

Artificial Photosynthesis From Basic Biology To Industrial Application

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Photosynthetic Protein Complexes - Petra Fromme 2008-11-21
Perfectly timed, this handbook covers many important aspects of the topic that have only recently been understood -- making this a truly comprehensive work. With its extensive use of color, it surveys the most important proteins involved in photosynthesis, discussing the structural information we have at our disposal. Most chapters are dedicated to one protein, while a few also summarize general associated concepts. The book also has an accompanying website that contains data files and animations to allow readers to visualize many of the complicated proteins presented. A must for anyone studying photosynthesis and structural biology, as well as those working in the plant and crop biotechnology industry.

[Nanophotocatalysis and Environmental Applications](#) - Inamuddin
2019-03-29

This book presents photocatalysis as a state-of-art technology in energy production and conversion. The ever increasing demand for energy with growing economies has led to a dearth of energy sources. The exhaustive dependability on non-renewable resources of energy has not just depleted them but also lead to the birth of secondary problems such as pollution and climate change. The photoactive processes have opened a new window for the production of green energy and helped in environmental sustainability. The harnessing of renewable sources especially sun and water for fuel production and noxious gases reduction solve both the issues of pollution mitigation and energy crisis.

Biogas from Waste and Renewable Resources - Dieter Deublein
2008-04-18

Written as a practical introduction to biogas plant design and operation, this book fills a huge gap by presenting a systematic guide to this emerging technology -- information otherwise only available in poorly intelligible reports by US governmental and other official agencies. The author draws on teaching material from a university course as well as a wide variety of industrial biogas projects he has been involved with, thus combining didactical skill with real-life examples. Alongside biological and technical aspects of biogas generation, this timely work also looks at safety and legal aspects as well as environmental considerations.

Handbook of Microalgal Culture - Amos Richmond 2013-04-03

Algae are some of the fastest growing organisms in the world, with up to 90% of their weight made up from carbohydrate, protein and oil. As well as these macromolecules, microalgae are also rich in other high-value compounds, such as vitamins, pigments, and biologically active compounds. All these compounds can be extracted for use by the cosmetics, pharmaceutical, nutraceutical, and food industries, and the algae itself can be used for feeding of livestock, in particular fish, where on-going research is dedicated to increasing the percentage of fish and shellfish feed not derived from fish meal. Microalgae are also applied to wastewater bioremediation and carbon capture from industrial flue gases, and can be used as organic fertilizer. So far, only a few species of microalgae, including cyanobacteria, are under mass cultivation. The potential for expansion is enormous, considering the existing hundreds of thousands of species and subspecies, in which a large gene-pool offers a significant potential for many new producers. Completely revised, updated and expanded, and with the inclusion of new Editor, Qiang Hu of Arizona State University, the second edition of this extremely important book contains 37 chapters. Nineteen of these chapters are written by new authors, introducing many advanced and emerging technologies and applications such as novel photobioreactors, mass cultivation of oil-bearing microalgae for biofuels, exploration of naturally occurring and genetically engineered microalgae as cell factories for high-value

chemicals, and techno-economic analysis of microalgal mass culture. This excellent new edition also contains details of the biology and large-scale culture of several economically important and newly-exploited microalgae, including Botryococcus, Chlamydomonas, Nannochloropsis, Nostoc, Chlorella, Spirulina, Haematococcus, and Dunaliella species/strains. Edited by Amos Richmond and Qiang Hu, each with a huge wealth of experience in microalgae, its culture, and biotechnology, and drawing together contributions from experts around the globe, this thorough and comprehensive new edition is an essential purchase for all those involved with microalgae, their culture, processing and use. Biotechnologists, bioengineers, phycologists, pharmaceutical, biofuel and fish-feed industry personnel and biological scientists and students will all find a vast amount of cutting-edge information within this Second Edition. Libraries in all universities where biological sciences, biotechnology and aquaculture are studied and taught should all have copies of this landmark new edition on their shelves.

Bioenergy Research: Biomass Waste to Energy - Manish Srivastava
2021-08-01

This volume is fourth part of the five-part set on bioenergy research. This volume covers biomass to bioenergy production concept. The book is focused on the possible and versatile biomass options available for the generation of bioenergy. Additionally, the book also explores different types of biomass for bioenergy generation at a commercial level. Further, the book elaborates on different kind of cellulose and sugar rich waste which can also be utilized for bioenergy production. It covers other relevant issues such as recent technological advancement in biomass to bioenergy conversion, waste management in the context of biomass to biofuels production technologies, green methods of energy production, alternates of fossil fuels in the near future. It also explores biomass waste valorization, utilizing microbial processes in bioenergy production. This is a useful reading material for students, researchers, industry and policy experts. Other four volumes of this set explore basic concepts, latest progress, commercial opportunities and integrated solution for bioenergy concerns.

