Metal Organic Frameworks Design And Application

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Metal-organic Framework Membranes For Molecular Gas Separations Royal Society of Chemistry Presents state-of-the-art knowledge of heterogeneous catalysts including new applications in energy and environmental fields This book focuses on emerging techniques in heterogeneous catalysis, from new methodology for catalysts design and synthesis, surface studies and operando spectroscopies, ab initio techniques, to critical catalytic systems as relevant to energy and the environment. It provides the vision of addressing the foreseeable knowledge gap unfilled by classical knowledge in the field. Heterogeneous Catalysts: Advanced Design, Characterization and Applications begins with an overview on the evolution in catalysts synthesis and introduces readers to facets engineering on catalysts; electrochemical synthesis of nanostructured catalytic thin films; and bandgap engineering of semiconductor photocatalysts. Next, it examines how we are gaining a more precise understanding of catalytic events and materials under working conditions. It covers bridging pressure gap in surface catalytic studies; tomography in catalysts design; and resolving catalyst performance at nanoscale via fluorescence microscopy. Quantum approaches to predicting molecular reactions on catalytic surfaces follows that, along with chapters on Density Functional Theory in heterogeneous catalysis; first principles simulation of electrified interfaces in electrochemistry; and high-throughput computational design of

novel catalytic materials. The book also discusses embracing the energy and environmental challenges of the 21st century through heterogeneous catalysis and much more. Presents recent developments in heterogeneous catalysis with emphasis on new fundamentals and emerging techniques Offers a comprehensive look at the important aspects of heterogeneous catalysis Provides an applications-oriented, bottoms-up approach to a high-interest subject that plays a vital role in industry and is widely applied in areas related to energy and environment Heterogeneous Catalysts: Advanced Design, Characterization and Applications is an important book for catalytic chemists, materials scientists, surface chemists, physical chemists, inorganic chemists, chemical engineers, and other professionals working in the chemical industry.

Metal-Organic Frameworks with Heterogeneous Structures John Wiley & Sons

Metal-Organic Frameworks for Chemical Reactions: From Organic Transformations to Energy Applications brings together the latest information on MOFs materials, covering recent technology in the field of manufacturing and design. The book covers different aspects of reactions from energy storage and catalysts, including preparation, design and characterization techniques of MOFs material and applications. This comprehensive resource is ideal for researchers and advanced students studying metal-organic frameworks in academia and industry. Metal-organic frameworks (MOFs) are nanoporous polymers made up of inorganic metal focuses connected by natural ligands. These entities have become a hot area of research because of their exceptional physical and chemical properties that make them useful in di?erent ?elds, including medicine, energy and the environment. Since combination conditions strongly a?ect the properties of these compounds, it is especially important to choose an appropriate synthetic technique that produces a product with homogenous morphology, small size dispersion, and high thermal stability. Covers the synthetic advantages and versatile applications of metal-organic frameworks (MOFs) due to their organic-inorganic hybrid nature and unique porous structure Includes energy applications such as batteries, fuel storage, fuel cells, hydrogen evaluation reactions and super capacitors Features information on using MOFs as a replacement to conventional engineering materials because they are lightweight, less costly, environmentally-friendly and sustainable

Physicochemical Aspects of Metal-Organic Frameworks Royal Society of Chemistry

This unique compendium describes research progress on metal-organic framework (MOF) membranes for different relevant industrial gas separations. Specifically, the book focuses mainly on gas separations which are important in flue gas treatment, natural gas purification, hydrogen purification, and nuclear reprocessing. The advantages of using MOFs in mixed matrix membranes are discussed. Some of the pressing challenges in the field, and strategies to potentially overcome them are also distinctly outlined.This volume is a useful reference materials for professionals, academics, researchers and postgraduate students in chemical engineering and materials engineering.

Metal-Organic Frameworks for Chemical Reactions John Wiley & Sons
Metal-organic frameworks (MOFs) have emerged as a new family of nanoporous materials. With an enormous choice of inorganic/organic building blocks, MOFs possess a wide range of surface area, pore size, and functionality and, thus, have been considered versatile materials for many potential applications. This book presents a broad collection of recent modeling studies in the field of MOFs toward potential engineering applications, such as gas storage/separation, carbon capture, catalysis, water purification, and drug delivery. The subject of this book renders it unique, for while the various topics on MOFs boast vast literature, there is not yet a single coherent collection for modeling endeavors. The book will appeal to scientists, engineers, and students in the multidisciplinary intersections of materials science, chemistry, and engineering.

