

MATERIALS SCIENCE

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Organic Photovoltaics

Concepts
and Realization



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Organic Photovoltaics Concepts And Realization

Springer Series In Materials Science

Arthur James Wells



Organic Photovoltaics Concepts And Realization Springer Series In Materials Science:

Organic Photovoltaics Christoph Joseph Brabec, Vladimir Dyakonov, Jürgen Parisi, Niyazi Serdar Sariciftci, 2003-04-23 The present volume describes and explains the fundamentals of organic plastic solar cells in a manner accessible to both researchers and students. It provides an up to date and comprehensive account of these materials and corresponding devices which will play a key role in future solar energy systems.

Organic Nanomaterials Tomas Torres, Giovanni Bottari, 2013-08-05 Discover a new generation of organic nanomaterials and their applications. Recent developments in nanoscience and nanotechnology have given rise to a new generation of functional organic nanomaterials with controlled morphology and well defined properties which enable a broad range of useful applications. This book explores some of the most important of these organic nanomaterials describing how they are synthesized and characterized. Moreover the book explains how researchers have incorporated organic nanomaterials into devices for real world applications. Featuring contributions from an international team of leading nanoscientists, *Organic Nanomaterials* is divided into five parts. Part One introduces the fundamentals of nanomaterials and self assembled nanostructures. Part Two examines carbon nanostructures from fullerenes to carbon nanotubes to graphene reporting on properties, theoretical studies and applications. Part Three investigates key aspects of some inorganic materials self assembled monolayers, organic field effect transistors and molecular self assembly at solid surfaces. Part Four explores topics that involve both biological aspects and nanomaterials such as biofunctionalized surfaces. Part Five offers detailed examples of how organic nanomaterials enhance sensors and molecular photovoltaics. Most of the chapters end with a summary highlighting the key points. References at the end of each chapter guide readers to the growing body of original research reports and reviews in the field. Reflecting the interdisciplinary nature of organic nanomaterials, this book is recommended for researchers in chemistry, physics, materials science, polymer science and chemical and materials engineering. All readers will learn the principles of synthesizing and characterizing new organic nanomaterials in order to support a broad range of exciting new applications.

Quantum & Nano Technologies for Photovoltaics Loucas Tsakalakos, 2025-05-12 Ongoing concerns regarding greenhouse gas related environmental effects, energy security and the rising costs of conventional energy sources has led to sustained interest and growth in solar energy in general and photovoltaics in particular. Exploring state of the art developments from a practical point of view, *Quantum and Nanotechnology for Photovoltaics* is the second edition of the book and examines issues in increasing efficiency, decreasing costs and how these two goals can be achieved in a single photovoltaic device leveraging emergent quantum and nanoscale phenomena. The book provides fundamental background including new chapters on quantum physics, hot carrier solar cells, luminescent solar concentrators and additional topics and places research approaches within the proper physical context as related to photovoltaics performance enhancement. It reviews the applications of devices and their performance requirements followed by coverage of thin films and advanced band structure concepts for obtaining efficiencies above the Shockley

Queisser single band gap efficiency limit of 31% The editor and contributors also discuss the basic optical properties of nanostructured materials as related to photovoltaics applications and describes quantum hot carrier device physics related to performance They then explore recent literature in the application of various classes of nanostructures to photovoltaics The book covers solar cells based on hybrid organic inorganic nanocomposites structures quantum wells nanowires tubes and quantum dots It also discusses the use of nanoparticles quantum dots to enhance the performance of conventional solar cells and quantum enhanced luminescent solar concentrators Each chapter summarizes the historical development for the nanostructure class under consideration applications beyond photovoltaics and the major synthetic methods followed by a critique of leading works that have employed the particular quantum and or nanostructure type The book examines the advantages of each quantum nanostructure approach and the remaining technical challenges with an emphasis on possible future areas of research interest This work is intended for academic and industrial researchers developing new photovoltaic technologies primarily at the graduate level and beyond though senior level undergraduates with appropriate training in physics and materials science will also benefit from this book Many of the chapters also constitute useful background knowledge for managers and decision makers in companies developing advanced photovoltaic energy and materials technologies

