectra of glasses, and provides data on the spectra of optical constants in the IR and VUV ranges and on the IR band parameters for inorganic glasses. It includes factors responsible for the behavior of the refractive index dispersion of glasses in the transparency range. The reference fully details the opportunities provided by the recent version of dispersion analysis for glasses based on the specific analytical model for the complex dielectric constant. Until now, this information was only available in Russian journals. A large quantity of never-before-published data on numerical values of optical constants in the medium and far IR and of

IR band frequencies and intensities is given for a wide variety of inorganic glasses. For vitreous silica, data on the optical constants are also given for the broad wavelength range in the VUV. Optical Constants of Inorganic Glasses provides the only comprehensive review of available dispersion formulas and methods for interpolating and extrapolating the refractive indices of glasses in the transparency range. The volume is a valuable resource for researchers, practitioners in the fields of glass technology

World Scientific

Since publication of the first edition of this book in 1988, interest in the optical properties of materials has continued to grow and there have been a number of important developments in the field. The aim of this second edition is to present an up-to-date and broad picture of the field of optical constants covering the theoretical background, experimental techniques and results for a wide range of materials (bulk and thin film) over a wide spectral range from soft x-rays to microwaves. For the second edition Dr Ward has updated the book throughout. In particular, sections have been added on the optical properties of the sulphides, selenides and tellurides of cadmium, zinc and lead. Two other new

sections deal with low dimensional structures, an important and relatively recent development area, and the sensitivities of different methods for measuring ^In, ^Ik and ^Id. A new Appendix giving tabulated values of optical constants for a large number of elements, insulators and semiconductors at two common laser wavelengths completes the second edition. The author Leslie Ward has worked in the field of optical materials for about thirty years. He is the author of some 40 research publications and co-author of a book on the theory and practice of high-vacuum technology. From 1967 to 1982 he was Head of the Department of Applied Physics, and is currently an Honorary Research Fellow, at Coventry University.

Optical properties of organic semiconductors: From (sub-)monolayers to crystalline films World Scientific

Optical Constants of Crystalline and Amorphous Semiconductors Springer Science & Business Media

Optical Constants of Inorganic Glasses Academic Press

We have measured the optical properties of films of the organic semiconductors PTCDA and HBC, prepared by Organic Molecular Beam Expitaxy (OMBE), on different substrates by means of Differential Reflectance Spectroscopy

(DRS). The optical setup used [51] allows to characterize the samples in situ and during the film growth. This enables us to directly follow the thickness dependent optical properties of the organic films, starting from submonolayer coverage up to thicker films on the order of 20 monolayers (ML) film thickness. However, due to the different optical nature of the different substrates used, i.e., mica, glass, Au(111), and HOPG, the DRS signal can not directly be interpreted in terms of the absorption of the films. Rather, the optical constants n (index of refraction) and k (absorption index) of the organic films have to be calculated to be able to discuss the spectral absorption of the films. We have proposed a method by which the calculation of the optical constants of thin films on arbitrary substrates from just one spectral measurement (in our case the DRS) becomes possible. The results fulfill a priori a Kramers-Kronig consistency, characteristic for physically meaningful values of the optical constants, and no specific model is needed to express the spectral behavior of the optical constants. Still, the requirement that the absorption index has to approach zero sufficiently at the measurement intervals restricts the application of our method to a class of materials, which exhibit distinct and well-separated absorption bands, like e.g. organic semiconductors. By means of appropriate extrapolation procedures, the method is able to account for small non-zero values of the absorption index at the boundaries of the measurement interval. Although we exclusively discussed the application of our method to differential

reflectance spectra, it is anticipated that it works for all other optical quantities likewise.

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

Cuvillier Verlag

Nonlinear Optical Properties of Organic Molecules and Crystals, Volume 1 discusses the nonlinear optical effects in organic molecules and crystals, providing a classical distinction between quadratic and cubic processes. This book begins with a general overview of the basic properties of organic matter, followed by a review on the benefits derived from qu antum-chemistry-based models and growth and characterization of high quality, bulk organic crystals and waveguided structures. A case study focusing on a specific material, namely urea, which exemplifies a situation in which transparency in the UV region has been purposely traded for nonlinear efficiency is also deliberated. This text concludes with a description of a type of trade-off between the unpredictable orientation of molecules in crystalline media, polarity of liquid-crystalline structures, and dominant electronic contribution to the electro-optic effect. This publication is beneficial to solid-state physicists and chemists concerned with nonlinear optical properties of organic molecules and crystals.

