

Status Of Multijunction Solar Cells And Future Development

Presents a thorough overview of perovskite research, written by leaders in the field of photovoltaics The use of perovskite-structured materials to produce high-efficiency solar cells is a subject of growing interest for academic researchers and industry professionals alike. Due to their excellent light absorption, longevity, and charge-carrier properties, perovskite solar cells show great promise as a low-cost, industry-scalable alternative to conventional photovoltaic cells. Perovskite Cells: Materials, Processes, and Devices provides an up-to-date overview of the current state of perovskite solar cell research. Addressing the key areas in the rapidly growing field, this comprehensive volume covers novel materials, advanced theory, modelling and simulation, device physics, new processes, and the critical issue of solar cell stability. Contributions by an international panel of researchers highlight both the opportunities and challenges related to perovskite solar cells while offering detailed insights on topics such as the photon recycling processes, interfacial properties, and charge transfer principles of perovskite-based devices. Examines new compositions, hole and electron transport materials, lead-free materials, and 2D and 3D materials Covers interface modelling techniques, methods for modelling in two and three dimensions, and developments beyond Shockley-Queisser Theory Discusses new fabrication processes such as slot-die coating, processing, and vacuum sublimation Describes the device physics of perovskite solar cells, including recombination kinetics and optical absorption Explores innovative approaches to increase the light conversion efficiency of photovoltaic cells Perovskite Solar Cells: Materials, Processes, and Devices is essential reading for all those in the photovoltaic community, including materials scientists, surface physicists, surface chemists, solid state physicists, solid state chemists, and electrical engineers.

The first comprehensive book on thin-film solar cells, potentially a key technology for solving the energy production problem in the 21st century in an environmentally friendly way. It covers a wide range of scientific and technological aspects of thin film semiconductors - deposition technologies, growth mechanisms and the basic properties of amorphous and nano-crystalline silicon - as well as the optimum design theory and device physics of high-efficiency solar cells, especially of single-junction and multi-junction solar cells. The development of large-area solar cell modules using single and multi-junction solar cells is also considered. Examples of recent photovoltaic systems are presented and analysed.

This book presents new concepts for a next generation of PV. Among these concepts are: Multijunction solar cells, multiple excitation solar cells (or how to take benefit of high energy photons for the creation of more than one electron hole-pair), intermediate band solar cells (or how to take advantage of below band-gap energy photons) and related technologies (for quantum dots, nitrides, thin films), advanced light management approaches (plasmonics). Written by world-class experts, this book is a valuable reference guide accessible to both beginners and experts working with solar cell technology. The book deeply analyzes the current state-of-the-art of the new photovoltaic approaches and outlines the implementation paths of these advanced devices. Topics addressed range from the fundamentals to the description of state-of-the-art of the new types of solar cells.

This thoroughly revised text, now in its third edition, continues to provide a detailed discussion on all the aspects of solar photovoltaic (PV) technologies from physics of solar cells to manufacturing technologies, solar PV system design and their applications. The Third Edition includes a new chapter on ‘Advances in c-Si Cell Processes Suitable for Near Future Commercialization’ (Chapter 8) to introduce the technological advancement in the commercial production to keep the reader up to date. Organized in three parts, Part I introduces the fundamental principles of solar cell operation and design, Part II explains various technologies to fabricate solar cells and PV modules and Part III focuses on the use of solar photovoltaics as part of the system for providing electrical energy. In addition to this, numerous chapter-end exercises are given to reinforce the understanding of the subject. The text is intended for the undergraduate and postgraduate students of engineering and science disciplines. This book is of immense use for teachers, researchers and professionals working in the photovoltaic field. In a nutshell, this book is an absolute must-read for all those who want to understand and apply the basics behind photovoltaic devices and systems.

