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Zeolites and Catalysis - Jiri Cejka 2010-05-27

This indispensable two-volume handbook covers everything on this hot research field. The first part deals with the synthesis, modification, characterization and application of catalytic active zeolites, while the second focuses on such reaction types as cracking, hydrocracking, isomerization, reforming and other industrially important topics. Edited by a highly experienced and internationally renowned team with chapters written by the "Who's Who" of zeolite research.

Solid State Chemistry and its Applications - Anthony R. West 2014-01-08

Solid State Chemistry and its Applications, 2nd Edition: Student Edition is an extensive update and sequel to the bestselling textbook Basic Solid State Chemistry, the classic text for undergraduate teaching in solid state chemistry worldwide. Solid state chemistry lies at the heart of many significant scientific advances from recent decades, including the discovery of high-temperature superconductors, new forms of carbon and countless other developments in the synthesis, characterisation and applications of inorganic materials. Looking forward, solid state chemistry will be crucial for the development of new functional materials in areas such as energy, catalysis and electronic materials. This revised edition of Basic Solid State Chemistry has been completely rewritten and expanded to present an up-to-date account of the essential topics and recent developments in this exciting field of inorganic chemistry. Each section commences with a gentle introduction, covering basic principles, progressing seamlessly to a more advanced level in order to present a comprehensive overview of the subject. This new Student Edition includes the following updates and new features: Expanded coverage of bonding in solids, including a new section on covalent bonding and more extensive treatment of metallic bonding. Synthetic methods are covered extensively and new topics include microwave synthesis, combinatorial synthesis, mechano-synthesis, atomic layer deposition and spray pyrolysis. Revised coverage of electrical, magnetic and optical properties, with additional material on semiconductors, giant and colossal magnetoresistance, multiferroics, LEDs, fibre optics and solar cells, lasers, graphene and quasicrystals. Extended chapters on crystal defects and characterisation techniques. Published in full colour to aid comprehension. Extensive coverage of crystal structures for important families of inorganic solids is complemented by access to CrystalMaker® visualization software, allowing readers to view and rotate over 100 crystal structures in three dimensions. Solutions to exercises and supplementary lecture material are available online. Solid State Chemistry and its Applications, 2nd Edition: Student Edition is a must-have textbook for any undergraduate or new research worker studying solid state chemistry.

Zeolites and Zeolite-Like Materials - Bert Sels 2016-02-01

Zeolites and Zeolite-like Materials offers a comprehensive and up-to-date review of the important areas of zeolite synthesis, characterization, and applications. Its chapters are written in an educational, easy-to-

understand format for a generation of young zeolite chemists, especially those who are just starting research on the topic and need a reference that not only reflects the current state of zeolite research, but also identifies gaps and opportunities. The book demonstrates various applications of zeolites in heterogeneous catalysis and biomass conversion and identifies the endless possibilities that exist for this class of materials, their structures, functions, and future applications. In addition, it demonstrates that zeolite-like materials should be regarded as a living body developing towards new modern applications, thereby responding to the needs of modern technology challenges, including biomass conversion, medicine, laser techniques, and nanomaterial design, etc. The book will be of interest not only to zeolite-focused researchers, but also to a broad scientific and non-scientific audience. Provides a comprehensive review of the literature pertaining to zeolites and zeolite-like materials since 2000 Covers the chemistry of novel zeolite-like materials such as Metal-Organic Frameworks (MOFs), Covalent Organic Frameworks (COFs), hierarchical zeolite materials, new mesoporous and composite zeolite-like micro/mesoporous materials Presents essential information of the new zeolite-like structures, with a balanced coverage of the most important areas of the zeolite research (synthesis, characterization, adsorption, catalysis, new applications of zeolites and zeolite-like materials) Contains chapters prepared by known specialists who are members of the International Zeolite Association

Zeolites Karmen Margeta 2020-07-22

Natural resources, such as zeolite minerals, have an inexhaustible potential for scientific research and application. Both natural and synthetic zeolites have application in many researched areas including water and soil industries, biochemistry, and medicine due to their environmental and economic acceptability, unique structure, and specific characteristics. Over three sections, this book presents a comprehensive overview of zeolites and their potential applications in science. Chapters cover such topics as the history of zeolites, their structure and properties, layered zeolites, and use of zeolites for gas storage and separation as well as in veterinary medicine.