Non-Crystalline Solids

World Scientific

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 $\varepsilon(E) = \varepsilon_1(E) + i\varepsilon_2(E)$, the complex refractive index $n^*(E) = n(E) + ik(E)$, the absorption coefficient $\alpha(E)$, 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.

Optical Constants of Crystalline and Amorphous Semiconductors Academic Press

While bits and pieces of the index of refraction n and extinction coefficient k for a given material can be found in several handbooks, the Handbook of Optical Constants of Solids gives for the first time a single set of n and k values over the broadest spectral range (ideally from x-ray to mm-wave region). The critiquers have chosen the numbers for you, based on their own broad experience in the study of optical properties. Whether youneed one number at one wavelength or many numbers at many wavelengths, what is available in the literature is condensed down into a single set of numbers. * Contributors have decided the best values for n and k * References in each critique allow the reader to go back to the original data to examine and understand where the values have

come from * Allows the reader to determine if any data in a spectral region needs to be filled in * Gives a wide and detailed view of experimental techniques for measuring the optical constants n and k * Incorporates and describes crystal structure, space-group symmetry, unit-cell dimensions, number of optic and acoustic modes, frequencies of optic modes, the irreducible representation, band gap, plasma frequency, and static dielectric constant.

Optical Properties of Solids Elsevier

This book is an account of the manner in which the optical phenomena observed from solids relate to their fundamental properties. Written at the graduate level, it attempts a threefold purpose: an indication of the breadth of the subject, an in-depth examination of important areas, and a text for a two-semester course. The first two chapters present introductory theory as a foundation for subsequent reading. The following ten chapters broadly concern electronic properties associated with semiconductors ranging from narrow to wide energy gap materials. Lattice properties are examined in the remaining chap ters, in which effects governed by phonons in perfect crystals, point defects, their vibrational and electronic spectra, and electron-phonon interactions are stressed. Fun and hard work, both in considerable measure, have gone into the preparation of this volume. At the University of Freiburg, W. Germany, from August 7-20, 1966, the occasion of a NATO Advanced Study Institute on "The Optical Properties of Solids," the authors of these various chapters lectured for the Institute; this volume provides essentially the

"Proceed ings" of that meeting. Many major revisions of original lectures (contrac tions and enlargements) were required for better organization and presentation of the subject matter. Several abbreviated chapters appear mainly to indicate the importance of their contents in optical properties research and to indicate recently published books that provide ample coverage. We are indebted to many people: the authors for their efforts and patience; our host at the University of Freiburg, the late Professor Dr.

The Optical Constants of Single Crystal Bismuth in the Ultra-violet World Scientific

We have measured the optical properties of films of the organic semiconductors PTCDA (3,4:9,10-perylene-tetracarboxylic dianhydride) and HBC (p eri-hexabenzocoronene), prepared by Organic Molecular Beam Expitaxy (OMBE), on different substrates by means of Differential Reflectance Spectroscopy (DRS). The optical setup enables us to directly follow the thickness dependent optical properties of the organic films, starting from submonolayer coverage up to thicker films on the order of 20 monolayers (ML) film thickness. Due to the different optical nature of the different substrates used, i.e., mica, glass, Au(111), and HOPG, the direct interpretation of the DRS signal is not feasible. Therefore, we have proposed a method by which the calculation of the optical constants n (index of refraction) and k (absorption index) of thin films on arbitrary

substrates from just one spectral measurement (in our case the DRS) becomes possible. The results fulfill a priori a Kramers-Kronig consistency and no specific model is needed to express the spectral behavior of the optical constants. Based on our method, we have successfully calculated the optical constants, and therefore the absorption behavior, of films of different thickness of PTCDA on mica, glass, Au(111), and HOPG, as well as of HBC on mica, glass, and HOPG. Extrinsic effects due to island growth or the presence of a polarizable substrate (screening) have been accounted for. We have introduced a finite dipole model which considers the extended geometry and anisotropy of the organic molecules. The calculated absorption behavior is discussed in great detail in terms of spectral changes with varying film thickness, different growth modes, degree of ordering of the films, interactions with the substrates and oscillator strength. A direct observation of a monomer-dimer transition in solid films could be observed for the first time. Our results indicate an exciton delocalization over about 4 molecules for both molecules.