Applications of Metal-Organic Frameworks and Their Derived Materials World Scientific
Owing to the extensive interest in construction of functional metal organic frameworks (FMOFs), this book discusses the roles of functional groups on the structure and application of metal organic frameworks (MOFs). The contents of the book are classified based on the structural and chemical properties of organic functions, in order to make readers able to compare the different effects of each function on the structure and application of the MOFs. In each chapter, the chemical properties of applied functional groups are gathered to give deeper insight into the roles of organic functions in the structure and application of MOFs. In the function-application properties, the authors discuss how a functional group can dominate the host-guest chemistry of the MOFs and how this host-guest chemistry can expand the effectiveness and efficiency of the material in different fields of applications. Finally, function-structure properties are discussed. In function-application properties, it is discussed how a functional group can affect the topology, porosity, flexibility and stability of the framework. The features of this subject are novel and are presented for the first time.

Metal-Organic Frameworks Elsevier
This book examines the latest research and discovery in the use of MOFs in catalysis, highlighting the extent to which these materials have been embraced by the community.

Metal-Organic Frameworks for Chemical Reactions Springer Science & Business Media
A concise introduction to the chemistry and design principles behind important metal-organic frameworks and related porous materials Reticular chemistry has been applied to synthesize new classes of porous materials that are successfully used for myraid applications in areas such as gas separation, catalysis, energy, and electronics. Introduction to Reticular Chemistry gives an unique overview of the principles of the chemistry behind metal-organic frameworks (MOFs), covalent organic frameworks (COFs), and zeolitic imidazolate frameworks (ZIFs). Written by one of the pioneers in the field, this book covers all important aspects of reticular chemistry, including design and synthesis, properties and characterization, as well as current and future applications Designed to be an accessible resource, the book is written in an easy-to-understand style. It includes an extensive bibliography, and offers figures and videos of crystal structures that are available as an electronic supplement. Introduction to Reticular Chemistry: -Describes the underlying principles and design elements for the synthesis of important metal-organic frameworks (MOFs) and related materials -Discusses both real-life and future applications in various fields, such as clean energy and water adsorption -Offers all graphic material on a companion website -Provides first-hand knowledge by Omar Yaghi, one

of the pioneers in the field, and his team. Aimed at graduate students in chemistry, structural chemists, inorganic chemists, organic chemists, catalytic chemists, and others, Introduction to Reticular Chemistry is a groundbreaking book that explores the chemistry principles and applications of MOFs, COFs, and ZIFs.

The Chemistry of Metal-Organic Frameworks, 2 Volume Set Springer

- Microporous Organic Polymers: Design, Synthesis, and Function By J.-X. Jiang and A. I. Cooper - Hydrogen, Methane and Carbon Dioxide Adsorption in Metal-Organic Framework Materials By X. Lin, N. R. Champness, and M. Schröder -Doping of Metal-Organic Frameworks with Functional Guest Molecules and Nanoparticles By F. Schröder and R. A. Fischer -Chiral Metal-Organic Porous Materials: Synthetic Strategies and Applications in Chiral Separation and Catalysis By K. Kim, M. Banerjee, M. Yoon, and S. Das -Controlled Polymerization by Incarceration of Monomers in Nanochannels By T. Uemura and S. Kitagawa -Designing Metal-Organic Frameworks for Catalytic Applications L. Ma and W. Lin -Magnetic and Porous Molecule-Based Materials By N. Roques, V. Mugnaini, and J. Veciana

Metal-Organic Framework Nanocomposites Springer Nature

Metal-Organic Framework Nanocomposites: From Design to Application assembles the latest advances in MOF nanocomposites, emphasizing their design, characterization, manufacturing, and application and offering a wide-ranging view of these materials with exceptional physical and chemical properties. FEATURES Discusses various types of MOF materials, such as polyaniline MOF nanocomposites, magnetic MOF nanocomposites, and carbon nanotube-based MOF nanocomposites Includes chapters on the usage of these materials in pollutant removal, electrochemical devices, photocatalysts, biomedical applications, and other applications Covers different aspects of composite fabrication from energy storage and catalysts, including preparation, design, and characterization techniques Emphasizes the latest technology in the field of manufacturing and design Aimed at researchers, academics, and advanced students in materials science and engineering, this book offers a comprehensive overview and analysis of these extraordinary materials.