Electron Spin Interactions in Chemistry and Biology - Gertz Likhtenshtein
2016-07-25

This book presents the versatile and pivotal role of electron spin interactions in nature. It provides the background, methodologies and tools for basic areas related to spin interactions, such as spin chemistry and biology, electron transfer, light energy conversion, photochemistry, radical reactions, magneto-chemistry and magneto-biology. The book also includes an overview of designing advanced magnetic materials, optical and spintronic devices and photo catalysts. This monograph will be of interest to scientists and graduate students working in the areas related to spin interactions physics, biophysics, chemistry and chemical engineering.

Clean Energy for Sustainable Development - Abul Kalam Azad
2016-11-12

Clean Energy for Sustainable Development: Comparisons and Contrasts of New Approaches presents information on the fundamental challenge that the energy sector faces with regard to meeting the ever growing demand for sustainable, efficient, and cleaner energy. The book compares recent developments in the field of energy technology, clean and low emission energy, and energy efficiency and environmental sustainability for industry and academia. Rasul, Azad and Sharma, along with their team of expert contributors, provide high-end research findings on relevant industry themes, including clean and sustainable energy sources and technologies, renewable energy technologies and

their applications, biomass and biofuels for sustainable environment, energy system and efficiency improvement, solar thermal applications, and the environmental impacts of sustainable energy systems. This book uses global institutes and case studies to explore and analyze technological advancements alongside practical applications. This approach helps readers to develop and affirm a better understanding of the relevant concepts and solutions necessary to achieve clean energy and sustainable development in both medium and large-scale industries. Compares in-depth research on a wide range of clean technologies, from global institutes in Australia, Europe, and India Evaluates the recent developments in clean technologies against the efficiency of tried and tested applications Considers case studies on the advancements of sustainable energy into industry from around the world

Introduction to Nanoscience and Nanotechnology - Gabor L. Hornyak 2008-12-22

The maturation of nanotechnology has revealed it to be a unique and distinct discipline rather than a specialization within a larger field. Its textbook cannot afford to be a chemistry, physics, or engineering text focused on nano. It must be an integrated, multidisciplinary, and specifically nano textbook. The archetype of the modern nano textbook, *Introduction to Nanoscience and Nanotechnology* builds a solid background in characterization and fabrication methods while integrating the physics, chemistry, and biology facets. The remainder of this color text focuses on applications, examining engineering aspects as well as nanomaterials and industry-specific applications in such areas as energy, electronics, and biotechnology. Also available in two course-specific volumes: *Introduction to Nanoscience* elucidates the nanoscale along with the societal impacts of nanoscience, then presents an overview of characterization and fabrication methods. The authors systematically discuss the chemistry, physics, and biology aspects of nanoscience, providing a complete picture of the challenges, opportunities, and inspirations posed by each facet before giving a brief glimpse at nanoscience in action: nanotechnology. *Fundamentals of Nanotechnology* surveys the field's broad landscape, exploring the physical basics such as nanorheology, nanofluidics, and nanomechanics as well as industrial concerns such as manufacturing, reliability, and safety. The authors then explore the vast range of nanomaterials and systematically outline devices and applications in various industrial sectors. Qualifying instructors who purchase either of these volumes (or the combined set) are given online access to a wealth of instructional materials. These include detailed lecture notes, review summaries, slides, exercises, and more. The authors provide enough material for both one- and two-semester courses.

Nanotechnology for a Sustainable World - Thomas Faunce 2012

Does humanity have a moral obligation to emphasise nanotechnology's role in addressing the critical public health and environmental problems of our age? This well crafted book explores this idea by analysing the prospects for a macroscale nanotechnology-for-environmental sustainability project in areas such as food, water and energy supply, medicine, healthcare, peace and security. Developing and applying an innovative science-based view of natural law underpinning a global social contract, it considers some of the key scientific and governance challenges such a global project may face. The book concludes that the moral culmination of nanotechnology is a Global Artificial Photosynthesis project. It argues that the symmetric patterns of energy creating photosynthesis, life and us are shaping not only the nanotechnological advances of artificial photosynthesis, but also the ethical and legal norms likely to best govern such scientific achievements to form a sustainable existence on this planet. *Nanotechnology for a Sustainable World* will appeal to many generations of scientists and policymakers working to improve our world in public health, environmental sustainability and renewable energy and nanotechnology. It will also be a valuable resource for similarly motivated students of chemistry, physics, biology, nanotechnology and photosynthesis, as well as environmental and energy ethics, law and policy.

