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DEFECTS AND SURFACE-INDUCED EFFECTS IN ADVANCED PEROVSKITES

Springer Science & Business Media **Complex oxide materials, especially the ABO₃-type perovskite materials, have been attracting growing scientific interest due to their unique electro-optical properties, leading to photorefractive effects that form the basis for such devices as holographic storage, optical data processing and phase conjugation. The optical and mechanical properties of non-metals are strongly affected by the defects and impurities that are unavoidable in any real material. Nanoscopically sized surface effects play an important role, especially in multi-layered ABO₃ structures, which are good candidates for high capacity memory cells. The 51 papers presented here report the latest developments and new results and will greatly stimulate progress in high-tech technologies using perovskite materials.**

HALIDE PEROVSKITES

PHOTOVOLTAICS, LIGHT EMITTING DEVICES, AND BEYOND

John Wiley & Sons **Real insight from leading experts in the field into the causes of the unique photovoltaic performance of perovskite solar cells, describing the fundamentals of perovskite materials and device architectures. The authors cover materials research and development, device fabrication and engineering methodologies, as well as current knowledge extending beyond perovskite photovoltaics, such as the novel spin physics and multiferroic properties of this family of materials. Aimed at a better and clearer understanding of the latest developments in the hybrid perovskite field, this is a must-have for material scientists, chemists, physicists and engineers entering or already working in this booming field.**

ADVANCED ORGANIC AND INORGANIC OPTICAL MATERIALS

19-22 AUGUST, 2002, RIGA, LATVIA

Society of Photo Optical **Proceedings of this conference are published in 2 vols. The other pt. has title: Advanced optical devices, technologies, and medical applications.**

PEROVSKITE MATERIALS FOR ENERGY AND ENVIRONMENTAL APPLICATIONS

John Wiley & Sons **PEROVSKITE MATERIALS FOR ENERGY AND ENVIRONMENTAL APPLICATIONS** The book provides a state-of-the-art summary and discussion about the recent progress in the development and engineering of perovskite solar cells materials along with the future directions it might take. Among all 3rd generation solar cells, perovskite solar cells have recently been attracting much attention and have also emerged as a hot research area of competing materials for silicon PV due to their easy fabrication, long charge-carrier lifetime, low binding energy, low defect density, and low cost. This book focuses primarily on the perovskite structures and utilizes them in modern technologies of photovoltaics and environmental applications. It will be unique in terms of the use of perovskite structures in solar cell applications. This book also discusses the type of perovskites, their synthetic approach, and environmental and solar cell applications. The book also covers how perovskite solar cells originated and the recent advances in perovskite solar cells. The reader will find in this book a lucid account that: Introduces the history of perovskite materials. Explores perovskite materials for energy conversion and environmental-related applications. Covers perovskite light absorber materials for the fabrication of high-performance perovskite solar cells. Describes the device architectures and physics of perovskite solar cells. Discusses the role of perovskite absorber, electron transport, and hole transport materials layers. Audience The book 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.

PEROVSKITE PHOTOVOLTAICS AND OPTOELECTRONICS

FROM FUNDAMENTALS TO ADVANCED APPLICATIONS

John Wiley & Sons **Discover a one-of-a-kind treatment of perovskite 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.

PEROVSKITE MATERIALS

SYMPOSIUM HELD APRIL 1-5, 2002, SAN FRANCISCO, CALIFORNIA, U.S.A.

Perovskites form a large class of materials, deceptively simple in basic structure but immensely complex in compositional variations, symmetry changes, and physical properties. They include ferroelectrics, magnetoresistive materials, oxide ion and proton conductors, superconductors, and an abundant phase in the Earth's lower mantle. This volume brings together researchers operating in diverse areas with the common goal of understanding perovskite's intrinsic and extrinsic properties and their potential use. A recurring theme is the interplay of theory and experiment in understanding and predicting properties. Sessions on theory and modeling are featured, emphasizing phase changes and elasticity of Earth materials such as MgSiO₃, and CaSiO₃, and underscoring new magnetic and ferroelectric materials, including thin films and multilayers. These are complemented by experimental studies of the synthesis of new families of perovskites and property measurements. The volume shows the diversity of materials, measurements, and ideas being studied at present.

