

Sadao Adachi

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



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Properties Of Group Iv Iii V And Ii Vi Semiconductors

**O. Madelung, W. von der Osten, U.
Rössler**



Properties Of Group Iv Iii V And Ii Vi Semiconductors:

Properties of Group-IV, III-V and II-VI Semiconductors Sadao Adachi, 2005-06-14 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

Intrinsic Properties of Group IV Elements and III-V, II-VI and I-VII Compounds / Intrinsische Eigenschaften Von Elementen Der IV. Gruppe und Von III-V-, II-VI- und I-VII-Verbindungen

O. Madelung, W. von der Osten, U. Rössler, 1986-12 **Properties of Semiconductor Alloys** Sadao Adachi, 2009-04-20 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

Handbook of II-VI Semiconductor-Based Sensors and Radiation Detectors Ghenadii Korotcenkov, 2023-04-20 Three volumes book Handbook of II VI Semiconductor Based Sensors and Radiation Detectors is the first to cover both chemical sensors and biosensors and all types of photodetectors and radiation detectors based on II VI semiconductors It contains a comprehensive and detailed analysis of all aspects of the application of II VI semiconductors in these devices The first volume Materials and Technologies of a three volume set describes the physical chemical and electronic properties of II VI compounds which give rise to an increased interest in these semiconductors Technologies that are used in the development of various devices based on II VI connections such as material synthesis deposition characterization processing and device fabrication are also discussed in detail in this volume It covers also topics related to synthesis and application of II VI based nanoparticles and quantum dots as well their toxicity biocompatibility and biofunctionalization

Photoconductivity and Photoconductive

Materials, 2 Volume Set Safa O. Kasap, 2022-06-27 Dieses wichtige Referenzwerk behandelt die grundlegenden Konzepte der Photoleitfähigkeit und der photoleitenden Materialien. Mit Photoconductivity and Photoconductive Materials präsentiert Professor Kasap eine maßgebliche Zusammenstellung der wesentlichen Grundsätze der Photoleitfähigkeit und stellt eine Auswahl aktueller photoleitfähiger Materialien vor. Der erste Band des zweibändigen Werks beginnt mit einer Darstellung der grundlegenden Konzepte und Definitionen. Es folgt eine Charakterisierung der verschiedenen Techniken auf Grundlage von stationärer transienter und modulierter Photoleitfähigkeit und der neuen Methode der Ladungsextraktion durch linear steigende Spannung CELIV. Auch die Physik der Terahertz Photoleitfähigkeit sowie die Grundlagen der organischen Halbleiter LSOI werden behandelt. Der zweite Band beginnt mit einem umfassenden Überblick über eine Vielzahl unterschiedlicher photoleitfähiger Materialien, wobei der Schwerpunkt auf einige der wichtigsten Photoleiter gelegt wird, darunter hydriertes amorphes Silizium, Cadmium, Quecksilber, Tellurid, verschiedene Röntgenphotoleiter, Diamantfilme, Metallhalogenidperowskite, Nanodrähte und Quantenpunkte. Auch die Anwendungen der photoleitenden Antenne werden erörtert. Das Werk, das zahlreiche Beiträge führender Autoren auf diesem Fachgebiet enthält, bietet den Leserinnen und Lesern außerdem eine gründliche Einführung in die Charakterisierung von Halbleitern mit Hilfe von Techniken der Photoleitfähigkeit, insbesondere gleichmäßiger Beleuchtung und Phototransistor Gittertechniken. Eine umfassende Darstellung organischer Photoleiter mitsamt Informationen zu Photoerzeugung, Transport und Anwendungen im Druckbereich. Praktische Erörterungen der transienten Lichtleitfähigkeit im Flugzeitverfahren inklusive Experimentiertechniken und Interpretationshinweisen. Eine eingehende Betrachtung der transienten Photoleitfähigkeit organischer Halbleiterschichten und neuartiger Techniken der transienten Photoleitfähigkeit. Photoconductivity and Photoconductive Materials ist nicht nur ein wichtiges Referenzwerk für Physiker in der Forschung, Materialwissenschaftler und Elektroingenieure, sondern auch ein unverzichtbares Nachschlagewerk für Doktoranden und Studierende höherer Semester, die sich mit dem Bereich der optoelektronischen Materialien beschäftigen sowie für Forschende in der Industrie. Ein umfassendes zweibändiges Werk mit Beiträgen führender Fachautoren, herausgegeben von einem angesehenen Forscher auf dem Gebiet der Photoleitfähigkeit.