Volume 2. Renewable Resources

Perovskite Photovoltaics and Optoelectronics

Modelling High Efficiency Semiconductor Multi-Junction Solar Cells

New Aspects and Solutions

Materials, Processes, and Devices

Processing Techniques and Applications

Sustainable Material Solutions for Solar Energy Technologies: Processing Techniques and Applications provides an overview of challenges that must be addressed to efficiently utilize solar energy. The book explores novel materials and device architectures that have been developed to optimize energy conversion efficiencies and minimize environmental impacts. Advances in technologies for harnessing solar energy are extensively discussed, with topics including materials processing, device fabrication, sustainability of materials and manufacturing, and current state-of-the-art. Leading international experts discuss the applications, challenges, and future prospects of research in this increasingly vital field, providing a valuable resource for students and researchers working in this field. Explores the fundamental aspects of sustainable materials for solar energy applications, with in-depth discussions of the most promising material solutions for solar energy technologies: photovoltaic, photoaltic, hydrogen production, harvesting and storage Discusses the environmental challenges to be overcome and importance of efficient materials utilization for clean energy Looks at design materials processing and optimization of device fabrication via metrics such as power-to-weight ratio, effectiveness as EOL compared to BOL, and life-cycle analysis

The aim of this book is to provide a comprehensive overview of the fundamentals and engineering of high concentrator photovoltaic (HCPV) technology and to elucidate how this complex and emerging technology is applied in power plants. It is the first of its kind to focus exclusively on HCPV technology and offers a valuable reference volume to readers. This book is the result of an international collaboration among experts and each chapter is written by a specialist in the field. The conversion of solar energy to electricity plays an important role in power generation and HCPV is signalled by many researchers and professionals as one of the most promising sources of solar power. Therefore this book provides an important resource for companies, research institutes and universities to assist with the understanding of fundamentals, different applications and potential of such technology.

The Proceedings of the First International Conference on Opto-Electronics and Applied Optics 2014, IEM OPTRONIX 2014 presents the research contributions presented in the conference by researchers from both India and abroad. Contributions from established scientists as well as students are included. The book is organized to enable easy access to various topics of interest. The first part includes the Keynote addresses by Phillip Russell, Max Planck Institute of the Light Sciences, Erlangen, Germany and Lorenzo Pavesi, University of Trento, Italy. The second part focuses on the Plenary Talks given by eminent scientists, namely, Azhar Rahman, City University London, London; Bishnu Pal, President, The Optcal Society of India; Kamakhya Ghatak, National Institute of Technology, Agartala; Kehar Singh, Former Professor, India Institute of Technology Delhi; Mourad Zghal, SUPCOM, University of Carthage, Tunisia; Partha Roy Chaudhuri, IIT Kharagpur; S.K. Bhadra, CSIR-Central Glass and Ceramic Research Institute, Kolkata; Sanjib Chatterjee, Raja Ramanna Centre for Advanced Technology, Indore; Takeo Sasaki, Tokyo University, Japan; Lakshminarayan Hazra, Emeritus Professor, University of Calcutta, Kolkata; Shyam Akasha, IITM University, Gwalior and Vasudevan Lakshminarayana, University of Waterloo, Canada. The subsequent parts focus on topic-wise contributory papers in Application of Solar Energy; Diffraction Tomography; E.M. Radiation Theory and Antenna; Fibre Optics and Devices; Photonics for Space Applications; Micro-Electronics and VLSI; Nano-Photonics, Bio-Photonics and Bio-Medical Optics; Non-linear Phenomena and Chaos; Optical and Digital Data and Image Processing; Optical Communications and Networks; Optical Design; Opto-Electronic Devices; Opto-Electronic Materials and Quantum Optics and Information Processing.

The Performance of Photovoltaic (PV) Systems: Modelling, Measurement and Assessment explores the system lifetime of a PV system and the energy output of the system over that lifetime. The book concentrates on the prediction, measurement, and assessment of the performance of PV systems, allowing the reader to obtain a thorough understanding of the performance issues and progress that has been made in optimizing system performance. Provides unique insights into the performance of photovoltaic systems Includes comprehensive and systematic coverage of a fascinating area in energy Written by an expert team of authors and a respected editor