Artificial Photosynthesis - Anthony F. Collings 2007-09-24

Since the events crucial to plant photosynthesis are now known in molecular detail, this process is no longer nature's secret, but can for the first time be mimicked by technology. Broad in its scope, this book spans the basics of biological photosynthesis right up to the current approaches for its technical exploitation, making it the most complete resource on artificial photosynthesis ever published. The contents draw on the expertise of the Australian Artificial Photosynthesis Network, currently the world's largest coordinated research effort to develop effective photosynthesis technology. This is further backed by expert contributions

from around the globe, providing an authoritative overview of current research worldwide.

Handbook of Hydrogen Energy - S.A. Sherif 2014-07-29

Can hydrogen and electricity supply all of the world's energy needs? *Handbook of Hydrogen Energy* thoroughly explores the notion of a hydrogen economy and addresses this question. The handbook considers hydrogen and electricity as a permanent energy system and provides factual information based on science. The text focuses on a large cross section of applications such as fuel cells and catalytic combustion of hydrogen. The book also includes information on inversion curves, physical and thermodynamic tables, and properties of storage materials, data on specific heats, and compressibility and temperature-entropy charts and more. Analyzes the principles of hydrogen energy production, storage, and utilization Examines electrolysis, thermolysis, photolysis, thermochemical cycles, and production from biomass and other hydrogen production methods Covers all modes of hydrogen storage: gaseous, liquid, slush, and metal hydride storage *Handbook of Hydrogen Energy* serves as a resource for graduate students, as well as a reference for energy and environmental engineers and scientists.

Sustainable Materials and Green Processing for Energy

Conversion - Kuan Yew Cheong 2021-10-08

Sustainable Materials and Green Processing for Energy Conversion provides a concise reference on green processing and synthesis of materials required for the next generation of devices used in renewable energy conversion and storage. The book covers the processing of bio-organic materials, environmentally-friendly organic and inorganic sources of materials, synthetic green chemistry, bioresorbable and transient properties of functional materials, and the concept of sustainable material design. The book features chapters by worldwide experts and is an important reference for students, researchers, and engineers interested in gaining extensive knowledge concerning green processing of sustainable, green functional materials for next generation energy devices. Additionally, functional materials used in energy devices must also be able to degrade and decompose with minimum energy after being disposed of at their end-of-life. Environmental pollution is one of the global crises that endangers the life cycles of living things. There are multiple root causes of this pollution, including industrialization that demands a huge supply of raw materials for the production of products related to meeting the demands of the Internet-of-Things. As a result, improvement of material and product life cycles by incorporation of green, sustainable principles is essential to address this challenging issue. Offers a resourceful reference for readers interested in green processing of environmentally-friendly and sustainable materials for energy conversion and storage devices Focuses on designing of materials through green-processing concepts Highlights challenges and opportunities in green processing of renewable materials for energy devices

Photosynthesis - Dmitry Shevela 2018-11-09

Photosynthesis has been an important field of research for more than a century, but the present concerns about energy, environment and climate have greatly intensified interest in and research on this topic. Research has progressed rapidly in recent years, and this book is an interesting read for an audience who is concerned with various ways of harnessing solar energy. Our understanding of photosynthesis can now be said to have reached encyclopedic dimensions. There have been, in the past, many good books at various levels. Our book is expected to fulfill the needs of advanced undergraduate and beginning graduate students in branches of biology, biochemistry, biophysics, and bioengineering because photosynthesis is the basis of future advances in producing more food, more biomass, more fuel, and new chemicals for our expanding global human population. Further, the basics of photosynthesis are and will be used not only for the above, but in artificial photosynthesis, an important emerging field where chemists, researchers and engineers of solar energy systems will play a major role. *Biomimetics* - Amitava Mukherjee 2010-03-01

Nature's evolution has led to the introduction of highly efficient biological mechanisms. Imitating these mechanisms offers an enormous potential for the improvement of our day to day life. Ideally, by bio-inspiration we can get a better view of nature's capability while studying its models and adapting it for our benefit. This book takes us into the interesting world of biomimetics and describes various arenas where the technology is applied. The 25 chapters covered in this book disclose recent advances and new ideas in promoting the mechanism and applications of biomimetics.

