Liquid Crystalline Semiconductors Materials Properties And Applications Springer Series%25

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Liquid Crystalline Semiconductors Richard J. Bushby,Stephen M. Kelly,Mary O'Neill,2012-11-28 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.

Dielectric Properties Of Liquid Crystals Zbigniew Galewski,2007-01-01 Introduction - This book, consisting of 10 chapters, should be treated as a complement that brings the reader up to date with the latest contributions to the rich literature on liquid crystals. A prominent place in this literature is occupied by the dielectric properties which are important in estimation of usefulness of these materials and in understanding the molecular processes determining various

mesophases. In the field of dielectrics in general, and in connection with the structure and phase transitions the entries in references [1-14] can be recommended. With respect to general aspects of liquid-crystalline properties and molecular dynamics one can point out the references [15-36]. Most of them contain as well chapters on dielectric properties. In addition there is a number of books and monographs related strictly to the dielectric properties of liquid crystals, in particular references [37-45]. For the readers less familiar with this topic and interested in the basic knowledge of dielectric aspects of liquid crystals one can suggest the reviews [46-48]. Basic difference between properties of isotropic liquid and liquid crystal lies in the existence in the latter case of at least one degree of order. The ordering can be also considered with respect to a crystalline phase. Thus introducing at least one degree of disorder (rotational or translational) causes the occurrence of a mesophase which, however, is not identical with the liquid-crystalline phase. If the mesophase is to be liquid-crystalline, it should possess at least one translational degree of disorder. The disorder connected with further degrees of freedom leads to rich polymorphism. The most characteristic feature of liquid-crystalline phases is a precisely defined degree of disorder of molecules building these phases and their anisotropy which is exhibited in molecular structure and all measurable physical parameters such as polarizability. This is the reason why such phases are also called anisotropic liquids. The insertion into the molecules that form mesophases of fragments either chiral or influencing antagonistically already present fragments (e.g. by replacing one alkyl group by perfluorinated chain) leads to additional interactions which compete with interactions responsible for the stability of liquid-crystalline phases. This causes the frustration phenomena, i.e. the mutual overlapping of interactions frequently responsible for opposite effects. These induced phenomena conduce to unexpected structures (banana-type or columnar-type mesophases) and properties such as helicity, ferroelectricity or antiferroelectricity. Of particular interest seem to be ferroelectric liquid crystals (chiral tilted smectics such as SmC*, SmI* and others) showing collective modes: tilt fluctuations (soft modes) and phase fluctuations (Goldstone mode). Unusual progress observed in the last half-century has occurred due to use of some additional interacting fragments and structural details. Liquid crystalline polymers and metalomesogens present rapidly growing branches of knowledge of liquid crystal. Ferromagnetism and superconductivity of liquid crystals still pose a challenge. In this monograph we present different aspects of dielectric properties of mesogens. Chapter 1 presented by Otowski is dedicated to general problems of the molecular dipole s motion in electric field. Based on the broadband dielectric studies results of a few liquid-crystalline substances, their dielectric behavior is discussed by means of Nordio-Rigatti-Segre theory. The pretransitional anomalies observed in isotropic phase close to the phase transitions by means of dielectric measurements are described by Drozd-Rzoska, Rzoska and Janik in Chapter 2. An extended part of this book is devoted to chiral liquid crystals, the importance of which for applications and expectations for them are continuously increasing. The principles of the dielectric behavior of chiral liquid-crystalline compounds based on general considerations applying for other dipolar systems as well is presented by Hoffmann in Chapter