The Handbook on Optical Constants of Semiconductors Elsevier 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 $\varepsilon(E) = \varepsilon_1(E) + i\varepsilon_2(E)$, the complex refractive index $n^*(E) = n(E) + ik(E)$, the absorption coefficient $\alpha(E)$, 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.

Handbook of Optical Constants of Solids CRC Press

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.

Optical Constants of Single Crystal Bismuth Academic Press

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.

The Handbook on Optical Constants of Semiconductors CRC Press

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.

The Optical Properties of Crystalline Graphite

Elsevier

This is the third volume of the very successful set. This updated volume will contain non-linear properties of some of the most useful materials as well as chapters on optical measurement techniques. Contributors have decided the best values for n and k References in each critique allow the reader to go back to the original data to examine and understand where the values have come from Allows the reader to determine if any data in a spectral region needs to be filled in Gives a wide and detailed view of experimental techniques for measuring the optical constants n and k Incorporates and describes crystal structure, space-group symmetry, unit-cell dimensions, number of optic and acoustic modes, frequencies of optic modes, the irreducible representation, band gap, plasma frequency, and static dielectric constant

Optical Constants of an Isolated Hexagonal Crystal of Silenium

Elsevier

This set of five volumes,

four volumes edited by Edward D. Palik and a volume by Gorachand Ghosh, is a unique resource for any science and technology library. It provides materials researchers and optical device designers with reference facts in a context not available anywhere else. The singular functionality of the set derives from the unique format for the three core volumes that comprise the Handbook of Optical Constants of Solids. The Handbook satisfies several essential needs: first, it affords the most comprehensive database of the refractive index and extinction (or loss) coefficient of technically important and scientifically interesting dielectrics. This data has been critically selected and evaluated by authorities on each material. Second, the dielectric constant database is supplemented by tutorial chapters covering the basics of dielectric theory and reviews of experimental techniques for each wavelength region and material characteristic. As an additional resource, two of the tutorial chapters summarize the relevant characteristics of each of the materials in the database. The data in the core volumes have been collected and analyzed over a period of twelve years, with the most recent completed in 1997. The volumes systematically define the dielectric properties of 143 of the most engaging materials, including metals, semiconductors,

and insulators. Together, the three Palik books contain nearly 3,000 pages, with about 2/3 devoted to the dielectric constant data. The tutorial chapters in the remaining 1/3 of the pages contain a wealth of information, including some dielectric data. Hence, the separate volume, Index to Handbook of Optical Constants of Solids, which is included as part of the set, substantially enhances the utility of the Handbook and in essence, joins all the Palik volumes into one unit. It isthen of great importance to users of the set. A final volume rounds out the set. The Handbook of Thermo-Optic Coefficients of Optical Materials with Applications collects refractive index measurements and their temperature dependence for a large number of crystals and glasses. Mathematical models represent these data, and in turn are used in the design of nonlinear optical devices. * Unique source of extremely useful optical data for a very broad community of scientists, researchers, and practitioners * Will be of great practical applicability to both industry and research * Presents optical constants for a broadest spectral range, for a very large number of materials: Paliks three volumes include 143 materials including 43 elements; Ghoshs volume includes some 70 technologically interesting crystals and many commercial glasses * Includes a special index

volume that enables the user to search for the information in the three Palik volumes easily and quickly * Critique chapters in the Palik volumes discuss the data and give reference to most of the literature available for each material * Presents various techniques for measuring the optical constants and mathematical models for analytical calculations of some data

Some Optical Properties of Crystalline Quartz ...

Springer Science & Business Media

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, llI-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.