Handbook of Fullerene Science and Technology - Xing Lu

2022-09-24

Nanocarbon chemistry and physics is a fast-developing, broad research area – the Nobel prizes in 1996 and 2010 awarded to two key discoveries in the field, and several other nanocarbon achievements of comparable importance. Owing to this rapid growth, the nanocarbon landscape fundamentally changes every few years, creating a need to survey the field on a regular basis to update the books that have become incomplete or even obsolete. As such, this book focuses on fullerenes and metallofullerenes and also on the related areas of nanotubes and graphenes. All the covered research topics provide important fundamental knowledge for the natural sciences, but also for applications in molecular electronics, superconductivity, catalysis, photovoltaics and medical diagnostics. The current nanocarbon research activities have particularly high application potential in the conversion of solar energy, future molecular memories, non-conventional materials for optoelectronics, and new treatments for civilization diseases. Offering a truly up-to-date critical survey of nanocarbon science, its concepts and highlights, it follows the concept of a handbook: it addresses key topics systematically, from historical background, methodological aspects, current important issues, and application potential, all supplied with extensive referencing. With individual chapters written by leading experts with extensive research experience, it is a comprehensive reference resource for graduate students and active researchers alike.

Handbook of Porphyrin Science (Volumes 16 - 20): With Applications to Chemistry, Physics, Materials Science, Engineering, Biology and Medicine - Karl M Kadish 2012-06-08

This is the fourth set of Handbook of Porphyrin Science. Porphyrins, phthalocyanines and their numerous analogues and derivatives are materials of tremendous importance in chemistry, materials science, physics, biology and medicine. They are the red color in blood (heme) and the green in leaves (chlorophyll); they are also excellent ligands that can coordinate with almost every metal in the Periodic Table. Grounded in natural systems, porphyrins are incredibly versatile and can be modified in many ways; each new modification yields derivatives, demonstrating new chemistry, physics and biology, with a vast array of medicinal and technical applications. As porphyrins are currently employed as platforms for study of theoretical principles and applications in a wide variety of fields, the Handbook of Porphyrin Science represents a timely ongoing series dealing in detail with the synthesis, chemistry, physicochemical and medical properties and applications of polypyrrole macrocycles. Professors Karl Kadish, Kevin Smith and Roger Guilard are internationally recognized experts in the research field of porphyrins, each having his own separate area of expertise in the field. Between them, they have published over 1500 peer-reviewed papers and edited more than three dozen books on diverse topics of porphyrins and phthalocyanines. In assembling the new volumes of this unique handbook, they have selected and attracted the very best scientists in each sub-discipline as contributing authors. This handbook will prove to be a modern authoritative treatise on the subject as it is a collection of up-to-date works by world-renowned experts in the field. Complete with hundreds of figures, tables and structural formulas, and thousands of literature citations, all researchers and graduate students in this field will find the Handbook of Porphyrin Science an essential, major reference source for many years to come.

Chemical Energy Storage - Robert Schlögl 2022-01-19

Energy – in the headlines, discussed controversially, vital. The use of regenerative energy in many primary forms leads to the necessity to store grid dimensions for maintaining continuous supply and enabling the replacement of fossil fuel systems. Chemical energy storage is one of the possibilities besides mechano-thermal and biological systems. This work starts with the more general aspects of chemical energy storage in the context of the geosphere and evolves to dealing with aspects of electrochemistry, catalysis, synthesis of catalysts, functional analysis of catalytic processes and with the interface between electrochemistry and heterogeneous catalysis. Top-notch experts provide a sound, practical, hands-on insight into the present status of energy conversion aimed primarily at the young emerging research front.

Solar-to-Chemical Conversion - Hongqi Sun 2021-04-29

This comprehensive book systematically covers the fundamentals in solar energy conversion to chemicals, either fuels or chemical products. It includes natural photosynthesis with emphasis on artificial processes for solar energy conversion and utilization. The chemical processes of solar energy conversion via homogeneous and/or heterogeneous photocatalysis has been described with the mechanistic insights. It also consists of reaction systems toward a variety of applications, such as

water splitting for hydrogen or oxygen evolution, photocatalytic CO₂ reduction to fuels, and light driven N₂ fixation, etc. This unique book offers the readers a broad view of solar energy utilization based on chemical processes and their perspectives for future sustainability.

Nanotechnology Toward the Sustainocene - Thomas Alured Faunce 2014-12-02

While the sustainability of our world is being endangered or destroyed by the misguided activities of artificial human entities, real people have begun to expand their moral sympathies sufficiently to prioritize protecting our world's interests. They have developed a new technology—nanotechnology—that has the potential to advance human society toward a period of long-term sustainability, termed "the Sustainocene." This book comprises chapters by experts in various fields of nanotechnology and in related areas of governance under the theme of how nanotechnology can assist in the creation of the Sustainocene. The book will appeal to anyone involved in nanotechnology, macromolecular science, public policy related to sustainability, renewable energy, and climate change.