3. In general considerations based on the example of 12 selected substances showing extremely rich polymorphism Marzec, Mikulko, Wróbel and Haase analyze impressive behaviors of collective modes (Chapter 4). The problem of non-linear dielectric effects constitutes an important part of this book. A general introduction to the non-linear dielectric spectroscopy is contained in Chapter 5 elaborated by Kedziora, who concentrates himself on the isotropic phase, solutions and precritical phenomena. The problem of molecular properties of smectic materials and relaxation in ferroelectric liquid crystals with particular attention paid to electrooptic phenomena are discussed by Kuczynski in Chapter 6. Advantages of electrooptic methods applied to chiral tilted smectic liquid crystals with either ferroelectric or antiferroelectric dipole order are known. However, less popular problem of so called organic glass formers presented by Massalska-Arodz, Sciesinska, Sciesinski, Krawczyk, Inoba and Zielinski in Chapter 7 deserved attentions. Properties of these materials are discussed by using the results of complementary methods such as INS, QENS, adiabatic calorimetry and far-infrared spectra. Chapter 8, presented by Rózanski, is devoted to the dielectric properties of liquid crystals confined in porous matrices or dispersed throughout solid matrices. Such systems seem to be fascinating not only from the point of view of surface interactions but also due to attractive properties of dispersed systems in nanoscale. Of great value is also Chapter 9 by Kocot, Merkel, Sufin, Vij and Mehl describing dendrimeric liquid crystals built of molecules containing siloxane or carbosilazane cores. The problems of dynamics and ordering are discussed in terms of IR and dielectric spectroscopy results. Chapter 10, written by Urban, is committed to the relaxation processes in calamitic liquid crystals with emphasis on pressure and temperature effects. Finally let us direct readers attention to general references relating to the new liquid crystalline compounds [49] and IUPAC classification of these systems [50].
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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 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.

Springer Handbook of Materials Data Hans Warlimont,Werner Martienssen,2018-07-27 The second edition of this well-received handbook is the most concise yet comprehensive compilation of materials data. The chapters provide succinct descriptions and summarize essential and reliable data for various types of materials. The information is amply illustrated with 900 tables and 1050 figures selected primarily from well-established data collections, such as Landolt-Börnstein, which is now part of the SpringerMaterials database. The new edition of the Springer Handbook of Materials Data starts by presenting the latest CODATA recommended values of the fundamental physical constants and provides comprehensive tables of the physical and physicochemical properties of the elements. 25 chapters collect and summarize the most frequently used data and relationships for numerous metals, nonmetallic materials, functional materials and selected special structures such as liquid crystals and nanostructured materials. Along with careful updates to the content and the inclusion of timely and extensive references, this second edition includes new chapters on polymers, materials for solid catalysts and low-dimensional semiconductors. This handbook is an authoritative reference resource for engineers, scientists and students engaged in the vast field of materials science.

Liquid Crystals II D.M.P. Mingos,2013-10-03 The liquid crystalline state may be identified as a distinct and unique state of matter which is characterised by properties which resembles those of both solids and liquids. It was first recognised in the

middle of the last century through the study of nerve myelin and derivatives of cholesterol. The research in the area really gathered momentum, however, when as a result of the pioneering work of Gray in the early 1970's organic compounds showing liquid crystalline properties were shown to be suitable to form the basis of display devices in the electronic products. The study of liquid crystals is truly multidisciplinary and has attached the attention of physicists, biologists, chemists, mathematicians and electronics engineers. It is therefore impossible to cover all these aspects fully in two small volumes and therefore it was decided in view of the overall title of the series to concentrate on the structural and bonding aspects of the subject. The Chapters presented in these two volumes have been organised to cover the following fundamental aspects of the subject. The calculation of the structures of liquid crystals, an account of their dynamical properties and a discussion of computer simulations of liquid crystalline phases formed by Gay Berne mesogens. The relationships between molecular conformation and packing are analysed in some detail. The crystal structures of liquid crystal mesogens and the importance of their X ray scattering properties for characterisational purposes are discussed.

Oxadiazole in Material and Medicinal Chemistry Priya Ranjan Sahoo,Abhishek Saxena,Satish Kumar,2024-09-06 The book “Oxadiazole in Material and Medicinal Chemistry” is based on the utility of organic motifs that contain oxadiazole units in their molecular architecture. Most of the common and alternate ways to synthesize oxadiazole-based probes have been discussed. The book also features some of the advanced applications of such organic motifs in liquid crystals, OLEDs, imaging agents, and medicines. Few practical applications of oxadiazole-based molecules in material and electronic areas have also been outlined. The book focuses on understanding the role of oxadiazole scaffolds in biological events, disease monitoring, and detection. The therapeutic effect of oxadiazole-based probes on cancer, inflammation, and neurodegeneration have also been covered in the book. Oxadiazole probes in inhibitor design and the corresponding inhibitory potency as drug development have been outlined. The authors hope that the book will garner positive interest among students and researchers associated with material and medicinal chemistry.