CATALYSIS BY PRECIOUS METALS, PAST AND FUTURE

MDPI **The future of the precious metals is shiny and resistant. Although expensive and potentially replaceable by transition metal catalysts, precious metal implementation in research and industry shows potential. These metals catalyze oxidation and hydrogenation due to their dissociative behavior toward hydrogen and oxygen, dehydrogenation, isomerization, and aromatization, etc. The precious metal catalysts, especially platinum-based catalysts, are involved in a variety of industrial processes. Examples include Pt-Rh gauze for nitric acid production, the Pt/Al₂O₃ catalyst for cyclohexane and propylene production, and Pd/Al₂O₃ catalysts for petrochemical hydropurification reactions, etc. A quick search of the number of published articles in the last five years containing a combination of corresponding "metals" (Pt, Pd, Ru, Rh and Au) and "catalysts" as keywords indicates the importance of the Pt catalysts, but also the continuous increase in the contribution of Pd and Au. This Special Issue reveals the importance of precious metals in catalysis and focuses on mono- and bi-metallic formulations of any supported precious metals and their promotional catalytic effect of other transition metals. The application of precious metals in diverse reactions, either homogeneous or heterogeneous, and studies of the preparation, characterization, and applications of the supported precious metal catalysts, are presented.**

ADVANCED MATERIALS FOR RADIATION DETECTION

Springer Nature **This book offers readers an overview of some of the most recent advances in the field of advanced materials used for gamma and X-ray imaging. Coverage includes both technology and applications, with an in-depth review of the research topics from leading specialists in the field. Emphasis is on high-Z materials like CdTe, CZT and GaAs, as well as perovskite crystals, since they offer the best implementation possibilities for direct conversion X-ray detectors. Authors discuss material challenges, detector operation physics and technology and readout integrated circuits required to detect signals processes by high-Z sensors.**

FUNCTIONAL PROPERTIES OF ADVANCED ENGINEERING MATERIALS AND BIOMOLECULES

Springer Nature **This book shows how a small toolbox of experimental techniques, physical chemistry concepts as well as quantum/classical mechanics and statistical methods can be used to understand, explain and even predict extraordinary applications of these advanced engineering materials and biomolecules. It highlights how improving the material foresight by design, including the fundamental understanding of their physical and chemical properties, can provide new technological levels in the future.**

PEROVSKITES AND RELATED MIXED OXIDES

CONCEPTS AND APPLICATIONS

John Wiley & Sons This comprehensive handbook and ready reference details all the main achievements in the field of perovskite-based and related mixed-oxide materials. The authors discuss, in an unbiased manner, the potentials as well as the challenges related to their use, thus offering new perspectives for research and development on both an academic and industrial level. The first volume begins by summarizing the different synthesis routes from molten salts at high temperatures to colloidal crystal template methods, before going on to focus on the physical properties of the resulting materials and their related applications in the fields of electronics, energy harvesting, and storage as well as electromechanics and superconductivity. The second volume is dedicated to the catalytic applications of perovskites and related mixed oxides, including, but not limited to total oxidation of hydrocarbons, dry reforming of methane and denitrogenation. The concluding section deals with the development of chemical reactors and novel perovskite-based applications, such as fuel cells and high-performance ceramic membranes. Throughout, the contributions clearly point out the intimate links between structure, properties and applications of these materials, making this an invaluable tool for materials scientists and for catalytic and physical chemists.

ADVANCES IN CONDENSED MATTER OPTICS

Walter de Gruyter GmbH & Co KG The authors of this book, all with a background in condensed matter physics, have carried out advanced researches in recent years to study the optical and magneto-optical properties of many kinds of new functional materials, including metal-based metamaterials, narrow-to-wide-bandgap semiconductors, thin films, and magnetic and magneto-optical materials by using different types of optical methods and instruments. This book describes some of the more recent progresses and developments in the study of condensed matter optics in both theoretic and experimental fields. It will help readers, especially graduate students and scientists who are studying and working in the nano-photonics field, to understand more deeply the characteristics of light waves propagated in nano-structure-based materials with potential applications in the future.

ADVANCES IN MATERIALS SCIENCE AND TECHNOLOGY (AMST)

Trans Tech Publications Ltd Volume is indexed by Thomson Reuters CPCI-S (WoS). This special volume covers topics such as novel synthesis, processing and applications of advanced materials, micro and nano-structures, oxides and magnetic materials, nanomaterials, semiconductors, microwave dielectric, multiferroics, computational materials science, modeling and simulation of advanced materials and technology such as cryogenics and smart material for health care.

