Amorphous Semiconductors

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Amorphous Semiconductors John Wiley & Sons Growth and structure of amorphous and polycrystalline thin films -- Electrical and optical properties of amorphous thin films -- Electrical properties of polycrystalline semiconductor thin films -- Optical properties of polycrystalline semiconductor thin films --

The electronic structure of grain boundaries in polycrystalline semiconductor thin films -- Amorphous thin-film devices -- Industrial applications of polycrystalline thin-film devices -- Thin-film photovoltaic devices -- Applications of passive thin films. *Amorphous Semiconductors for Microelectronics* Springer Amorphous chalcogenide semiconductors have commercial value and have many uses such as image formation, including x-rays, and high-definition TV pick up tubes. They have widespread application in the microelectronics industry and amorphous metallic alloys also have useful magnetic properties. This book focuses on their imaging applications and related properties. It examines the two groups of amorphous semiconductors that are of most commercial interest: the chalcogenide glasses the tetrahedrally bonded amorphous solids such as amorphous silicon, germanium and related alloys Both of these groups may be conveniently prepared in the form of thin/thick films which is of considerable importance in applications where large-area coverage of flat or curved surfaces of rigid or flexible

materials is desirable such as in photovoltaic arrays, X-Ray sensors, display screens and photocopier drums. Provides information on the amorphous semiconductor s that are of most commercial interest Presents the history of the commercial applications, the latest developments and future possibilities *Optical Constants of Crystalline and Amorphous Semiconducto rs* World Scientific Twenty-four years ago, Hellmut Fritzsche came to our laboratory to evaluate our work in amorphous materials. He came many times, sometimes bringing his violin to play with our youngest son, to talk, to help, to discover, and to teach. The times with him were always exciting and rewarding. There was a camaraderie in the early years that has continued and a friendship that has deepened among Iris and me and Hellmut, Sybille and their children. The vision that Hellmut Fritzsche shared with me, the many important contributions he made, the science that he helped so firmly to establish, the courage he showed in the time of our adversity, and the potential that he recognized put all of us in the amorphous field, not only

his close friends and collaborators, in his debt. He helped make a science out of intuition, and played an important role not only in the experimental field but also in the basic theoretical aspects. It has been an honor to work with Hellmut through the years.
Amorphous Semiconducto rs 76 CRC Press
The electron theory of solids has attracted great attention in recent years, mainly because of the numerous practical applications of semicon ductors. However, all the reviews and monographs on this subject deal only with crystalline conductors. At present, mainly in the Soviet Union, experi mental and theoretical investigations have been extended to liquid and solid amorphous conductors, and in particular to such semiconductor s. However, all the work published so far in this field is in the form of separate papers scat tered throughout various journals, and there has as yet been no Soviet or for eign review of the theoretical work on amorphous semiconductor s, in spite of the increasing interest in them. The investigation of liquid and amorphous semiconductor s is of great practical importance, first, because all the solid semico'nducto

rs are usually prepared from the liquid phase and it is important to know the electrical and other properties of this phase; secondly, amorphous semiconductors are beginning to be used in industry, for example, amorphous Sb S films in vidicon tubes. In some cases, especially in optical instruments, 2 S amorphous semiconductors have advantages compared with crystals. Theore tical studies of amorphous semiconductors should help in these practical applications. The present monograph is the first attempt to present systematically the quantum electron theory of amorphous conductors. The most interesting-in the author's view-theoretical papers on this subject, published in journals are reviewed and critically compared. Amorphous and Liquid Semiconductors Springer Science & Business Media This book presents the most recent important ideas and developments in the field of Hydrogenated Amorphous Silicon and related materials. Each contribution is authored by an outstanding expert in that particular area. *Advances in Amorphous Semiconductors* Springer Currently this is the book providing a

thorough introduction and a unified theoretical basis for the interpretation of equilibrium transport processes in amorphous hydrogenated tetrahydrally coordinated semiconductors - a topic of great interest to physicists and material scientists (first devices for practical applications are already being manufactured). Most of the relevant literature is reviewed with particular emphasis on the approach developed by the authors. It explains most of the experimental data and allows the extraction of information about microscopic transport processes and parameters from equilibrium transport data. This work treats electronic transport in the mentioned type of semiconductors and in particular in a-Si:H and a-Ge:H. From elementary concepts the theory is developed towards higher degrees of completeness and sophistication. Further refinements for coping with the complexity of real systems are given. The comparison of theory with experiment is an important part of the book.