Handbook of Porphyrin Science (Volumes 6 - 10): With Applications to Chemistry, Physics, Materials Science, Engineering, Biology and Medicine - Karl M Kadish 2010-06-29

This is the second set of Handbook of Porphyrin Science. Porphyrins, phthalocyanines and their numerous analogues and derivatives are materials of tremendous importance in chemistry, materials science, physics, biology and medicine. They are the red color in blood (heme) and the green in leaves (chlorophyll); they are also excellent ligands that can coordinate with almost every metal in the Periodic Table. Grounded in natural systems, porphyrins are incredibly versatile and can be modified in many ways; each new modification yields derivatives, demonstrating new chemistry, physics and biology, with a vast array of medicinal and technical applications. As porphyrins are currently employed as platforms for study of theoretical principles and applications in a wide variety of fields, the Handbook of Porphyrin Science represents a timely ongoing series dealing in detail with the synthesis, chemistry, physicochemical and medical properties and applications of polypyrrole macrocycles. Professors Karl Kadish, Kevin Smith and Roger Guilard are internationally recognized experts in the research field of porphyrins, each having his own separate area of expertise in the field. Between them, they have published over 1500 peer-reviewed papers and edited more than three dozen books on diverse topics of porphyrins and phthalocyanines. In assembling the new volumes of this unique Handbook, they have selected and attracted the very best scientists in each sub-discipline as contributing authors. This Handbook will prove to be a modern authoritative treatise on the subject as it is a collection of up-to-date works by world-renowned experts in the field. Complete with hundreds of figures, tables and structural formulas, and thousands of literature citations, all researchers and graduate students in this field will find the Handbook of Porphyrin Science an essential, major reference source for many years to come.

Design, Fabrication, Properties and Applications of Smart and Advanced Materials - Xu Hou 2016-06-22

This book introduces various advanced, smart materials and the strategies for the design and preparation for novel uses from macro to micro or from biological, inorganic, organic to composite materials. Selecting the best material is a challenging task, requiring tradeoffs between material properties and designing functional smart materials. The development of smart, advanced materials and their potential applications is a burgeoning area of research. Exciting breakthroughs are anticipated in the future from the concepts and results reported in this book.

Porphyrin Science - Karl M. Kadish 2010-03-01

Porphyrins, phthalocyanines and their numerous analogues and derivatives are materials of tremendous importance in chemistry, materials science, physics, biology and medicine. They are the red color in blood (heme) and the green in leaves (chlorophyll); they are also excellent ligands that can coordinate with almost every metal in the Periodic Table. Grounded in natural systems, porphyrins are incredibly versatile and can be modified in many ways; each new modification yields derivatives demonstrated new chemistry, physics and biology, with a vast array of medicinal and technical applications. As porphyrins are currently employed as platforms for study of theoretical principles and applications in a wide variety of fields, the Handbook of Porphyrin Science represents a timely ongoing series dealing in detail with the synthesis, chemistry, physicochemical and medical properties and applications of polypyrrole macrocycles. Professors Karl Kadish, Kevin

Smith and Roger Guillard are internationally recognized experts in the research field of porphyrins, each having his own separate area of expertise in the field. Between them, they have published over 1500 peer-reviewed papers and edited more than three dozen books on diverse topics of porphyrins and phthalocyanines. In assembling the new volumes of this unique Handbook, they have selected and attracted the very best scientists in each sub-discipline as contributing authors of the chapters. This Handbook will prove to be a modern authoritative treatise on the subject as it is a collection of up-to-date works by world-renowned experts in the field. Complete with hundreds of figures, tables and structural formulas, and thousands of literature citations, all researchers and graduate students in this field will find the Handbook of Porphyrin Science an essential, major reference source for many years to come.

Solar Based Hydrogen Production Systems - Ibrahim Dincer
2013-09-05

This book provides a comprehensive analysis of various solar based hydrogen production systems. The book covers first-law (energy based) and second-law (exergy based) efficiencies and provides a comprehensive understanding of their implications. It will help minimize the widespread misuse of efficiencies among students and researchers in energy field by using an intuitive and unified approach for defining efficiencies. The book gives a clear understanding of the sustainability and environmental impact analysis of the above systems. The book will be particularly useful for a clear understanding of second law (exergy) efficiencies for various systems. It may serve as a reference book to the researchers in energy field. The definitions and concepts developed in the book will be explained through illustrative examples.