HYBRID PEROVSKITE SOLAR CELLS

CHARACTERISTICS AND OPERATION

John Wiley & Sons Unparalleled coverage of the most vibrant research field in photovoltaics! Hybrid perovskites, revolutionary game-changing semiconductor materials, have every favorable optoelectronic characteristic necessary for realizing high efficiency solar cells. The remarkable features of hybrid perovskite photovoltaics, such as superior material properties, easy material fabrication by solution-based processing, large-area device fabrication by an inkjet technology, and simple solar cell structures, have brought enormous attentions, leading to a rapid development of the solar cell technology at a pace never before seen in solar cell history. Hybrid Perovskite Solar Cells: Characteristics and Operation covers extensive topics of hybrid perovskite solar cells, providing easy-to-read descriptions for the fundamental characteristics of unique hybrid perovskite materials (Part I) as well as the principles and applications of hybrid perovskite solar cells (Part II). Both basic and advanced concepts of hybrid perovskite devices are treated thoroughly in this book; in particular, explanatory descriptions for general physical and chemical aspects of hybrid perovskite photovoltaics are included to provide fundamental understanding. This comprehensive book is highly suitable for graduate school students and researchers who are not familiar with hybrid perovskite materials and devices, allowing the accumulation of the accurate knowledge from the basic to the advanced levels.

TRANSFORMATION PROCESSES IN MINERALS

Walter de Gruyter GmbH & Co KG Volume 39 of *Reviews in Mineralogy and Geochemistry about Transformation Processes in Minerals* summarises the current state of the art. The selection of transformation processes covered here is by no means comprehensive, but represents a coherent view of some of the most important processes which occur specifically in minerals. Contents: Rigid unit modes in framework structures Strain and elasticity at structural phase transitions in minerals Mesoscopic twin patterns in ferroelastic and co-elastic minerals High-pressure structural phase transitions Order-disorder phase transitions Phase transformations induced by solid solution Magnetic transitions in minerals NMR spectroscopy of phase transitions in minerals Insights into phase transformations from Mössbauer spectroscopy Hard mode spectroscopy of phase transitions Synchrotron studies of phase transformations Radiation-induced amorphization

ADVANCED NANO DEPOSITION METHODS

John Wiley & Sons This concise reference summarizes the latest results in nano-structured thin films, the first to discuss both deposition methods and electronic applications in detail. Following an introduction to this rapidly developing field, the authors present a variety of organic and inorganic materials along with new deposition techniques, and conclude with an overview of applications and considerations for their technology deployment.

DIRECTORY OF PUBLISHED PROCEEDINGS

SERIES SEMT: SCIENCE/ENGINEERING/MEDICINE/TECHNOLOGY

FROM QUANTUM PARAELECTRIC/FERROELECTRIC PEROVSKITE OXIDES TO HIGH TEMPERATURE SUPERCONDUCTING COPPER OXIDES -- IN HONOR OF PROFESSOR K.A. MÜLLER FOR HIS LIFEWOR

MDPI With this book, we wish to honor the lifework of K. Alex Müller and present him with this book on the occasion of his 94th birthday. We are convinced that he will very much enjoy reading it. We would like to thank all contributors to this book, who addressed topics complementary and related to his work. The articles of the book represent the efforts in solid state physics - spanning more than 60 years - which have been groundbreaking in scientific and applied sciences. Many of the current hot topics are derived from this earlier work which has pioneered the way toward new experimental tools and/or refined techniques. From this point of view, the book presents, on one hand, a historical review and, on the other hand, a directory of possible future research.

COMPUTATIONAL MATERIALS SCIENCE

TRANSITIONING TO AFFORDABLE AND CLEAN ENERGY

MDPI Transitioning to Affordable and Clean Energy is a collective volume which combines original contributions and review papers that address the question how the transition to clean and affordable energy can be governed. It will cover both general analyses of the governance of transition, including policy instruments, comparative studies of countries or policies, and papers setting out scientifically sound visions of a clean and just energy system. In particular, the following aspects are foregrounded: • Governing the supply and demand side transformation • Geographical and cultural differences and their consequences for the governance of energy transitions • Sustainability and justice related to energy transitions (e.g., approaches for addressing energy poverty) Transitioning to Affordable and Clean Energy is part of MDPI's new Open Access book series Transitioning to Sustainability. With this series, MDPI pursues environmentally and socially relevant research which contributes to efforts toward a sustainable world. Transitioning to Sustainability aims to add to the conversation about regional and global sustainable development according to the 17 SDGs. The book series is intended to reach beyond disciplinary, even academic boundaries.