Energy Resources and Systems

Materials, Manufacture and Operation

Perovskite Solar Cells

From Fundamentals to Advanced Applications

High Concentrator Photovoltaics

McGraw-Hill's Handbook of Photovoltaics

The most comprehensive and widely cited reference on photovoltaic solar energy Fully revised and updated, the Handbook of Photovoltaic Science and Engineering, Second Edition incorporates the substantial technological advances and research developments in photovoltaics since its previous release. All topics relating to the photovoltaic (PV) industry are discussed with contributions by distinguished international experts in the field. Significant new coverage includes: three completely new chapters and six chapters with new authors device structures, processing, and manufacturing options for the three major thin film PV technologies high performance approaches for multijunction, concentrator, and space applications new types of organic polymer and dye-sensitized solar cells economic analysis of various policy options to stimulate PV growth including effect of public and private investment Detailed treatment covers scientific basis of the photovoltaic effect and solar cell operation the production of solar silicon and of silicon-based solar cells and modules how choice of semiconductor materials and their production influence costs and performance making measurements on solar cells and modules and how to relate results under standardised test conditions to real outdoor performance photovoltaic system installation and operation of components such as inverters and batteries, architectural applications of building-integrated PV Each chapter is structured to be partially accessible to beginners while providing detailed information of the physics and technology for experts. Encompassing a review of past work and the fundamentals in solar electric science, this is a leading reference and invaluable resource for all practitioners, consultants, researchers and students in the PV industry.

This book offers a global perspective of the current state of affairs in the field of solar power engineering. In four parts, this well-researched volume informs about:Established solar PV (photovoltaic) technologiesThird-generation PV technologies based on new materials with potential for low-cost large-scale productionSolar cell technology based

Amorphous silicon solar cell technology has evolved considerably since the first amorphous silicon solar cells were made at RCA Laboratories in 1974. Scien tists working in a number of laboratories worldwide have developed improved alloys based on hydrogenated amorphous silicon and microcrystalline silicon. Other scientists have developed new methods for growing these thin films while yet others have developed new photovoltaic (PV) device structures with im proved conversion efficiencies. In the last two years, several companies have constructed multi-megawatt manufacturing plants that can produce large-area, multijunction amorphous silicon PV modules. A growing number of people be lieve that thin-film photovoltaics will be integrated into buildings on a large scale in the next few decades and will be able to make a major contribution to the world's energy needs. In this book, Ruud E. I. Schropp and Miro Zeman present an authoritative overview of the current status of thin film solar cells based on amorphous and microcrystalline silicon. They review the significant developments that have occurred during the evolution of the technology and also discuss the most im portant recent innovations in the production of the materials, the understanding of the physics, and the fabrication and modeling of the devices.

This book gives an overview of all components, e.g. cells, concentrators, modules and systems, for systems of concentrator photovoltaics. It is an application-oriented book. The authors report on significant results related to design, technology, and applications, and they also cover the fundamental physics and market considerations.

III-V Multi-Junction Solar Cells

Handbook of Photovoltaic Science and Engineering

Characterization of Radiation Damage in Multi-junction Solar Cells Using Light-biased Current Measurements

Physical Model and Applications of High-Efficiency Electro-Optical Conversion Devices

New Concepts

Monolithic and Mechanical Multijunction Space Solar Cells

Practical Handbook of Photovoltaics, Third Edition, is a 'benchmark' publication for those involved in the design, manufacture and use of these devices. This fully revised handbook includes brand new sections on smart grids, net metering and the modeling of photovoltaic systems, as well as fully revised content on developments in photovoltaic applications, the economics of PV manufacturing and updated chapters on solar cell function, raw materials, photovoltaic standards, calibration and testing, all with new examples and case studies. The editor has assembled internationally-respected contributors from industry and academia around the world to make this a truly global reference. It is essential reading for electrical engineers, designers of systems, installers, architects, policymakers and physicists working with photovoltaics. Presents a cast of international experts from industry and academia to ensure the highest quality information from multiple stakeholder perspectives

Covers all things photovoltaics, from the principles of solar cell function and their raw materials, to the installation and design of full photovoltaic systems Includes case studies, practical examples, and reports on the latest advances and worldwide applications

III-V Multi-Junction Solar Cells.

A bird's-eye view of the developmental trends and problems of recent photovoltaics is presented. The worldwide effort to develop high-efficiency low-cost PV modules, making use of most efficient solar cells and clever low-cost solar concentrators is described.