Dye-sensitized Solar Cells K. Kalyanasundaram, 2010-08-03 The dye sensitized solar cell DSC is a photovoltaic converter that mimics natural photosynthesis Like green plants and algae it uses a molecular absorber the dye to harvest sunlight and generate electric charges Dye sensitized solar cells are poised to replace existing technologies in low density solar energy applications especially in contexts where mechanical robustness and light weight is required This book offers the first comprehensive look at this promising technology and aims to provide a graduate level text that brings together the fundamentals of DSC from three perspectives materials performance and mechanistic aspects as well as to serve as an advanced monograph that summarizes the key advances and lists the technical challenges remaining to be solved

Carbon Nanotubes and Related Structures Dirk M. Guldi, Nazario Martín, 2010-01-26 Written by the most prominent experts and pioneers in the field this ready reference combines fundamental research recent breakthroughs and real life applications in one well organized treatise As such both newcomers and established researchers will find here a wide range of current methods for producing and characterizing carbon nanotubes using imaging as well as spectroscopic techniques One major part of this thorough overview is devoted to the controlled chemical functionalization of carbon nanotubes covering intriguing applications in photovoltaics organic electronics and materials design The latest research on novel carbon derived structures such as graphene nanoribbons and carbon pea pods round off the book

Encyclopedia of Chemical Processing (Online) Sunggyu Lee, 2005-11-01 This second edition Encyclopedia supplies nearly 350 gold standard articles on the methods practices products and standards influencing the chemical industries It offers expertly written articles on technologies at the forefront of the field to maximize and enhance the research and production phases of

current and emerging chemical manufacturing practices and techniques This collecting of information is of vital interest to chemical polymer electrical mechanical and civil engineers as well as chemists and chemical researchers A complete reconceptualization of the classic reference series the Encyclopedia of Chemical Processing and Design whose first volume published in 1976 this resource offers extensive A Z treatment of the subject in five simultaneously published volumes with comprehensive indexing of all five volumes in the back matter of each tome It includes material on the design of key unit operations involved with chemical processes the design unit operation and integration of reactors and separation systems process system peripherals such as pumps valves and controllers analytical techniques and equipment and pilot plant design and scale up criteria This reference contains well researched sections on automation equipment design and simulation reliability and maintenance separations technologies and energy and environmental issues Authoritative contributions cover chemical processing equipment engineered systems and laboratory apparatus currently utilized in the field It also presents expert overviews on key engineering science topics in property predictions measurements and analysis novel materials and devices and emerging chemical fields ALSO AVAILABLE ONLINE This Taylor E mail e reference taylorandfrancis com International Tel 44 0 20 7017 6062 E mail online sales tandf co uk *Organic Photovoltaics* ,2006 **American Book Publishing Record** ,2003 **The British National Bibliography** Arthur James Wells,2003 *The Journal of the Korean Physical Society* ,2008 **Progress in High-Efficient Solution Process Organic Photovoltaic Devices** Yang Yang,Gang Li,2015-02-17 This book presents an important technique to process organic photovoltaic devices The basics materials aspects and manufacturing of photovoltaic devices with solution processing are explained Solution processable organic solar cells polymer or solution processable small molecules have the potential to significantly reduce the costs for solar electricity and energy payback time due to the low material costs for the cells low cost and fast fabrication processes ambient roll to roll high material utilization etc In addition organic photovoltaics OPV also provides attractive properties like flexibility colorful displays and transparency which could open new market opportunities The material and device innovations lead to improved efficiency by 8% for organic photovoltaic solar cells compared to 4% in 2005 Both academic and industry research have significant interest in the development of this technology This book gives an overview of the booming technology focusing on the solution process for organic solar cells and provides a state of the art report of the latest developments World class experts cover fundamental materials devices and manufacturing technology of OPV technology *Science in China* ,2008

Elementary Processes in Organic Photovoltaics Karl Leo,2016-12-20 This volume presents the results of a multi year research programme funded by the Deutsche Forschungsgemeinschaft German Research Council which explains how organic solar cells work In this new promising photovoltaic technology carbon based materials are deposited by low cost methods onto flexible substrates thus allowing devices which open completely new applications like transparent coatings for building solar cells integrated into clothing or packages and many more The investigation of organic solar cells is an