Physics of Amorphous Semiconductors Artech House Materials Science

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 Semiconductors** Springer Science & Business Media 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 semiconductor s 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 semiconductor s. 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. *Physical Properties of Amorphous Materials* Springer Science & Business Media The Institute for Amorphous Studies was founded in 1982 as the international center for the investigation of amorphous mate rials. It has since played an important role in promoting the und er standing of disordered matter in general. An Institute lecture series on "Fundamental s of Amorphous Materials and

Devices" was held during 1982-83 with distinguished speakers from universities and industry. These events were free and open to the public ,and were attended by many representatives of the scientific community. The lectures themselves were highly successful inasmuch as they provided not only formal instruction but also an opportunity for vigorous and stimulating debate. That last element could not be captured within the pages of a book I but the lectures concentrated on the latest advances in the field I which is why their essential contents are he re reproduced in collective form. Together they constitute an interdisciplinary status report of the field. The speakers brought many different viewpoints and a variety of back ground experiences io bear on the problems involved I but though language and conventions vary I the essential unity of the concerns is very clear I as indeed are the ultimate benefits of the many-sided approach.

Fundamentals of Amorphous Semiconductors John Wiley & Sons

Amorphous Silicon

Kazunobu Tanaka National Institute for Advanced Interdisciplinary Research, Ibaraki, Japan

Eiichi Maruyama

Hitachi Ltd, Ibaraki, Japan Toshikazu Shimada Hitachi Ltd, Ibaraki, Japan Hiroaki Okamoto Osaka University, Osaka, Japan Translated by Takeshi Sato, National Institute for Advanced Interdisciplinary Research, Ibaraki, Japan Amorphous silicon has substantially different properties as compared to crystalline silicon. It has therefore become recognized as a fascinating and important material in its own right, with many interesting facets that lead to a range of novel and still developing applications. Amorphous Silicon introduces the reader to this field by first discussing what is meant by the amorphous state. It details the way in which amorphous silicon is prepared, and the growth mechanism. The main structural, optical and electronic properties are then covered in detail, and there is a full chapter on the structural stability of the material, including photoinduced effects. Finally, a number of the most exciting applications of amorphous silicon are presented, including its use in solar cells, photo-sensors and liquid crystal displays. Amorphous Silicon will be of great interest to all those working in solid state physics or chemistry, materials

science and electronic engineering, from postgraduate students to more experienced workers in these fields. **NONCRYSTALLINE SEMICONDUCTORS** Wiley-Blackwell This book presents the most recent important ideas and developments in the field of Hydrogenated Amorphous Silicon and related materials. Each contribution is authored by an outstanding expert in that particular area. Contents:Structural Aspects:Structural Heterogeneities in Device-Quality Amorphous Hydrogenated Semiconductors (J A Reimer & M A Petrich)Local Structure of Dopants in Hydrogenated Amorphous Silicon (J B Boyce & S E Ready)Plasma Deposition of Amorphous and Crystalline Silicon: The Effect of Hydrogen on the Growth, Structure Electronic Properties (C C Tsai)Defects and Defect Dynamics:Thermal Equilibrium Effects in Doped Hydrogenated Amorphous Silicon (J Kakalios & R A Street)Kinetics of Carrier-Induced Metastable Defect Formation in Hydrogen Amorphous Silicon (W B Jackson & J Kakalios)Transient Photocapacitance Studies of Deep Defect Transitions in Hydrogenated Amorphous Silicon (J D

Cohen & A V Gelatos)The Microscopic Structure of Defects in a-Si:H and Related Materials (M Stutzmann & D K Biegelsen)Electronic Transport, Trapping and Recombination:Transport and Tail State Interactions in Amorphous Silicon (W E Spear)Recombination in a-Si:H — Temperature and Field Quenching of the Photoluminescence (W Fuhs & K Jahn)Photo-luminescence in a-Si:H Films and Multilayers (W-C Wang & H Fritzsche)Amorphous Si-Ge Alloys:Optoelectronic Properties and the Gap State Distribution in a-Si, Ge Alloys (S Aljishi et al.)Multilayers and Interfaces:Differential Absorption Spectroscopy on Amorphous Silicon Quantum Well Structures (K Hattori et al.)Growth and Structure of Interfaces in a-Si:H/a-SiOx and a-Si:H/a-SiNx:H Multilayers and Heterojunctions (L Yang & B Abeles)and others
Readership: Solid state physicists and electrical engineers.