Environmental Change and the World's Futures - Jonathan Paul Marshall
2015-08-27

Climate change and ecological instability have the potential to disrupt human societies and their futures. Cultural, social and ethical life in all societies is directed towards a future that can never be observed, and never be directly acted upon, and yet is always interacting with us. Thinking and acting towards the future involves efforts of imagination that are linked to our sense of being in the world and the ecological pressures we experience. The three key ideas of this book – ecologies, ontologies and mythologies – help us understand the ways people in many different societies attempt to predict and shape their futures. Each chapter places a different emphasis on the linked domains of environmental change, embodied experience, myth and fantasy, politics, technology and intellectual reflection, in relation to imagined futures. The diverse geographic scope of the chapters includes rural Nepal, the islands of the Pacific Ocean, Sweden, coastal Scotland, North America, and remote, rural and urban Australia. This book will appeal to researchers and students in anthropology, sociology, environmental studies, cultural studies, psychology and politics.

Artificial Photosynthesis - 2016-06-13

Artificial Photosynthesis, the latest edition in the Advances in Botanical Research series, which publishes in-depth and up-to-date reviews on a wide range of topics in the plant sciences features several reviews by recognized experts on all aspects of plant genetics, biochemistry, cell biology, molecular biology, physiology, and ecology. Publishes in-depth and up-to-date reviews on a wide range of topics in plant sciences Presents the latest information on artificial photosynthesis Features a wide range of reviews by recognized experts on all aspects of plant genetics, biochemistry, cell biology, molecular biology, physiology, and ecology

Organic Nanomaterials - Tomas Torres 2013-10-14

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.

Fundamentals of Nanotechnology - Gabor L. Hornyak 2018-12-14

WINNER 2009 CHOICE AWARD OUTSTANDING ACADEMIC TITLE!

Nanotechnology is no longer a subdiscipline of chemistry, engineering, or any other field. It represents the convergence of many fields, and therefore demands a new paradigm for teaching. This textbook is for the next generation of nanotechnologists. It surveys the field's broad landscape, exploring the physical basics such as nanorheology, nanofluidics, and nanomechanics as well as industrial concerns such as manufacturing, reliability, and safety. The authors then explore the vast range of nanomaterials and systematically outline devices and applications in various industrial sectors. This color text is an ideal companion to Introduction to Nanoscience by the same group of esteemed authors. Both titles are also available as the single volume Introduction to Nanoscience and Nanotechnology Qualifying instructors who purchase either of these volumes (or the combined set) are given online access to a wealth of instructional materials. These include detailed lecture notes, review summaries, slides, exercises, and more. The authors provide enough material for both one- and two-semester courses.

Solar Energy Conversion and Storage - Suresh C. Ameta 2015-11-05

Solar Energy Conversion and Storage: Photochemical Modes showcases the latest advances in solar cell technology while offering valuable insight into the future of solar energy conversion and storage. Focusing on photochemical methods of converting and/or storing light energy in the form of electrical or chemical energy, the book: Describes various types of solar cells, including photovoltaic cells, photogalvanic cells, photoelectrochemical cells, and dye-sensitized solar cells Covers the photogeneration of hydrogen, photoreduction of carbon dioxide, and artificial/mimicking photosynthesis Discusses the generation of electricity from solar cells, as well as methods for storing solar energy in the form of chemical energy Highlights existing photochemical methods of solar energy conversion and storage Explores emerging trends such as the use of nanoparticles Solar Energy Conversion and Storage: Photochemical Modes provides a comprehensive, state-of-the-art reference for graduate students, researchers, and engineers alike.

Fullerenes and Other Carbon-Rich Nanostructures - Jean-François Nierengarten 2014-05-16

Yanfei Shen and Takashi Nakanishi Exotic Self-Organized Fullerene Materials Based on Uncommon Hydrophobic-Amphiphilic Approach Yuming Zhao and Guang Chen C60 Fullerene Amphiphiles as Supramolecular Building Blocks for Organized and Well-Defined Nano scale Objects Anna Troeger, Vito Sgobba and Dirk M. Guldi Multilayer Assembly for Solar Energy Conversion Delphine Felder-Flesch Self- or Induced Organization of [60]Fullerene Hexakisadducts Andrés de la Escosura, Olga Trukhina, and Tomás Torres Dual Role of Phthalocyanines in Carbon Nano structure-Based Organic Photovoltaics Riccardo Marega, Davide Giust and Davide Bonifazi Supramolecular Chemistry of Carbon Nano tubes at Interfaces: Toward Applications Stephanie Frankenberger, Johanna A. Januszewski and Rik R. Tykwinski Oligomers from sp-Hybridized Carbon: Cumulenes and Polyynes.

Photochemistry - Angelo Albini 2016-10-03

Providing critical reviews of recent advances in photochemistry including organic and computational aspects, the latest volume in the Series reflects the current interests in this area. It also includes a series of highlights on molecular devices, global artificial photosynthesis, silicon nanoparticles, solar energy conversion, organic heterogeneous photocatalysis and photochemistry in surface-water environments. Volume 44 of the annual Specialist Periodical Reports: Photochemistry is essential reading for anyone wishing to keep up with the literature on photochemistry and its applications.