The Physics of Semiconductors Marius Grundmann, 2021-03-06 The 4th edition of this highly successful textbook features copious material for a complete upper level undergraduate or graduate course, guiding readers to the point where they can choose a specialized topic and begin supervised research. The textbook provides an integrated approach, beginning from the essential principles of solid state and semiconductor physics to their use in various classic and modern semiconductor devices for applications in electronics and photonics. The text highlights many practical aspects of semiconductors, alloys, strain heterostructures, nanostructures, amorphous semiconductors and noise, which are essential aspects of modern semiconductor research but often omitted in other textbooks. This textbook also covers advanced topics such as Bragg mirrors, resonators, polarized and magnetic semiconductors, nanowires, quantum dots, multi-junction solar cells.

thin film transistors and transparent conductive oxides The 4th edition includes many updates and chapters on 2D materials and aspects of topology The text derives explicit formulas for many results to facilitate a better understanding of the topics Having evolved from a highly regarded two semester course on the topic The Physics of Semiconductors requires little or no prior knowledge of solid state physics More than 2100 references guide the reader to historic and current literature including original papers review articles and topical books providing a go to point of reference for experienced researchers as well

Epitaxy of Semiconductors Udo W. Pohl, 2020-07-20 The extended and revised edition of this textbook provides essential information for a comprehensive upper level graduate course on the crystalline growth of semiconductor heterostructures Heteroepitaxy is the basis of today's advanced electronic and optoelectronic devices and it is considered one of the most important fields in materials research and nanotechnology The book discusses the structural and electronic properties of strained epitaxial layers the thermodynamics and kinetics of layer growth and it describes the major growth techniques metalorganic vapor phase epitaxy molecular beam epitaxy and liquid phase epitaxy It also examines in detail cubic and hexagonal semiconductors strain relaxation by misfit dislocations strain and confinement effects on electronic states surface structures and processes during nucleation and growth Requiring only minimal knowledge of solid state physics it provides natural sciences materials science and electrical engineering students and their lecturers elementary introductions to the theory and practice of epitaxial growth supported by references and over 300 detailed illustrations In this second edition many topics have been extended and treated in more detail e g in situ growth monitoring application of surfactants properties of dislocations and defects in organic crystals and special growth techniques like vapor liquid solid growth of nanowires and selective area epitaxy

Fundamentals of Silicon Carbide Technology Tsunenobu Kimoto, James A. Cooper, 2014-11-24 A comprehensive introduction and up to date reference to SiC power semiconductor devices covering topics from material properties to applications Based on a number of breakthroughs in SiC material science and fabrication technology in the 1980s and 1990s the first SiC Schottky barrier diodes SBDs were released as commercial products in 2001 The SiC SBD market has grown significantly since that time and SBDs are now used in a variety of power systems particularly switch mode power supplies and motor controls SiC power MOSFETs entered commercial production in 2011 providing rugged high efficiency switches for high frequency power systems In this wide ranging book the authors draw on their considerable experience to present both an introduction to SiC materials devices and applications and an in depth reference for scientists and engineers working in this fast moving field Fundamentals of Silicon Carbide Technology covers basic properties of SiC materials processing technology theory and analysis of practical devices and an overview of the most important systems applications Specifically included are A complete discussion of SiC material properties bulk crystal growth epitaxial growth device fabrication technology and characterization techniques Device physics and operating equations for Schottky diodes pin diodes JBS MPS diodes JFETs MOSFETs BJTs IGBTs and thyristors A survey of power electronics