Comprehensive Energy Systems Ibrahim Dincer,2018-02-07 Comprehensive Energy Systems, Seven Volume Set provides a unified source of information covering the entire spectrum of energy, one of the most significant issues humanity has to face. This comprehensive book describes traditional and novel energy systems, from single generation to multi-generation, also covering theory and applications. In addition, it also presents high-level coverage on energy policies, strategies, environmental impacts and sustainable development. No other published work covers such breadth of topics in similar depth. High-level sections include Energy Fundamentals, Energy Materials, Energy Production, Energy Conversion, and Energy Management. Offers the most comprehensive resource available on the topic of energy systems Presents an authoritative resource authored and edited by leading experts in the field Consolidates information currently scattered in publications from different research fields (engineering as well as physics, chemistry, environmental sciences and

economics), thus ensuring a common standard and language

Functional Organic and Hybrid Nanostructured Materials Quan Li,2018-01-25 The first book to explore the potential of tunable functionalities in organic and hybrid nanostructured materials in a unified manner. The highly experienced editor and a team of leading experts review the promising and enabling aspects of this exciting materials class, covering the design, synthesis and/or fabrication, properties and applications. The broad topical scope includes organic polymers, liquid crystals, gels, stimuli-responsive surfaces, hybrid membranes, metallic, semiconducting and carbon nanomaterials, thermoelectric materials, metal-organic frameworks, luminescent and photochromic materials, and chiral and self-healing materials. For materials scientists, nanotechnologists as well as organic, inorganic, solid state and polymer chemists.

Scientific and Technical Books and Serials in Print ,1984

Anisotropic Nanomaterials Quan Li,2015-06-09 In this book anisotropic one-dimensional and two-dimensional nanoscale building blocks and their assembly into fascinating and qualitatively new functional structures embracing both hard and soft components are explained. Contributions from leading experts regarding important aspects like synthesis, assembly, properties and applications of the above materials are compiled into a reference book. The anisotropy, i.e. the direction-dependent physical properties, of materials is fascinating and elegant and has sparked the quest for anisotropic materials with useful properties. With such a curiosity, material scientists have ventured into the realm of nanometer length scale and have explored the anisotropic nanoscale building blocks such as metallic and nonmetallic particles as well as organic molecular aggregates. It turns out that the anisotropic nanoscale building blocks, in addition to direction-dependent properties, exhibit dimension and morphology dependence of physical properties. Moreover, ordered arrays of anisotropic nanoscale building blocks furnish novel properties into the resulting system which would be entirely different from the properties of individual ones. Undoubtedly, these promising properties have qualified them as enabling building blocks of 21st century materials science, nanoscience and nanotechnology. Readers will find this book professionally valuable and intellectually stimulating in the rapidly emerging area of anisotropic nanomaterials. Quan Li, Ph.D., is Director of the Organic Synthesis and Advanced Materials Laboratory at the Liquid Crystal Institute of Kent State University, where he is also Adjunct Professor in the Chemical Physics Interdisciplinary Program. He has directed research projects funded by US Air Force Research Laboratory (AFRL), US Air Force Office of Scientific Research (AFSOR), US Army Research Office (ARO), US Department of Defense Multidisciplinary University Research Initiative (DoD MURI), US National Science Foundation (NSF), US Department of Energy (DOE), US National Aeronautics and Space Administration (NASA), Ohio Third Frontier, and Samsung Electronics, among others.