Metal-Organic Frameworks John Wiley & Sons

Metal-Organic Frameworks for Chemical Reactions: From Organic Transformations to Energy Applications brings together the latest information on MOFs materials, covering recent technology in the field of manufacturing and design. The book covers different aspects of reactions from energy storage and catalysts, including preparation, design and characterization techniques of MOFs material and applications. This comprehensive resource is ideal for researchers and advanced students studying metal-organic frameworks in academia and industry. Metal-organic frameworks (MOFs) are nanoporous polymers made up of inorganic metal focuses connected by natural ligands. These entities have become a hot area of research because of their exceptional physical and chemical properties that make them useful in di?erent ?elds, including medicine, energy and the environment. Since combination conditions strongly a?ect the properties of these compounds, it is especially important to choose an appropriate synthetic technique that produces a product with homogenous morphology, small size dispersion, and high thermal stability. Covers the synthetic advantages and versatile applications of metal-organic frameworks (MOFs) due to their organic-inorganic hybrid nature and unique porous structure Includes energy applications such as batteries, fuel storage, fuel cells, hydrogen evaluation reactions and super capacitors Features information on using MOFs as a replacement to conventional engineering materials because they are lightweight, less costly, environmentally-friendly and sustainable

Metal-Organic Frameworks (MOFs) for Environmental Applications Springer

Providing vital knowledge on the design and synthesis of specific metal-organic framework (MOF) classes as well as their properties, this ready reference summarizes the state of the art in chemistry. Divided into four parts, the first begins with a basic introduction to typical cluster units or coordination geometries and provides examples of recent and advanced MOF structures and applications typical for the respective class. Part II covers recent progress in linker chemistries, while special MOF classes and morphology design are described in Part III. The fourth part deals with advanced characterization techniques, such as NMR, in situ studies, and modelling. A final unique feature is the inclusion of data sheets of commercially available MOFs in the appendix, enabling experts and newcomers to the field to select the appropriate MOF for a desired application. A must-have reference for chemists, materials scientists, and engineers in academia and industry working in the field of catalysis, gas and water purification, energy storage, separation, and sensors.

Metal Organic Frameworks

John Wiley & Sons

This book presents a both detailed and comprehensive look at metal–organic frameworks (MOFs), a relatively new class of materials with a broad application potential. The beginning chapters focus on introducing the requisite fundamental knowledge of MOFs with respect to their classification, synthesis, functionalization approaches, and various other physiochemical facets such as structural morphology and coordination chemistry. The remaining chapters cover an array of diverse applications, from areas such as energy storage and environmental remediation, to drug delivery, biosensing, and tissue engineering. Featuring chapters dedicated to the design of novel MOF structures, as well as theoretical calculations via density functional theory and machine learning techniques, this book targets a wide readership of both academic and industrial researchers interested in an in-depth understanding of the latest MOF structure–function relationships, as well as their deployment in a wide variety of coordinated engineering applications.

Structural Design and Modification of Surface Anchored Metal-organic Frameworks: from Fundamental Study Towards Applications

Woodhead Publishing

Metal Organic Frameworks and Their Derivatives for Energy Conversion and Storage comprehensively covers the updated design and synthesis of metal organic frameworks (MOFs) and their derived materials, together with their applications in electrochemical energy conversion and storage. It starts with a systematic description of the rational structure design and facile fabrication methods of MOF-based materials and various MOF derivatives. Then representative examples of MOFs and MOF-derived materials used for solar water splitting, electrocatalysis, batteries and supercapacitors are demonstrated. Finally, developing trends, such as integrating MOFs with other smart materials and emerging 3D printing technology, is also covered. This book is suitable for a wide readership in material science, chemical science, energy field and engineering. Reviews the current research directions of metal-organic frameworks and their derived materials for electrochemical energy storage and conversion technologies Discusses synthesis and design strategies of metal-organic framework derived materials Focuses on the material-structure-property relationship and the impact towards the improved

performance of metal-organic framework materials

Elaboration And Applications Of Metal-organic Frameworks IGI Global

Metal Organic Frameworks: Fundamentals to Advanced offers a substantial and complete treatment of published results. The book includes a summary of current research, along with an in-depth explanation of Metal organic frameworks (MOFs) and applications in this versatile area. Metal organic frameworks (MOFs) are structured frameworks made up of metal ions and organic molecules. These materials are similar to sponges and can absorb, retain and remove molecules from their pores. As a result, metal-organic frameworks (MOFs) are the most rapidly evolving substances in chemistry with the highest surface areas due to their well-ordered pore structure.The exciting and vast surface area allows for more chemical reactions and molecule adsorption, hence this new resource provides the newest updates on the topics covered. Covers the synthetic advantages and versatile applications of metal-organic frameworks (MOFs) due to their organic-inorganic hybrid nature and unique porous structure Includes energy applications such as batteries, fuel storage, fuel cells, hydrogen evaluation reactions and super capacitors Features information on using MOFs as a replacement to conventional engineering materials as they are lightweight, less costly, environmentally-friendly and sustainable