ADVANCED X-RAY DETECTOR TECHNOLOGIES

DESIGN AND APPLICATIONS

Springer Nature This book offers readers an overview of some of the most recent advances in the field of detectors for X-ray imaging. Coverage includes both technology and applications, with an in-depth review of the research topics from leading specialists in the field. Emphasis is on high-Z materials like CdTe, CZT and perovskites, since they offer the best implementation possibilities for direct conversion X-ray detectors. Authors discuss material challenges, detector operation physics and technology and readout integrated circuits required to detect signals processes by high-Z sensors.

COMPREHENSIVE ENERGY SYSTEMS

Elsevier Comprehensive Energy Systems 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

ADVANCES IN MANUFACTURING SCIENCE AND ENGINEERING

Trans Tech Publications Ltd Selected, peer reviewed papers from the 4th international Conference on Manufacturing Science and Engineering (ICMSE 2013), March 30-31, 2013, Dalian, China

CHEMICAL ABSTRACTS

ADVANCES IN ELECTROCHEMICAL SCIENCE AND ENGINEERING

John Wiley & Sons This series, formerly edited by Heinz Gerischer and Charls V. Tobias, now edited by Richard C. Alkire and Dieter M. Kolb, has been warmly welcomed by scientists world-wide which is reflected in the reviews of the previous volumes: "This is an essential book for researchers in electrochemistry; it covers areas of both fundamental and practical importance, with reviews of high quality. The material is very well presented and the choice of topics reflects a balanced editorial policy that is welcomed." —The Analyst "All the contributions in this volume are well up to the standard of this excellent series and will be of great value to electrochemists.... The editors again deserve to be congratulated on this fine collection of reviews." —Journal of Electroanalytical Chemistry and Interfacial Chemistry "...competently and clearly written." —Berichte der Bunsen- Gesellschaft für Physikalische Chemie

INTEGRATING TIMESCALES FROM MOLECULES UP

Frontiers Media SA

LITHIUM-ION BATTERIES AND SOLAR CELLS

PHYSICAL, CHEMICAL, AND MATERIALS PROPERTIES

CRC Press Lithium-Ion Batteries and Solar Cells: Physical, Chemical, and Materials Properties presents a thorough investigation of diverse physical, chemical, and materials properties and special functionalities of lithium-ion batteries and solar cells. It covers theoretical simulations and high-resolution experimental measurements that promote a full understanding of the basic science to develop excellent device performance. Employs first-principles and the machine learning method to fully explore the rich and unique phenomena of cathode, anode, and electrolyte (solid and liquid states) in lithium-ion batteries Develops distinct experimental methods and techniques to enhance the performance of lithium-ion batteries and solar cells Reviews syntheses, fabrication, and measurements Discusses open issues, challenges, and potential commercial applications This book is aimed at materials scientists, chemical engineers, and electrical engineers developing enhanced batteries and solar cells for peak performance.

PEROVSKITE MATERIALS

SYNTHESIS, CHARACTERISATION, PROPERTIES, AND APPLICATIONS

BoD - Books on Demand The book summarizes the current state of the know-how in the field of perovskite materials: synthesis, characterization, properties, and applications. Most chapters include a review on the actual knowledge and cutting-edge research results. Thus, this book is an essential source of reference for scientists with research fields in energy, physics, chemistry and materials. It is also a suitable reading material for graduate students.

INDEX OF CONFERENCE PROCEEDINGS

ANNUAL CUMULATION

CARBON DIOXIDE REDUCTION THROUGH ADVANCED CONVERSION AND UTILIZATION TECHNOLOGIES

CRC Press Carbon Dioxide Reduction through Advanced Conversion and Utilization Technologies covers fundamentals, advanced conversion technologies, economic feasibility analysis, and future research directions in the field of CO₂ conversion and utilization. This book emphasizes principles of various conversion technologies for CO₂ reduction such as enzymatic conversion, mineralization, thermochemical, photochemical, and electrochemical processes. It addresses materials, components, assembly and manufacturing, degradation mechanisms, challenges, and development strategies. Applications of conversion technologies for CO₂ reduction to produce useful fuels and chemicals in energy and industrial systems are discussed as solutions to reduce greenhouse effects and energy shortages. Particularly, the advanced materials and technology of high temperature co-electrolysis of H₂O and CO₂ to produce sustainable fuels using solid oxide cells (SOCs) are reviewed and the introduction, fundamentals, and some significant topics regarding this CO₂ conversion process are discussed. This book provides a comprehensive and clear picture of advanced technologies in CO₂ conversion and utilization. Written in a clear and detailed manner, it is suitable for students as well as industry professionals, researchers, and academics.