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

Handbook of Optoelectronics John P. Dakin,Robert G. W. Brown,2017-10-06 Handbook of Optoelectronics offers a self-contained reference from the basic science and light sources to devices and modern applications across the entire spectrum of disciplines utilizing optoelectronic technologies. This second edition gives a complete update of the original work with a focus on systems and applications. Volume I covers the details of optoelectronic devices and techniques including semiconductor lasers, optical detectors and receivers, optical fiber devices, modulators, amplifiers, integrated optics, LEDs, and engineered optical materials with brand new chapters on silicon photonics, nanophotonics, and graphene optoelectronics. Volume II addresses the underlying system technologies enabling state-of-the-art communications, imaging, displays, sensing, data processing, energy conversion, and actuation. Volume III is brand new to this edition, focusing on applications in infrastructure, transport, security, surveillance, environmental monitoring, military, industrial, oil and gas, energy generation and distribution, medicine, and free space. No other resource in the field comes close to its breadth and depth, with contributions from leading industrial and academic institutions around the world. Whether used as a reference, research tool, or broad-based introduction to the field, the Handbook offers everything you need to get started. (The previous edition of this title was published as Handbook of Optoelectronics, 9780750306461.) John P. Dakin, PhD, is professor (emeritus) at the Optoelectronics Research Centre, University of Southampton, UK. Robert G. W. Brown, PhD, is chief executive officer of the American Institute of Physics and an adjunct full professor in the Beckman Laser Institute and Medical Clinic at the University of California, Irvine.

Springer Handbook of Condensed Matter and Materials Data Werner Martienssen,Hans Warlimont,2006-09-21 Springer Handbook of Condensed Matter and Materials Data provides a concise compilation of data and functional relationships from the fields of solid-state physics and materials in this 1200 page volume. The data, encapsulated in 914 tables and 1025 illustrations, have been selected and extracted primarily from the extensive high-quality data collection Landolt-Börnstein and also from other systematic data sources and recent publications of physical and technical property data. Many chapters are authored by Landolt-Börnstein editors, including the prominent Springer Handbook editors, W. Martienssen and H. Warlimont themselves. The Handbook is designed to be useful as a desktop reference for fast and easy retrieval of essential and reliable data in the lab or office. References to more extensive data sources are also provided in the book and by interlinking to the relevant sources on the enclosed CD-ROM. Physicists, chemists and engineers engaged in fields of solid-state sciences and materials technologies in research, development and application will appreciate the ready access to the key information coherently organized within this wide-ranging Handbook. From the reviews: ...this is the most complete compilation I have ever seen... When I received the book, I immediately searched for data I never found elsewhere..., and I found them rapidly... No doubt that this book will soon be in every library and on the desk of most solid state scientists and engineers. It will never be at rest. -Physicalia Magazine

Physics Briefs ,1994

Nanomaterials for Sustainable Energy Quan Li,2016-05-12 This book presents the unique mechanical, electrical, and optical properties of nanomaterials, which play an important role in the recent advances of energy-related applications. Different nanomaterials have been employed in energy saving, generation, harvest, conversion, storage, and transport processes very effectively and efficiently. Recent progress in the preparation, characterization and usage of 1D, 2D nanomaterials and hybrid architectures for energy-related applications and relevant technologies and devices, such as solar cells, thermoelectronics, piezoelectronics, solar water splitting, hydrogen production/storage, fuel cells, batteries, and supercapacitors is covered. Moreover, the book also highlights novel approaches in nanomaterials design and synthesis and evaluating materials sustainability issues. Contributions from active and leading experts regarding important aspects like the synthesis, assembly, and properties of nanomaterials for energy-related applications are compiled into a reference book. As evident from the diverse topics, the book will be very valuable to researchers working in the intersection of physics, chemistry, biology, materials science and engineering. It may set the standard and stimulates future developments in this rapidly emerging fertile frontier of nanomaterials for energy.