The Chemistry of Metal-Organic Frameworks John Wiley & Sons

Hybrid organic-inorganic materials and the rational design of their interfaces open up the access to a wide spectrum of functionalities not achievable with traditional concepts of materials science. This innovative class of materials has a major impact in many application domains such as optics, electronics, mechanics, energy storage and conversion, protective coatings, catalysis, sensing and nanomedicine. The properties of these materials do not only depend on the chemical structure, and the mutual interaction between their nano-scale building blocks, but are also strongly influenced by the interfaces they share. This handbook focuses on the most recent investigations concerning the design, control, and dynamics of hybrid organic-inorganic interfaces, covering: (i) characterization methods of interfaces, (ii) innovative computational approaches and simulation of interaction processes, (iii) in-situ studies of dynamic aspects controlling the formation of these interfaces, and (iv) the role of the interface for process optimization, devices, and applications in such areas as optics, electronics, energy and medicine.

Functional Metal-Organic Frameworks: Gas Storage, Separation and Catalysis John Wiley & Sons

Providing vital knowledge on the design and synthesis of specific metal-organic framework (MOF) classes as well as their properties, this ready reference summarizes the state of the art in chemistry. Divided into four parts, the first begins with a basic introduction to typical cluster units or coordination geometries and provides examples of recent and advanced MOF structures and applications typical for the respective class. Part II covers recent progress in linker chemistries, while special MOF classes and morphology design are described in Part III. The fourth part deals with advanced characterization techniques, such as NMR, in situ studies, and modelling. A final unique feature is the inclusion of data sheets of commercially available MOFs in the appendix, enabling experts and newcomers to the field to select the appropriate MOF for a desired application. A must-have reference for chemists, materials scientists, and engineers in academia and industry

working in the field of catalysis, gas and water purification, energy storage, separation, and sensors.

Porous Organic Frameworks CRC Press
Metal–organic frameworks (MOFs) are crystalline porous materials constructed from metal ions/clusters and organic linkers, combining the merits of both organic and inorganic components. Due to high porosity, rich functionalities, well-defined open channels and diverse structures, MOFs show great potentials in field such as gas storage and separation, catalysis, and sensing. Combining them with polymers tunes their chemical, mechanical, electrical and optical properties, and endows MOFs with processability. Covalent organic frameworks (COFs) are crystalline porous materials built from organic molecular units with diverse structures and applications. Hybrid materials with intriguing properties can be achieved by appropriate preparation methods and careful selection of MOFs/COFs and polymers, broadening their potential applications. This book documents the latest research progress in MOF/COF-polymer hybrid materials and reviews and summarises hybridization strategies to achieve MOF/COF polymeric composites. It also introduces various applications and potential applicable scenarios of hybrid MOF/COF polymers. Hybrid Metal–Organic Framework and Covalent Organic Framework Polymers offers an overview to readers who are new to this field, and will appeal to graduate students and researchers working on porous materials, polymers, hybrid materials, and supramolecular chemistry.

Metal-Organic Frameworks for Photonics Applications John Wiley & Sons
The series Topics in Current Chemistry Collections presents critical reviews from the journal Topics in Current Chemistry organized in topical volumes. 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.

Metal-Organic Frameworks John Wiley & Sons
Metal-Organic Frameworks for Environmental Applications examines this important topic, looking at potential materials and methods for the remediation of pressing pollution issues, such as heavy-metal contaminants in water streams, radioactive waste disposal, marine oil-spillage, the treatment of textile and dye industry effluents, the clean-up of trace amounts of explosives in land and water, and many other topics. This survey of the cutting-edge research and technology of MOFs is an invaluable resource for researchers working in inorganic chemistry and materials science, but it is also ideal for graduate students studying MOFs and their applications. Examines the

applications of metal-organic frameworks for the remediation of environmental pollutants Features leading experts who research the applications of MOFs from around the world, including contributions from the United States, India and China Explores possible solutions to some of today's most pressing environmental challenges, such as heavy-metal contamination in bodies of water, oil spills and clean-up of explosives hidden in land and water Provides an excellent reference for researchers and graduate students studying in the areas of inorganic chemistry, materials chemistry and environmental science

Introduction to Reticular Chemistry American Chemical Society

This book describes the design, synthesis, characterization and applications of porous organic frameworks (POFs). Special emphasis is placed on the utilization of porous materials for CO2 capture and CH4 and H2 storage, which have promising potential for addressing the issues of environmental degradation and climate change. It also includes two chapters introducing the properties of POFs and defining the principles of synthesis, as well as a chapter dealing with post-modified POFs. This book is intended for those readers who are interested in porous materials and their applications. Guangshan Zhu is a professor at the College of Chemistry, Jilin University, China.