Solar Energy Conversion - Gertz I. Likhtenshtein 2012-02-13

Finally filling a gap in the literature for a text that also adopts the chemist's view of this hot topic, Professor Likhtenshtein, an experienced author and internationally renowned scientist, considers different

physical and engineering aspects in solar energy conversion. From theory to real-life systems, he shows exactly which chemical reactions take place when converting light energy, providing an overview of the chemical perspective from fundamentals to molecular harvesting systems and solar cells. This essential guide will thus help researchers in academia and industry better understand solar energy conversion, and so ultimately help this promising, multibillion dollar field to expand. From the contents: * Electron Transfer Theories * Principle Stages of Photosynthetic Light Energy Conversion * Photochemical Systems of Light Energy Conversion * Redox Processes on Surface of Semiconductors and Metals * Dye-Sensitized Solar Cells * Photocatalytic Reduction and Oxidation of Water

Carbon Nanotubes and Related Structures - Dirk M. Guldi
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, nanofibers and carbon nanotubes, round off the book.

Bioinorganic Photochemistry - Grazyna Stochel 2009-06-10

Bioinorganic photochemistry is a rapidly evolving field integrating inorganic photochemistry with biological, medical and environmental sciences. The interactions of light with inorganic species in natural systems, and the applications in artificial systems of medical or environmental importance, form the basis of this challenging interdisciplinary research area. Bioinorganic Photochemistry provides a comprehensive overview of the concepts and reactions fundamental to the field, illustrating important applications in biological, medical and environmental sciences. Topics covered include: Cosmic and environmental photochemistry Photochemistry of biologically relevant nanoassemblies Molecular aspects of photosynthesis Photoinduced electron transfer in biosystems Modern therapeutic strategies in photomedicine The book concludes with an outlook for the future of environmental protection, discussing emerging techniques in the field of pollution abatement, and the potential for bioinorganic photochemistry as a pathway to developing cheap, environmentally friendly sources of energy. Written as an authoritative guide for researchers involved in the development of bioinorganic photochemical processes, Bioinorganic Photochemistry is also accessible to scientists new to the field, and will be a key reference source for advanced courses in inorganic, and bioinorganic chemistry.

New Technologies and the Law of Armed Conflict - Hitoshi Nasu
2013-12-23

Modern technological development has been both rapid and fundamentally transformative of the means and methods of warfare, and of the broader environment in which warfare is conducted. In many cases, technological development has been stimulated by, and dedicated to, addressing military requirements. On other occasions, technological developments outside the military sphere affect or inform the conduct of warfare and military expectations. The introduction of new technologies such as information technology, space technologies, nanotechnology and robotic technologies into our civil life, and into warfare, is expected to influence the application and interpretation of the existing rules of the law of armed conflict. In this book, scholars and practitioners working in the fields critically examine the potential legal challenges arising from the use of new technologies and future directions of legal development in light of the specific characteristics and challenges each technology presents with regard to foreseeable humanitarian impacts upon the battlespace.

Chromic Phenomena - Peter Bamfield 2010-02-12

"Chromic phenomena, or those produced by materials which exhibit colour in response to a chemical or physical stimulus, have increasingly been at the heart of 'high-tec' developments in a variety of fields in the last decade. Many of the newer technologies, which are at the cutting edge of research, are multi-disciplinary, involving researchers from areas as diverse as physics, biology, materials science and electronic engineering. Chromic Phenomena covers five main areas: * Colour change materials, such as photochromic, thermochromic and electrochromic materials * Materials which absorb and reflect light - the

classical dyes and pigments * Luminescent phenomena, including phosphorescence, fluorescence and electroluminescence * Materials which absorb light and transfer energy, eg photosensitisers, infra-red absorbers and laser-addressable compounds * Phenomena involving the manipulation of light by chemicals, such as liquid crystals, lustre pigments, optoelectronics and photonics Providing an entry point both for new researchers and for established ones, this book, with its emphasis on the technological applications of these chromic phenomena, develops and investigates new applications for colour chemistry. It will be of interest to industrialists and professionals in the biological, medicinal, electronics/telecommunications and colorant industries, as well as academics in these fields."