applications including switch mode power supplies motor drives power converters for electric vehicles and converters for renewable energy sources Coverage of special applications including microwave devices high temperature electronics and rugged sensors Fully illustrated throughout the text is written by recognized experts with over 45 years of combined experience in SiC research and development This book is intended for graduate students and researchers in crystal growth material science and semiconductor device technology The book is also useful for design engineers application engineers and product managers in areas such as power supplies converter and inverter design electric vehicle technology high temperature electronics sensors and smart grid technology

Renewable and Alternative Energy: Concepts, Methodologies, Tools, and Applications Management Association, Information Resources, 2016-10-19 As the human population expands and natural resources become depleted it becomes necessary to explore other sources for energy consumption and usage Renewable and Alternative Energy Concepts Methodologies Tools and Applications provides a comprehensive overview of emerging perspectives and innovations for alternative energy sources Highlighting relevant concepts on energy efficiency current technologies and ongoing industry trends this is an ideal reference source for academics practitioners professionals and upper level students interested in the latest research on renewable energy

Bismuth-Containing Alloys and Nanostructures Shumin Wang, Pengfei Lu, 2019-07-03 This book focuses on novel bismuth containing alloys and nanostructures covering a wide range of materials from semiconductors topological insulators silica optical fibers and to multiferroic materials It provides a timely overview of bismuth alloys and nanostructures from material synthesis and physical properties to device applications and also includes the latest research findings Bismuth is considered to be a sustainable and environmentally friendly element and has received increasing attention in a variety of innovative research areas in recent years The book is intended as a reference resource and textbook for graduate students and researchers working in these fields

Air Force Research Resumés , Infrared Detectors Antonio Rogalski, 2010-11-15 Completely revised and reorganized while retaining the approachable style of the first edition Infrared Detectors Second Edition addresses the latest developments in the science and technology of infrared IR detection Antoni Rogalski an internationally recognized pioneer in the field covers the comprehensive range of subjects necessary to un

Chalcogenide Photovoltaics Roland Scheer, Hans-Werner Schock, 2011-03-31 This first comprehensive description of the most important material properties and device aspects closes the gap between general books on solar cells and journal articles on chalcogenide based photovoltaics Written by two very renowned authors with years of practical experience in the field the book covers II VI and I III VI₂ materials as well as energy conversion at heterojunctions It also discusses the latest semiconductor heterojunction models and presents modern analysis concepts Thin film technology is explained with an emphasis on current and future techniques for mass production and the book closes with a compendium of failure analysis in photovoltaic thin film modules With its overview of the semiconductor physics and technology needed this practical book is

ideal for students researchers and manufacturers as well as for the growing number of engineers and researchers working in companies and institutes on chalcogenide photovoltaics

Electronic Structure Methods for Complex Materials Wai-Yim Ching, Paul Rulis, 2012-05-17 This book details the application of the OLCAO method for calculating the properties of solids from fundamental principles to a wide array of material systems The method specializes in large and complex models and is able to compute a variety of useful properties including electronic optical and spectroscopic properties