Zeolites in Sustainable Chemistry - Feng-Shou Xiao 2015-09-28

This book is devoted to the new development of zeolitic catalysts with an emphasis on new strategies for the preparation of zeolites, novel techniques for their characterization and emerging applications of zeolites as catalysts for sustainable chemistry, especially in the fields of energy, biomass conversion and environmental protection. Over the years, energy and the environment have become the most important global issues, while zeolitic catalysts play important roles in addressing them. With individual chapters written by leading experts, this book offers an essential reference work for researchers and professionals in both academia and industry. Feng-Shou Xiao is a Professor at the Department of Chemistry, Zhejiang University, China. Xiangju Meng is an Associate Professor at the Department of Chemistry, Zhejiang

University, China.

Chemistry of Silica and Zeolite-Based Materials - Abderrazzak Douhal 2019-07-04

Chemistry of Silica and Zeolite-Based Materials covers a wide range of topics related to silica-based materials from design and synthesis to applications in different fields of science and technology. Since silica is transparent and inert to the light, it is a very attractive host material for constructing artificial photosynthesis systems. As an earth-abundant oxide, silica is an ideal and basic material for application of various oxides, and the science and technology of silica-based materials are fundamentally important for understanding other oxide-based materials. The book examines nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, photonics, photosensors, photovoltaics, energy, environmental sciences, drug delivery, and health. Written by a highly experienced and internationally renowned team from around the world, Chemistry of Silica and Zeolite-Based Materials is ideal for chemists, materials scientists, chemical engineers, physicists, biologists, biomedical sciences, environmental scientists, toxicologists, and pharma scientists. --- "The enormous versatility of silica for building a large variety of materials with unique properties has been very well illustrated in this book.... The reader will be exposed to numerous potential applications of these materials - from photocatalytic, optical and electronic applications, to chemical reactivity in confined spaces and biological applications. This book is of clear interest not only to PhD students and postdocs, but also to researchers in this field seeking an understanding of the possible applications of meso and microporous silica-derived materials." - Professor Avelino Corma, Institute of Chemical Technology (ITQ-CSIC) and Polytechnical University of Valencia, Spain Discusses the most important advances in various fields using silica materials, including nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, and other topics Written by a global team of experts from a variety of science and technology disciplines Ideal resource for chemists, materials scientists, and chemical engineers working with oxide-based materials

Zeolites - Bojan Držaj 1985

The synthesis of zeolites with desired structure and properties is of great importance for the preparation of highly active and selective catalysts for inorganic and organic reactions. The zeolite matrix offers unique possibilities for carrying out molecular shape-selective catalysis and this places the zeolite matrices among the most successful tools used in molecular engineering on a large scale. These proceedings cover the most recent developments in the fields of synthesis, structure determination and technological use of zeolites. The papers give detailed explanations of the processes involved in the mechanisms of zeolite synthesis. Special attention is focussed on complex ionic equilibria which occur in the starting hydrogel, to the "templating effect" and to the kinetics of zeolite formation. New powerful methods for structure determination of these materials, which usually consist of small crystals, are presented e.g. neutron diffraction and X-ray diffraction using synchrotron radiation. The distribution of tetrahedrally coordinated framework-constituent elements and their interaction with adsorbates is revealed by using high magnetic field nuclear magnetic resonance with sample spinning at "magic" angle (MAS NMR). Quite a number of articles are devoted to the dependence of the physico-chemical properties of zeolites on the parameters set during their synthesis. Descriptions are given of the possible technological use of synthetic zeolites in the fields of adsorption, catalysis, the production of laundry detergents, the removal of radioactive wastes, and the technological use of natural zeolites in the fields of animal feeding, municipal water treatment, paper and cement production, and energy storage. This book will be of interest to scientists working in the fields of catalysis, surface science, inorganic chemistry, materials science, petrochemistry, solid state physics, crystallography and geology.--[Source inconnue].

Zeolites and Mesoporous Materials at the Dawn of the 21st Century - A. Galarneau 2001-08-13

The Zeolites and Mesoporous Materials at the Dawn of the 21st Century Proceedings are the expression of the oral and poster communications which were presented during the 13th International Zeolite Conference (IZC). They are subdivided into 32 thematic sessions starting from the genesis of materials to their applications through their characterisation. The paper volume contains the full texts of the 5 plenary and 6 keynote lectures and informative summaries of 150 oral and 540 poster presentations. These contributions have been selected among the 903 submissions received from a total of 57 countries! In order to gather all the communications in a handy document, the full texts of oral and poster presentations are

available in CD-ROM. Besides the fields of zeolite science always represented at IZC (synthesis, characterisation, catalysis, etc.), some subjects strengthened their position (mesoporous materials, theory and modelling), new areas emerge (advanced materials, environmental and life sciences) and older ones regain interest (natural zeolites). The understanding and development of the unique properties of porous materials relies on a unique blend of multidisciplinary knowledge: material science, with the implication of organic and colloid chemistry, to prepare micro- and mesoporous materials, surface and adsorption science sustained by theory and modelling to understand the peculiar behaviour of molecules in confined systems, special branches of catalysis, physics, chemical engineering and life science to design novel applications. The gathering of these elements is at the basis of a fruitful and evolutionary zeolite science, as it is hopefully reflected by these proceedings.