interdisciplinary topic covering physics chemistry and engineering The different chapters address topics ranging from the synthesis of new organic materials to the characterization of the elementary processes such as exciton transport and separation and the principles of highly efficient device design div **Physics Briefs** ,1988 **Multiscale Modelling of Organic and Hybrid Photovoltaics** David Beljonne,Jerome Cornil,2014-08-12 The series Topics in Current Chemistry presents critical reviews of the present and future trends in modern chemical research The scope of coverage is all areas of chemical science including the interfaces with related disciplines such as biology medicine and materials science The goal of each thematic volume is to give the non specialist reader whether in academia or industry a comprehensive insight into an area where new research is emerging which is of interest to a larger scientific audience Each review within the volume critically surveys one aspect of that topic and places it within the context of the volume as a whole The most significant developments of the last 5 to 10 years are presented using selected examples to illustrate the principles discussed The coverage is not intended to be an exhaustive summary of the field or include large quantities of data but should rather be conceptual concentrating on the methodological thinking that will allow the non specialist reader to understand the information presented Contributions also offer an outlook on potential future developments in the field Review articles for the individual volumes are invited by the volume editors Readership research chemists at universities or in industry graduate students **Organic Solar Cells** Masahiro Hiramoto,Seiichiro Izawa,2020-12-16 This book focuses on the essential scientific ideas and breakthroughs in the last three decades for organic solar cells that have realized practical applications The motivation for publishing this book is to explain how those essential ideas have arisen and to provide a foundation for future progress by target readers students novices in the field and scientists with expertise The main topics covered in the book include the fundamental principles and history of organic solar cells blended junction nanostructure control photocurrent generation photovoltage generation doping practical organic solar cells and possible ideas for the future The editors enthusiastically anticipate the vigorous development of the field of organic solar cells by young scientists of the next generation **Organic Photovoltaics** Sam-Shajing Sun,Niyazi Serdar Sariciftci,2017-12-19 Recently developed organic photovoltaics OPVs show distinct advantages over their inorganic counterparts due to their lighter weight flexible shape versatile materials synthesis and device fabrication schemes and low cost in large scale industrial production Although many books currently exist on general concepts of PV and inorganic PV materials and devices few are available that offer a comprehensive overview of recently fast developing organic and polymeric PV materials and devices Organic Photovoltaics Mechanisms Materials and Devices fills this gap The book provides an international perspective on the latest research in this rapidly expanding field with contributions from top experts around the world It presents a unified approach comprising three sections General Overviews Mechanisms and Modeling and Materials and Devices Discussions include sunlight capture exciton diffusion and dissociation interface properties charge recombination and migration and a variety of currently

developing OPV materials devices The book also includes two forewords one by Nobel Laureate Dr Alan J Heeger and the other by Drs Aloysius Hepp and Sheila Bailey of NASA Glenn Research Center Organic Photovoltaics equips students researchers and engineers with knowledge of the mechanisms materials devices and applications of OPVs necessary to develop cheaper lighter and cleaner renewable energy throughout the coming decades Organic Photovoltaics Christoph Brabec, Ullrich Scherf, Vladimir Dyakonov, 2011-09-22 Providing complementary viewpoints from academia as well as technology companies this book covers the three most important aspects of successful device design materials device physics and manufacturing technologies It also offers an insight into commercialization concerns such as packaging technologies system integration reel to reel large scale manufacturing issues and production costs With an introduction by Nobel Laureate Alan Heeger WOLEDs and Organic Photovoltaics Vivian W. W. Yam, 2010-11-19 A major global issue that the world is facing today is the upcoming depletion of fossil fuels and the energy crisis In 1998 the global annual energy consumption was 12.7 TW of which 80% was generated from fossil fuels This also translates into huge annual emissions of CO₂ that leads to massive environmental problems 2 particularly the global warming which could be disastrous Future global annual energy needs are also estimated to rise dramatically A major challenge confronting the world is to find an additional 14-20 TW by 2050 when our energy reserves based on fossil fuels are vanishing The massive demand for energy would require materials and/or processes that would help to provide new sources of clean renewable energy or to develop processes that would harvest energy or to better utilize energy in an efficient manner The present monograph WOLEDs and Organic Photovoltaics Recent Advances and Applications focuses on a very important and timely subject of topical interest that deals with the more efficient use of energy through white organic light emitting diodes WOLEDs for solid state lighting and the development of clean sources of renewable energy through the harvesting of light energy for conversion into electrical energy in organic photovoltaics While LED solid state lighting and photovoltaics have been dominated by inorganic semiconductor materials and silicon based solar cells there have been growing interests in the development of WOLEDs and organic photovoltaics

Next Generation of Photovoltaics Ana Cristobal, Antonio Martí Vega, Antonio Luque López, 2012-02-14 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 in next generation photovoltaics this book is an essential 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

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