Semiconductors — Basic Data Otfried Madelung, 2012-12-06 The frequent use of well known critical data handbooks like Beilstein Gmelin and Landolt Bomstein is impeded by the fact that merely larger libraries often far away from the scientist s working place can afford such precious collections To satisfy an urgent need of many scientists working in the field of semiconductor physics for having at their working place a comprehensive high quality but cheap collection of at least the basic data of their field of interest this volume contains the most important data of semiconductors All data were compiled from information on semiconductors presented on more than 6000 pages in various volumes of the New Series of Landolt Bomstein We hope to meet the needs of the community of semiconductor physicists with this volume forming a bridge between the laboratory and additional information sources in the libraries The Editor Marburg January 1996 Table of contents A Introduction 1 General remarks 1 2 The corresponding Landolt Bomstein volumes 2 3 Physical quantities tabulated in this volume 3 B Physical data Elements of the IVth group and IV IV compounds 1 1 Diamond C 5 1 2 Silicon Si 11 1 3 Germanium Ge 28 1 4 Grey tin a Sn 42 1 5 Silicon carbide SiC 47 1 6 Silicon germanium alloys SixGel_x 57 2 III V compounds 2 1 Boron nitride BN 60 2 2 Boron phosphide BP 65 2 3 Boron arsenide BAs 68 2 4 Aluminium nitride AlN 69 2 5 Aluminium phosphide AlP 72 2 6 Aluminium arsenide AlAs

Comprehensive Semiconductor Science and Technology, 2011-01-28 Semiconductors are at the heart of modern living Almost everything we do be it work travel communication or entertainment all depend on some feature of semiconductor technology Comprehensive Semiconductor Science and Technology Six Volume Set captures the breadth of this important field and presents it in a single source to the large audience who study make and exploit semiconductors Previous attempts at this achievement have been abbreviated and have omitted important topics Written and Edited by a truly international team of experts this work delivers an objective yet cohesive global review of the semiconductor world The work is divided into three sections The first section is concerned with the fundamental physics of semiconductors showing how the electronic features and the lattice dynamics change drastically when systems vary from bulk to a low dimensional structure and further to a nanometer size Throughout this section there is an emphasis on the full understanding of the underlying physics The second section deals largely with the transformation of the conceptual framework of solid state physics into devices and systems which require the growth of extremely high purity nearly defect free bulk and epitaxial materials The last section is devoted to exploitation of the knowledge described in the previous sections to highlight the spectrum of devices we see all around us Provides a comprehensive global picture of the semiconductor world Each of the

work s three sections presents a complete description of one aspect of the whole Written and Edited by a truly international team of experts **Semiconductor Radiation Detectors** Alan Owens,2019-05-31 Choice Recommended Title July 2020 Bringing together material scattered across many disciplines Semiconductor Radiation Detectors provides readers with a consolidated source of information on the properties of a wide range of semiconductors their growth characterization and the fabrication of radiation sensors with emphasis on the X and gamma ray regimes It explores the promise and limitations of both the traditional and new generation of semiconductors and discusses where the future in semiconductor development and radiation detection may lie The purpose of this book is two fold firstly to serve as a text book for those new to the field of semiconductors and radiation detection and measurement and secondly as a reference book for established researchers working in related disciplines within physics and engineering Features The only comprehensive book covering this topic Fully up to date with new developments in the field Provides a wide ranging source of further reference material

Earth-Abundant Materials for Solar Cells Sadao Adachi,2015-10-28 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 **Scintillation Dosimetry** Sam Beddar,Luc Beaulieu,2018-09-03 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 erenkov 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 *Physical Chemistry of Semiconductor Materials and Processes* ,2015-10-12 The development of solid state devices began a little more than a century ago with the discovery of the electrical conductivity of ionic solids Today solid state technologies form the background of the society in which we live The aim of this book is threefold to present the background physical chemistry on which the technology of semiconductor devices is based secondly to describe specific issues such as the role of defects on the properties of solids and the crucial influence of surface properties and ultimately to look at the physics and chemistry of semiconductor growth processes both at the bulk and thin film level together with some issues relating to the properties of nano devices Divided into five chapters it covers Thermodynamics of solids including phases and their properties and structural order Point defects in semiconductors Extended defects in semiconductors and their interactions with point defects and impurities Growth of semiconductor materials Physical chemistry of semiconductor materials processing With

applications across all solid state technologies the book is useful for advanced students and researchers in materials science physics chemistry electrical and electronic engineering It is also useful for those in the semiconductor industry

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