Focus on Solid State Chemistry - Arte M. Newman 2007

This book on solid state chemistry presents studies of chemical, structural, thermodynamic, electronic, magnetic, and optical properties and processes in solids. Research areas include: bonding in solids, crystal chemistry, crystal growth mechanisms, diffusion epitaxy, high-pressure processes, magnetic properties of materials, optical characterisation of materials, order-disorder, phase equilibria and transformation mechanisms, reactions at surfaces, statistical mechanics of defect interactions, structural studies and transport phenomena.

Handbook of Zeolite Science and Technology - Scott M. Auerbach 2003-07-31

The Handbook of Zeolite Science and Technology offers effective analyses of salient cases selected expressly for their relevance to current and prospective research. Presenting the principal theoretical and experimental underpinnings of zeolites, this international effort is at once complete and forward-looking, combining fundamental

Innovation in Zeolite Materials Science - P.J. Grobet 2011-09-22

The proceedings of this zeolite scientific meeting reflect the growing drive to discover new materials. It is evident that zeolite materials science is in a post-ZSM-5 period - pushed by a massive expansion of new compositions and topologies, and the application of new scientific tools. Four new zeolite topologies were detailed at this meeting. Important new trends were the resurgence of interest in computational and theoretical approaches to explain synthesis, sorption and catalytic data, and the increasing use of NMR and high-resolution imaging.

Zeolite Synthesis - Mario L. Occelli 1989

This volume is a complete progress report on the various aspects of zeolite synthesis on a molecular level. It provides many examples that illustrate how zeolites can be crystallized and what the important parameters are that control crystallization. Forty-two chapters cover such topics as: crystallization techniques; gel chemistry; crystal size and morphology; the role of organic compounds; and novel synthesis procedures. It offers a complete review of zeolite synthesis as well as the latest finding in this important field. Contains benchmark contributions from many notable pioneers in the field, including R.M. Barrer, H. Robson, and Robert Milton.

Environmentally Friendly Zeolites - Rafael Chaves Lima 2019-05-24

This book details zeolites, their structures and the parameters that influence their synthesis, providing a new and actual perspective of this field. Following this, the authors show different processes used to synthesize zeolites using residues, natural materials, and other eco-friendly materials such as raw powder glass, clays, aluminum cans, diatomites, rice ashes or coal ashes. Finally, this book gives the reader a wide range of different synthesis methods that they can be applied to several industrial processes.

Zeolites in Sustainable Chemistry - Feng-Shou Xiao 2016-08-23

This book is devoted to the new development of zeolitic catalysts with an emphasis on new strategies for the preparation of zeolites, novel techniques for their characterization and emerging applications of zeolites as catalysts for sustainable chemistry, especially in the fields of energy, biomass conversion and environmental protection. Over the years, energy and the environment have become the most important global issues, while zeolitic catalysts play important roles in addressing them. With individual chapters written by leading experts, this book offers an essential reference work for researchers and professionals in both academia and industry. Feng-Shou Xiao is a Professor at the Department of Chemistry, Zhejiang

University, China. Xiangju Meng is an Associate Professor at the Department of Chemistry, Zhejiang University, China.

Zeolite Microporous Solids: Synthesis, Structure, and Reactivity - Rui Diwu 2012-11-05

Intensive research on zeolites, during the past thirty years, has resulted in a deep understanding of their chemistry and in a true zeolite science, including synthesis, structure, chemical and physical properties, and catalysis. These studies are the basis for the development and growth of several industrial processes applying zeolites for selective sorption, separation, and catalysis. In 1983, a NATO Advanced Study Institute was organized in Alcabideche (portugal) to establish the State-of-the-Art in Zeolite Science and Technology and to contribute to a better understanding of the structural properties of zeolites, the configurational constraints they may exert, and their effects in adsorption, diffusion, and catalysis. Since then, zeolite science has witnessed an almost exponential growth in published papers and patents, dealing with both fundamentals issues and original applications. The proposal of new procedures for zeolite synthesis, the development of novel and sophisticated physical techniques for zeolite characterization, the discovery of new zeolitic and related microporous materials, progresses in quantum chemistry and molecular modeling of zeolites, and the application of zeolites as catalysts for organic reactions have prompted increasing interest among the scientific community. An important and harmonious interaction between various domains of Physics, Chemistry, and Engineering resulted therefrom.