Fundamental Physics of Amorphous Semiconductors F. Yonezawa,2012-12-06 The Kyoto Summer Institute 1980 (KSI '80), devoted to Fundamental Physics of Amorphous Semiconductors, was held at Research Institute for Fundamental Physics (RIFP), Kyoto University, from 8-11 September, 1980. The KSI '80 was the successor of the preceding Institutes which were

held in July 1978 on Particle Physics and Accelerator Projects and in September 1979 on Physics of Low-Dimensional Systems. The KSI '80 was attended by 200 participants, of which 36 were from abroad: Canada, France, Korea, Poland, U.K., U.S.A, U.S.S.R., and the Federal Republic of Germany. The KSI '80 was organized by RIFP and directed by the Amorphous Semicon ductor group in Japan. A few years ago, we started to organize an interna tional meeting on amorphous semiconductors' as a satell ite meeting of the International Conference on Physics of Semiconductors held on September 1-5, 1980 in Kyoto. We later decided to hold the meeting in the form of the Kyoto Summer Institute. The Kyoto Summer Institute is aimed to be something between a school and a conference. Accordingly, the object of the KSI '80 was to provide a series of invited lectures and informal seminars on fundamental physics of amorphous semiconductors. No contributed paper was accepted, but seminars were open.

Nanoscience with Liquid Crystals Quan Li,2014-04-17 This book focuses on the exciting topic of nanoscience with liquid crystals: from self-organized nanostructures to applications. The elegant self-organized liquid crystalline nanostructures, the synergetic characteristics of liquid crystals and nanoparticles, liquid crystalline nanomaterials, synthesis of nanomaterials using liquid crystals as templates, nanoconfinement and nanoparticles of liquid crystals are covered and discussed, and the prospect of fabricating functional materials is highlighted. Contributions, collecting the scattered literature of the field from leading and active players, are compiled to make the book a reference book. Readers will find the book useful and of benefit both as summaries for works in this field and as tutorials and explanations of concepts for those just entering the field. Additionally, the book helps to stimulate future developments.

Materials Science in Photocatalysis Elisa I. Garcia Lopez,Leonardo Palmisano,2021-08-15 Materials Science in Photocatalysis provides a complete overview of the different semiconductor materials, from titania to third-generation photocatalysts, examining the increasing complexity and novelty of the materials science in photocatalytic materials. The book describes the most recommended synthesis procedure for each of them and the suitable characterization techniques for determining the optical, structural, morphological, and physical-chemical properties. The most suitable applications of the photocatalysts are described in detail, as well as their environmental applications for wastewater treatment, gaseous effluents depollution, water splitting, CO2 ?xation, selective organic synthesis, coupling reactions, and other selective transformations under both UV light and visible-light irradiation. This book offers a useful reference for a wide audience from students studying chemical engineering and materials chemistry to experienced researchers working on chemical engineering, materials science, materials engineering, environment engineering, nanotechnology, and green chemistry. Includes a complete overview of the different semiconductor materials used as photocatalysts Describes methods of preparation and characterization of photocatalysts and their applications Examines new possibilities to prepare effective photocatalysts

Photoelectric Properties and Applications of Low-Mobility Semiconductors Rolf Könenkamp,2003-07-01 This volume discusses the photoelectric behavior of three semiconducting thin film materials hydrogenated amorphous silicon (a Si:H), nano porous titanium dioxide, and the fullerene C60. Despite the fundamental structural differences between these materials, their electronic properties are at least on the phenomenological level surprisingly similar, since all three materials have rather low carrier mobilities. In the last decade a Si:H has conquered large market segments in photo voltaics, fiat panel displays and detector applications. It is surely the most advanced and best understood of the three materials. Nano porous Ti02 is used successfully in a novel solar cell featuring an organic dye absorber. This product is now at the brink of commercialization, while electronic applica tions for C60 still appear to be in the exploration phase. At this stage it appears that some of the insight and many of the exper imental techniques used in the development of a Si:H may prove useful in the on going and yet very basic study of TiO2 and C60 thin films. This idea is the guideline to this book. Without being comprehensive on the part of amorphous silicon, it attempts to outline basic characterization schemes for the nano porous and fullerene materials, and to evaluate their potential for applications with respect to a reference, which is given by a Si:H.

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