Oxide Free Nanomaterials for Energy Storage and Conversion Applications covers in depth topics on non-oxide nanomaterials involving transition metal nitrides, carbides, selenides, phosphides, oxynitrides based electrodes, & other non-oxide groups. The current application of nanostructured non-oxides involves their major usage in energy storage and conversion devices variety of applications such as supercapacitor, batteries, dye-sensitized solar cells and hydrogen production applications. The current application of energy storage devices involves their usage of nanostructured non-oxide materials with improved energy and power densities. In this book readers will discover the major advancements in this field during the past decades. The various techniques used to prepare environmentally friendly nanostructured non-oxide materials, their structural and morphological characterization, their improved mechanical and material properties, and finally, current applications and future impacts of these materials are discussed. While planning and fabricating non-oxide materials, the readers must be concern over that they ought to be abundant, cost-efficient and environment-friendly for clean innovation and conceivably be of use in an expansive choice of utilization. The book gives detailed literature on the development of nanostructured non-oxides, their use as energy related devices and their present trend in the industry and market. This book also emphasis on the latest advancement about application of these noble non-oxide based materials for photocatalytic water-splitting. Recent progress on various kinds of both photocatalytic and electrocatalytic nanomaterials is reviewed, and essential aspects which govern catalytic behaviours and the corresponding stability are discussed. The book will give an updated literature on the synthesis, potential applications and future of nanostructured non-oxides in energy related applications. This book is highly useful to researchers working in the field with diversified backgrounds are expected to making the chapter truly interdisciplinary in nature. The contents in the book will emphasize the recent advances in interdisciplinary research on processing, morphology, structure and properties of nanostructured non-materials and their applications in energy applications such as supercapacitors, batteries, solar cells, electrochemical water splitting and other energy applications. Thus, nanotechnology researchers, scientists and experts need to have update of the growing trends and applications in the field of science and technology. Further, the postgraduate students, scientists, researchers and technologists are need to buy this book. Offers a comprehensive coverage of the nanostructured non-oxide materials and their potential energy applications Examines the properties of nanostructured non-oxide materials that make them so adaptable Explores the mechanisms by which nanoparticles interact with each other, showing how these can be used for industrial applications Shows the how nanostructured non-oxide materials are used in a wide range of industry sectors, containing energy production and storage

Concentrating Photovoltaics (CPV): The Path Ahead Multijunction Solar Cells

Solar Cells

Next Generation of Photovoltaics

Fundamentals and Applications

Fundamentals, Engineering and Power Plants

This monograph presents a wider spectrum of researches, developments, and case specific studies in the area of smart power systems and integration of renewable energy systems. The book will be for the benefit of a wider audience including researchers, postgraduate students, practicing engineers, academics, and regulatory policy makers. It covers a wide range of topics from fundamentals, and modelling and simulation aspects of traditional and smart power systems to grid integration of renewables; Micro Grids; challenges in planning and operation of a smart power system; risks, security, and stability in smart operation of a power system; and applied research in energy storage.

The fourth book of the four-volume edition of 'Solar cells' consists chapters that are general in nature and not related specifically to the so-called photovoltaic generations, novel scientific ideas and technical solutions, which has not properly approved. General issues of the efficiency of solar cell and through hydrogen production in photoelectrochemical solar cell are discussed. Considerable attention is paid to the quantum-size effects in solar cells both in general and on specific examples of super-lattices, quantum dots, etc. New materials, such as cuprous oxide as an active material for solar cells, AISB for use as an absorber layer in p-i-n junction solar cells, InGaAsN as a promising material for multi-junction tandem solar cells, InP in solar cells with MIS structures are discussed. Several chapters are devoted to the analysis of both status and perspective of organic photovoltaics such as polymer/fullerene solar cells, poly(p-phenylene-vinylene) derivatives, photovoltaic textiles, photovoltaic fibers, etc.