THE BRITISH NATIONAL BIBLIOGRAPHY

PHOTOFERROELECTRICS

Springer Science & Business Media Since Valasek's discovery of the ferroelectric properties of Rochelle salt nearly 60 years ago, ferroelectricity has been regarded as one of the traditional branches of dielectric physics. It has had important applications in lattice dynamics, quantum electronics, and nonlinear optics. The study of electron processes in ferroelectrics was begun with VUL's investigations of the ferroelectric properties of barium titanate [1.1]. Intrinsic and extrinsic optical absorption, band structure, conductivity and photoconductivity, carrier mobility, and transport mechanisms were examined in this compound, and in other perovskite ferroelectric semiconductors. An important discovery was that of the highly photosensitive photoconducting ferroelectrics of type AVB_{1-x}VI_x (e.g. SbSI) by MERZ et al. in 1962 [1.2,3]. A large number of ferroelectric semiconductors (some photosensitive, some not) are now known, including broad-band materials (e.g. lithium niobate, lithium tantalate, barium and strontium niobate, and type-A~B~I compounds), BI and narrow-band semiconductors (e.g. type A_{1-x}VB_x compounds). A series of improper ferroelectric semiconductors and photosensitive ferroelastics have been discovered, of which SbO_{1-x} is an example. s 7 Owing to the uncertainty of their band structure, the difficulty in determining the nature of the levels, the complexity of alloying, and their generally low mobility values, ferroelectrics are rarely of interest regarded as nonlinear semiconductors. The most fruitful approach has been the study of the influence of electrons (especially nonequilibrium electrons) and electron excitations on phase transitions and ferroelectric properties. A large group of phenomena have recently been discovered and investigated.

ADVANCED SOLID CATALYSTS FOR RENEWABLE ENERGY PRODUCTION

IGI Global In recent years, the replacement of non-renewable crude oil by renewable sources has been addressed, particularly in developed countries. Its main driving force has been the increasing demand and limited reserves of fossil fuels, the greenhouse gas effect, and the need of securing energy supplies. Advanced Solid Catalysts for Renewable Energy Production provides emerging research on renewable energy production, catalysts, and environmental effects of increased productivity. While highlighting the challenges for future generations to develop in the sustainable energy age, readers will learn the importance of new approaches not only for synthesizing more active and selective (nano)catalysts, but also, for designing innovative catalytic processes that can eventually meet the growing energy efficiency demand and overcome the environmental issues. This book is an important resource for academicians, university researchers, technology developers, and graduate level students.

ADVANCED NANOMATERIALS FOR SOLAR CELLS AND LIGHT EMITTING DIODES

Elsevier Advanced Nanomaterials for Solar Cells and Light Emitting Diodes discusses the importance of nanomaterials as the active layers in solar cells and light emitting diodes (LEDs), along with the progress of nanomaterials as the electron and hole transporting layers. Specifically, the book reviews the use of nano-morphology of polymers, small molecules, and the organic-inorganic perovskites as the active layers in solar cells and LEDs. The design, fabrication and properties of metal-oxide-based nano-structures as electron and hole transporting layers are also reviewed. In addition, the development of plasmonic nanomaterials for solar cells and LEDs is discussed. Each topic in this book includes an overview of the materials system from principles to process. The advantages, disadvantages and related methodologies are highlighted. The book includes applications based on materials and emphasize how to improve the performance of solar cells and LEDs by the materials design, with a focus on nanomaterials. Provides latest research on nanostructured materials including small molecules, polymers, organic-inorganic perovskites, and many other relevant materials systems for solar cells and LEDs Addresses each promising materials system from principles to process, detailing the advantages and disadvantages of the most relevant methods of processing and fabrication Looks ahead to most likely techniques to improve performance of solar cells and light emitting diodes

PLASMONICS

BoD - Books on Demand Plasmonics gives researchers in universities and industries and designers an overview of phenomena enabled by artificially designed metamaterials and their application for plasmonic devices. The purpose of this book is to provide a detailed introduction to the basic modeling approaches and an overview of enabled innovative phenomena. The main research agenda of this book is aimed at the study of modeling techniques and novel functionalities such as plasmonic enhancement of solar cell efficiency, plasmonics in sensing, etc. The topics addressed in this book cover the major strands: theory, modeling and design, applications in practical devices, fabrication, characterization, and measurement. It is worthwhile mentioning that the strategic objectives of developing new artificial functional materials require close cooperation of the research in each subarea.