Photosynthesis - Julian J. Eaton-Rye 2011-11-04

"Photosynthesis: Plastid Biology, Energy Conversion and Carbon Assimilation" was conceived as a comprehensive treatment touching on most of the processes important for photosynthesis. Most of the chapters provide a broad coverage that, it is hoped, will be accessible to advanced undergraduates, graduate students, and researchers looking to broaden their knowledge of photosynthesis. For biologists, biochemists, and biophysicists, this volume will provide quick background understanding for the breadth of issues in photosynthesis that are important in research and instructional settings. This volume will be of interest to advanced undergraduates in plant biology, and plant biochemistry and to graduate students and instructors wanting a single reference volume on the latest understanding of the critical components of photosynthesis.

Light, Water, Hydrogen - CRAIG GRIMES 2007-12-03

This book covers the field of solar production of hydrogen by water photo-splitting (photoelectrolysis) using semiconductor photoanodes. The emphasis of the discussion is on the use of nanotechnology in the field. The theories behind photocatalysis and photoelectrochemical processes responsible for hydrogen production are given in detail. This provides a state-of-the-art review of the semiconductor materials and methods used for improving the efficiency of the processes. The book also gives an account of the techniques used for making the nanostructures.

Developments and Innovation in Carbon Dioxide (CO₂) Capture and Storage Technology - M. Mercedes Maroto-Valer 2010-07-13

Carbon dioxide (CO₂) capture and storage (CCS) is the one advanced technology that conventional power generation cannot do without. CCS technology reduces the carbon footprint of power plants by capturing, and storing the CO₂ emissions from burning fossil-fuels and biomass. This volume provides a comprehensive reference on the state of the art research, development and demonstration of carbon storage and utilisation, covering all the storage options and their environmental impacts. It critically reviews geological, terrestrial and ocean sequestration, including enhanced oil and gas recovery, as well as other advanced concepts such as industrial utilisation, mineral carbonation, biofixation and photocatalytic reduction. Foreword written by Lord Oxburgh, Climate Science Peer Comprehensively examines the different methods of storage of carbon dioxide (CO₂) and the various concepts for utilisation Reviews geological sequestration of CO₂, including coverage of reservoir sealing and monitoring and modelling techniques used to verify geological sequestration of CO₂

Plants, Biotechnology and Agriculture - Denis Murphy 2011

At a time when the world's food supplies are increasingly unable to meet the needs of a burgeoning population, there is significant diversity of opinion concerning the benefits and perceived dangers of the application of biotechnology to food production. Plants, Biotechnology and Agriculture provides the reader with a guide to plants as both organisms and resources. The first half of the book gives an overview of plant biology, suitable for students of plant biology and agriculture as well as those without a biology background. This is followed by an outline of the human exploitation of plants, from domestication to scientific manipulation. Further chapters describe the technologies that are now being used to improve crops, society's responses to these technologies, and how they are being modified as a result. The book concludes with a discussion of future challenges for biotechnology in the face of rapid population growth, depletion of non-renewable resources and climate change.

Photosynthesis: Structures, Mechanisms, and Applications - Harvey J.M. Hou 2017-05-16

To address the environmental, socioeconomic, and geopolitical issues associated with increasing global human energy consumption, technologies for utilizing renewable carbon-free or carbon-neutral energy sources must be identified and developed. Among renewable sources, solar energy is quite promising as it alone is sufficient to meet

global human demands well into the foreseeable future. However, it is diffuse and diurnal. Thus effective strategies must be developed for its capture, conversion and storage. In this context, photosynthesis provides a paradigm for large-scale deployment. Photosynthesis occurs in plants, algae, and cyanobacteria and has evolved over 3 billion years. The process of photosynthesis currently produces more than 100 billion tons of dry biomass annually, which equates to a global energy storage rate of ~100 TW. Recently, detailed structural information on the natural photosynthetic systems has been acquired at the molecular level, providing a foundation for comprehensive functional studies of the photosynthetic process. Likewise, sophisticated spectroscopic techniques have revealed important mechanistic details. Such accomplishments have made it possible for scientists and engineers to construct artificial systems for solar energy transduction that are inspired by their biological counterparts. The book contains articles written by experts

and world leaders in their respective fields and summarizes the exciting breakthroughs toward understanding the structures and mechanisms of the photosynthetic apparatus as well as efforts toward developing revolutionary new energy conversion technologies. The topics/chapters will be organized in terms of the natural sequence of events occurring in the process of photosynthesis, while keeping a higher-order organization of structure and mechanism as well as the notion that biology can inspire human technologies. For example, the topic of light harvesting, will be followed by charge separation at reaction centers, followed by charge stabilization, followed by chemical reactions, followed by protection mechanisms, followed by other more specialized topics and finally ending with artificial systems and looking forward. As shown in the table of contents (TOC), the book includes and integrates topics on the structures and mechanisms of photosynthesis, and provides relevant information on applications to bioenergy and solar energy transduction.