Concentrating Photovoltaics (CPV) is one of the most promising technologies to produce solar electricity at competitive prices. High performing CPV systems with efficiencies well over 30% and multi-megawatt CPV plants are now a reality. As a result of these achievements, the global CPV market is expected to grow dramatically over the next few years reaching cumulative installed capacity of 12.5 GW by 2020. In this context, both new and consolidated players are moving fast to gain a strategic advantage in this emerging market. Written with clear, brief and self-contained technical explanations, Handbook of Concentrator Photovoltaics Technology provides a complete review of CPV covering: the fundamentals of solar radiation and tracking; all aspects of characterization and reliability; case studies based on the description of actual systems and plants in the field; environmental impact, market potential and cost analysis. CPV technology is a key point of expansion. This timely handbook aims to provide a comprehensive assessment of all CPV scientific, technological and engineering background with a view to equipping engineers and industry professionals with all of the vital information they need to sustain the impetus of this encouraging technology. Key features: Uniquely combines an explanation of the fundamentals of CPV systems and components with an overview of the market place and their real-life applications. Each chapter is written by well-known industry specialists with extensive expertise in each particular field of CPV technology. Reviews the basic concepts of multi-junction solar cells and new concepts for CPV cells, highlighting the key differences between them. Demonstrates the state of the art of several CPV centres and companies. Facilitates future cost calculation models for CPV. Features extensive case studies in each chapter, including coverage of CPV modules and systems.

This book is a concise review of the current status and future prospects of concentrating photovoltaic (CPV) technology. Starting with a summary of the current technical and economic status of CPV technology, it identifies the factors that hold CPV back in the commercial market. The main technical areas considered are solar cells, tracking and optics. The solar cells section focuses on spectrum splitting systems, which offer potentially higher efficiency than multi-junction cells with reductions in the manufacturing constraints that lead to high costs. It also offers a brief survey of the latest developments in spectral splitting alongside a discussion of the advances in solar cell manufacturing that aid the development of such systems. Further, it examines electrical design principles for spectral splitting systems that can improve the spectral stability of these systems' performance. The section on tracking includes a description of tracking integration with an update of the review published in Nature, presenting the latest advances in the field and focusing on surveying conceptual approaches rather than providing an exhaustive description of the literature. The optics section explores 3D printing and other emerging methods of fabricating optics for both prototype and large-scale production, as well as new classes of concentrators, particularly those based on novel photonic materials such as angular filters. Lastly, the authors explore the impact that environmental factors have on the performance of CPV in non-standard environments before concluding with a discussion of the combinations of technologies that they anticipate will most effectively boost CPV in the commercial market.

Technology, New Concepts & Policy

Energy Research Abstracts

Next Generation Photovoltaics and Its Applications

Advances in Optical Science and Engineering

Silicon Based Thin Film Solar Cells

Concentrating Photovoltaics (CPV): The Path AheadSpringer

Triple-junction amorphous silicon solar cells have been characterized using two techniques to identify the current-limiting component cell after a variety of radiation exposure experiments. The first technique is calculation of integrated current from quantum efficiency (QE) data, which is commonly accepted by the photovoltaics community for predicting the current output of a solar cell. This study shows that significant sources of uncertainty make quantum efficiency measurements unreliable in low quality multi-junction devices such as those that have been severely degraded by particle radiation.An alternate method is examined whereby a solar cell is illuminated by simulated air-mass zero (AM0) light and secondary filtered lamps are used to boost the current in two of the three component cells. Through characterization of the test condition shows that the targeted component cell limits the current of the device as a result of the boost light, making the current measured from the device under test represent the current output of the desired component cell. This method is henceforth called light-biased current measurement (LBCM). An additional benefit of the light-biased current measurement is the significantly reduced time required to make a measurement compared to quantum efficiency measurements.Successful repeatability and reproducibility experiments further validate this test method. As shown during reproducibility testing, one of the two solar simulators used introduces an expected increase in the measurement uncertainty due its unstable intensity output. The increase in variance of the data is well correlated to the estimated measurement uncertainty.