PEROVSKITE SOLAR CELLS

MATERIALS, PROCESSES, AND DEVICES

John Wiley & Sons 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 Solar 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, roll 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.

POLYMER-ENGINEERED NANOSTRUCTURES FOR ADVANCED ENERGY APPLICATIONS

Springer This book provides a comprehensive overview of engineering nanostructures mediated by functional polymers in combination with optimal synthesis and processing techniques. The focus is on polymer-engineered nanostructures for advanced energy applications. It discusses a variety of polymers that function as precursors, templates, nano-reactors, surfactants, stabilizers, modifiers, dopants, and spacers for directing self-assembly, assisting organization, and templating growth of numerous diverse nanostructures. It also presents a wide range of polymer processing techniques that enable the efficient design and optimal fabrication of nanostructured polymers, inorganics, and organic-inorganic nanocomposites using in-situ hybridization and/or ex-situ recombination methodologies. Combining state-of-the-art knowledge from polymer-guided fabrication of advanced nanostructures and their unique properties, it especially highlights the new, cutting-edge breakthroughs, future horizons, and insights into such nanostructured materials in applications such as photovoltaics, fuel cells, thermoelectrics, piezoelectrics, ferroelectrics, batteries, supercapacitors, photocatalysis, and hydrogen generation and storage. It offers an instructive and approachable guide to polymer-engineered nanostructures for further development of advanced energy materials to meet ever-increasing global energy demands. Interdisciplinary and broad perspectives from internationally respected contributors ensure this book serves as a valuable reference source for scientists, students, and engineers working in polymer science, renewable energy materials, materials engineering, chemistry, physics, surface/interface science, and nanotechnology. It is also suitable as a textbook for universities, institutes, and industrial institutions.

HYBRID ORGANIC-INORGANIC PEROVSKITES

John Wiley & Sons This book summarizes the chemical variability and structural diversity of all known hybrid organic-inorganic perovskites subclasses including halides, azides, formates, dicyanamides, cyanides and dicyanometallates. It also presents a comprehensive account of their intriguing physical properties, including photovoltaic and optoelectronic properties, dielectricity, magnetism, ferroelectricity, ferroelasticity and multiferroicity. Moreover, the current challenges and future opportunities in this exciting field have also been discussed. Such a timely book will definitely show the readers a complete landscape of hybrid organic-inorganic perovskites and associated multifunctionalities.

PEROVSKITE PHOTOVOLTAICS

BASIC TO ADVANCED CONCEPTS AND IMPLEMENTATION

Academic Press *Perovskite Photovoltaics: Basic to Advanced Concepts and Implementation* examines the emergence of perovskite photovoltaics, associated challenges and opportunities, and how to achieve broader development. Consolidating developments in perovskite photovoltaics, including recent progress solar cells, this text also highlights advances and the research necessary for sustaining energy. Addressing different photovoltaics fields with tailored content for what makes perovskite solar cells suitable, and including commercialization examples of large-scale perovskite solar technology. The book also contains a detailed analysis of the implementation and economic viability of perovskite solar cells, highlighting what photovoltaic devices need to be generated by low cost, non-toxic, earth abundant materials using environmentally scalable processes. This book is a valuable resource for engineers, scientists and researchers, and all those who wish to broaden their knowledge on flexible perovskite solar cells. Includes contributions by leading solar cell academics, industrialists, researchers and institutions across the globe. Addresses different photovoltaics fields with tailored content for what makes perovskite solar cells different. Provides commercialization examples of large-scale perovskite solar technology, giving users detailed analysis on the implementation, technical challenges and economic viability of perovskite solar cells.

CHEMICALLY DEPOSITED NANOCRYSTALLINE METAL OXIDE THIN FILMS

SYNTHESIS, CHARACTERIZATIONS, AND APPLICATIONS

Springer Nature This book guides beginners in the areas of thin film preparation, characterization, and device making, while providing insight into these areas for experts. As chemically deposited metal oxides are currently gaining attention in development of devices such as solar cells, supercapacitors, batteries, sensors, etc., the book illustrates how the chemical deposition route is emerging as a relatively inexpensive, simple, and convenient solution for large area deposition. The advancement in the nanostructured materials for the development of devices is fully discussed.

AMERICAN BOOK PUBLISHING RECORD