Fundamental Physics of Amorphous Semiconductors Springer Nature

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 semiconductor s' as a satell ite meeting of the International Conference on "Physics of Semiconducto rs" 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 semiconductor s. No contributed paper was accepted, but seminars were open.

The Physics and

Applications of Amorphous Semiconductors National Academies Although amorphous semiconductors have been studied for over four decades, many of their properties are not fully understood. This book discusses not only the most common spectroscopic techniques but also describes their advantages and disadvantages. Provides information on the most used spectroscopic techniques Discusses the advantages and disadvantages of each technique *Fundamental Physics of Amorphous Semiconductors* World Scientific Understanding the structural unit of crystalline solids is vital in determining their optical and electronic properties. However, the disordered nature of amorphous semiconductors, where no long-range order is retained, makes it difficult to determine their structure using traditional methods. This book shows how computer modelling can be used to overcome the difficulties that arise in the atomic scale identification of amorphous semiconductors. The book explains how to generate a random structure using computer modelling, providing readers with the techniques to construct realistic

material structures. It shows how the optical and electronic properties are related to random structures. Readers will be able to understand the characteristic features of disordered semiconductors. The structural and electronic modifications by photon irradiation are also discussed in detail. This book is ideal for both physicists and engineers working in solid state physics, semiconductor engineering and electrical engineering. **Amorphous Semiconductors** Springer 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. Polycrystalline and Amorphous Thin Films and Devices Springer Science & Business Media This book gives the first systematic and complete survey of technology and application of amorphous silicon, a material with a huge potential in electronic applications. The book features contributions by world-wide leading researchers in this field. Trap Level Spectroscopy in Amorphous Semiconductors Springer Science & Business Media This is a useful textbook for graduate students in the fields of solid state physics and chemistry as well as electronic engineering. Presenting the fundamentals of amorphous semiconductors clearly, it will be essential reading for young scientists intending to develop new preparation techniques for more ideal amorphous semiconductors e.g. a-Si: H, to fabricate stable and efficient solar cells and thin film transistors

and new artificial amorphous materials such as multilayers for quantum devices.A large portion is devoted to the latest developments of amorphous semiconductors including electronic properties of a-Si: H, nature of weak bonds and gap states in a-Si: H, mechanisms for light-induced defect creation in a-Si: H and chalcogenides, quantum phenomena in multilayer fi

Electronic Transport in Hydrogenated Amorphous Semiconductors Springer Science & Business Media Explores key aspects of materials and device physics including electronic properties and stability issues. Supplemented by 321 equations, 370 illustrations, and an extensive list of references.

Disordered Materials Springer Understanding the structural unit of crystalline solids is vital in determining their optical and electronic properties. However, the disordered nature of amorphous semiconductors, where no long-range order is retained, makes it difficult to determine their structure using traditional methods. This book shows how computer modelling can be used to overcome the difficulties that arise in the atomic scale identification

of amorphous semiconductors. The book explains how to generate a random structure using computer modelling, providing readers with the techniques to construct realistic material structures. It shows how the optical and electronic properties are related to random structures. Readers will be able to understand the characteristic features of disordered semiconductors. The structural and electronic modifications by photon irradiation are also discussed in detail. This book is ideal for both physicists and engineers working in solid state physics, semiconductor engineering and electrical engineering.

Photo-Induced Metastability in Amorphous Semiconductors Elsevier

The aim of this NATO ASI has been to present an up-to-date overview of current areas of interest in amorphous materials, with particular emphasis on electronic properties and device applications. In order to limit the material to a manageable amount, the meeting was concerned almost exclusively with semiconducting materials. This volume should be regarded as a follow-on to the NATO ASI held in Sozopol, Bulgaria in 1996 and

published as "Amorphous Insulators and Semiconductors" edited by M.F. Thorpe and M.1. Mitkova (Kluwer Academic Publishers, NATO ASI series, 3 High Technology - Vol. 23). The lectures and seminars fill the gap between graduate courses and research seminars. The lecturers and seminar speakers were chosen as experts in their respective areas, and the lectures and seminars that were given are presented in this volume. During the first week of the meeting, an emphasis was placed on introductory lectures while the second week focused more on research seminars. There were two very good poster sessions that generated a lot of discussion, but these are not reproduced in this volume as the editors wanted to have only larger contributions to make the proceedings more coherent.