Discover a one-of-a-kind treatment of provskite photovoltaics In less than a decade, the photovoltaics of organic-inorganic halide perovskite materials have surpassed the efficiency of semiconductor compounds like CdTe and CIGS in solar cells. In Perovskite Photovoltaics and Optoelectronics: From Fundamentals to Advanced Applications, distinguished engineer Dr. Tsutomu Miyasaka delivers a comprehensive exploration of foundational and advanced topics regarding halide perovskites. It summarizes the latest information and discussion in the field, from fundamental theory and materials to critical device applications. With contributions by top scientists working in the perovskite community, the accomplished editor has compiled a resource of central importance for researchers working on perovskite related materials and devices. This edited volume includes coverage of new materials and their commercial and market potential in areas like perovskite solar cells and perovskite LEDs. It also includes: A thorough introduction to halide perovskite materials, their synthesis, and dimension control Comprehensive explorations of the photovoltaics of halide perovskites and their historical background Practical discussions of solid-state and transfer mechanisms in halide perovskite semiconductors In-depth examinations of multi-cation anion-based high efficiency perovskite solar cells Perfect for materials scientists, surface physicists, surface chemists, and solid-state physicists, Perovskite Photovoltaics and Optoelectronics: From Fundamentals to Advanced Applications is also an indispensable resource for solid state chemists and electrical engineers.

This book addresses the rapidly developing class of solar cell materials and designed to provide much needed information on the fundamental principles of these materials, together with how these are employed in photovoltaic applications. A special emphasis have been given for the space applications through study of radiation tolerant solar cells. This book present a comprehensive research outlining progress on the synthesis, fabrication and application of solar cells from fundamental to device technology and is helpful for graduate students, researchers, and technologists engaged in research and development of materials.

Multijunction Solar Cells on Epitaxial Templates

Fundamentals, Technologies And Applications

High-Efficient Low-Cost Photovoltaics

Holographic Thin Film Systems for Multijunction Solar Cells

Thin-Film Solar Cells

Advances in Power and Control Engineering

Silicon Based Thin Film Solar Cells explains concepts related to technologies for silicon (Si) based photovoltaic applications. Topics in this book focus on 'new concept' solar cells. These kinds of cells can make photovoltaic power production an economically viable option in comparison to the bulk crystalline semiconductor technology industry. A transition from bulk crystalline Si solar cells toward thin-film technologies reduces usage of active material and introduces new concepts based on nanotechnologies. Despite its importance, the scientific development and understanding of new solar cells is not very advanced, and educational resources for specialized engineers and scientists are required. This textbook presents the fundamental scientific aspects of Si thin films growth technology, together with a clear understanding of the properties of the material and how this is employed in new generation photovoltaic solar cells. The textbook is a valuable resource for graduate students working on their theses, young researchers and all people approaching problems and fundamental aspects of advanced photovoltaic conversion.

Enormous leaps forward in the efficiency and the economy of solar cells are being made at a furious pace. New materials and manufacturing processes have opened up new realms of possibility for the application of solar cells. Crystalline silicon cells are increasingly making way for thin film cells, which are spawning experimentation with third-generation high-efficiency multijunction cells, carbon-nanotube based cells, UV light for voltage enhancement, and the use of the infrared spectrum for night-time operation, to name only a few recent advances. This thoroughly updated new edition of Markwart and Castaner's Solar Cells, extracted from their industry standard Practical Handbook of Photovoltaics, is the definitive reference covering the science and operation, materials and manufacture of solar cells. It is essential reading for engineers, installers, designers, and policy-makers who need to understand the science behind the solar cells of today, and tomorrow, in order to take solar energy to the next level. A thorough update to the definitive reference to solar cells, created by a cast of international experts from industry and academia to ensure the highest quality information from multiple perspectives Covers the whole spectrum of solar cell information, from basic scientific background, to the latest advances in materials, to manufacturing issues, to testing and calibration. Case studies, practical examples and reports on the latest advances take the new edition of this amazing resource beyond a simple amalgamation of a vast amount of knowledge, into the realm of real world applications

The book features selected high-quality papers presented at the International Conference on Computing, Power and Communication Technologies 2019 (GUCON 2019), organized by Galgotias University, India, in September 2019. Divided into three sections, the book discusses various topics in the fields of power electronics and control engineering, power and energy systems, and machines and renewable energy. This interesting compilation is a valuable resource for researchers, engineers and students.

In general, these proceedings will appeal to people interested or active in the area of CPV, PV, and other fields of renewable energies, such as students of physics, university professors, scientists, technologists, people in the world of finance, and others. The proceedings book covers the technical aspects of concentrating photovoltaics (CPV). CPV technology uses optics to concentrate the sunlight onto a solar cell made of semiconductor materials. Silicon solar cells are used at low concentration levels of between 2 and 100. At high concentration, typically >300, the solar cell area is greatly reduced and more expensive technologies like III-V multi-junction solar cells can be used to increase conversion efficiencies. The CPV technology is competitive in arid regions of the world with high solar intensities and will allow to further reduce the cost of solar electricity in the future. The state-of-the-art for the technology, but also critical issues for this technology are summarized in this proceedings book. Thus, this book is the most comprehensive summary for the CPV technology written by the most prominent scientists and engineers active in the field.

Solar Energy Update

Proceedings of GUCON 2019

Solar Power Generation

Handbook of Concentrator Photovoltaic Technology

Recent Developments

The Performance of Photovoltaic (PV) Systems

The Amorphous Silicon Research Project (ASRP) was established at the Solar Energy Research Institute in 1983 and is responsible for all US Department of Energy government supported research activities in the field of amorphous silicon photovoltaics. The objectives and research directions of the project have been established by a Five-Year Research Plan, which was developed at SERI in cooperation with the Department of Energy in 1984 and is divided into research on single-junction and multi-junction solar cells. DOE/SERI has recently initiated a new three year program to be performed in collaboration with US industry to perform work on high efficiency amorphous silicon solar cells and submodules. The objectives of this initiative are: (i) to achieve 18% efficiencies for small area multi-junction amorphous silicon cells, and (ii) to achieve amorphous silicon submodule efficiencies in the 10 to 13% range for single-junction and multi-junction submodule configurations over areas of at least 1000 cm²/sp.

This book covers major technological advancements in, and evolving applications of, thermal and photovoltaic solar energy systems. Advances in technologies for harnessing solar energy are extensively discussed, with topics including the fabrication, compaction and optimization of energy grids, solar cells and panels. Leading international experts discuss the applications, challenges and future prospects of research in this increasingly vital field, providing a valuable resource for all researchers working in this field. This second volume of Energy Resources and Systems is focused on renewable energy resources. Renewable energy mainly comes from wind, solar, hydropower, geothermal, ocean, bioenergy, ethanol and hydrogen. Each of these energy resources is important and growing. For example, high-head hydroelectric energy is a well established energy resource and already contributes about 20% of the world's electricity. Some countries have significant high-head resources and produce the bulk of their electrical power by this method. However, the bulk of the world's high-head hydroelectric resources have not been exploited, particularly by the underdeveloped countries. Low-head hydroelectrc is unexploited and has the potential to be a growth area. Wind energy is the fastest growing of the renewable energy resources for the electricity generation. Solar energy is a popular renewable energy resource. Geothermal energy is viable near volcanic areas. Bioenergy and ethanol have grown in recent years primarily due to changes in public policy meant to encourage its usage. Energy policies stimulated the growth of ethanol, for example, with the unintended side effect of rise in food prices. Hydrogen has been pushed as a transportation fuel. The authors want to provide a comprehensive series of texts on the interlinking of the nature of energy resources, the systems that utilize them, the environmental effects, the socioeconomic impact, the political aspects and governing policies. Volume 1 on Fundamentals and Non Renewable Resources was published in 2009. It blends fundamental concepts with an understanding of the non-renewable resources that dominate today's society. The authors are now working on Volume 3, on nuclear advanced energy resources and nuclear batteries, consists of fusion, space power systems, nuclear energy conversion, nuclear batteries and advanced power; fuel cells and energy storage. Volume 4 will cover environmental effects, remediation and policy. Solutions to providing long term, stable and economical energy is a complex problem, which links social, economical, technical and environmental issues. It is the goal of the four volume Energy Resources and Systems series to tell the whole story and provide the background required by students of energy to understand the complex nature of the problem and the importance of linking social, economical, technical and environmental issues.

Space Photovoltaic Research and Technology 1995

Proceedings of the First International Conference, IEM OPTRONIX 2014

Modelling, Measurement and Assessment

Concentrator Photovoltaics

Second Law of Thermodynamics: Status and Challenges

From Materials to Device Technology