Zeolite Chemistry and Applications - Benoit Louis 2020-04-20

Introduction to Zeolite Science and Practice - E.M. Flanigen 1991-02-05

Zeolites and related molecular sieves have quickly become important pathways to new opportunities in the fields of oil processing and petrochemical synthesis. The signs of intense activity in both industry and academia are evident: burgeoning papers and patent applications; increasing numbers of industrial zeolite-based processes and their rapid expansion into organic chemicals manufacturing; recent progress in zeolite accessibility range, matrix behaviour, lattice components and satellite structures; and the recognition that zeolites, which are stable and can be regenerated, may be incorporated into new, environmentally friendly processes. This volume offers a thorough, up-to-date introduction to zeolites and such related materials as crystalline aluminium phosphates and clays. Its 16 chapters, each written by specialists, provide detailed treatments of zeolite theory (including a review of major developments), zeolite laboratory and research practice, and zeolite industry applications. Students and individuals entering the field will find *Introduction to Zeolite Science and Practice* a thorough guidebook. Experienced researchers will appreciate its in-depth coverage of the zeolite spectrum, including the latest views on zeolite structure, characterization and applications.

Zeolites and Zeolite-like Materials - Bert Sels 2016-07-29

Zeolites and Zeolite-like Materials offers a comprehensive and up-to-date review of the important areas of zeolite synthesis, characterization, and applications. Its chapters are written in an educational, easy-to-understand format for a generation of young zeolite chemists, especially those who are just starting research on the topic and need a reference that not only reflects the current state of zeolite research, but also identifies gaps and opportunities. The book demonstrates various applications of zeolites in heterogeneous catalysis and biomass conversion and identifies the endless possibilities that exist for this class of materials, their structures, functions, and future applications. In addition, it demonstrates that zeolite-like materials should be regarded as a living body developing towards new modern applications, thereby responding to the needs of modern technology challenges, including biomass conversion, medicine, laser techniques, and nanomaterial design, etc. The book will be of interest not only to zeolite-focused researchers, but also to a broad scientific and non-scientific audience. Provides a comprehensive review of the literature pertaining to zeolites and zeolite-like materials since 2000 Covers the chemistry of novel zeolite-like materials such as Metal-Organic Frameworks (MOFs), Covalent Organic Frameworks (COFs), hierarchical zeolite materials, new mesoporous and composite zeolite-like micro/mesoporous materials Presents essential information of the new zeolite-like structures, with a balanced coverage of the most important areas of the zeolite research (synthesis, characterization, adsorption, catalysis, new applications of zeolites and zeolite-like materials) Contains chapters prepared by known specialists who are members of

the International Zeolite Association

Catalysis and Zeolites - Jens Weitkamp 1999-06

Zeolites and zeolite-like microporous materials have been playing an ever-increasing role in heterogeneous catalysis for more than three decades. An impressive number of large-scale industrial processes in petroleum refining, petrochemistry and the manufacture of organic chemicals are nowadays carried out using zeolite catalysts, and the future of zeolites in industrial catalysis continues to be bright. Authored by an international team of renowned scientists, the seven chapters of this book present a comprehensive overview of the application of zeolites in industrial catalysis, while also providing a true scientific understanding of how zeolites are synthesized, modified and characterized, and putting special emphasis on shape-selective catalysis, which is a unique feature of zeolites.

Zeolites in Catalysis - Russell E Morris 2017-06-01

Covering the breadth of zeolite chemistry and catalysis, this book provides the reader with a complete introduction to field, covering synthesis, structure, characterisation and applications. Beginning with the history of natural and synthetic zeolites, the reader will learn how zeolite structures are formed, synthetic routes, and experimental and theoretical structure determination techniques. Their industrial applications are covered in-depth, from their use in the petrochemical industry, through to fine chemicals and more specialised clinical applications. Novel zeolite materials are covered, including hierarchical zeolites and two-dimensional zeolites, showcasing modern developments in the field. This book is ideal for newcomers who need to get up to speed with zeolite chemistry, and also experienced researchers who will find this a modern, up-to-date guide.

Chemistry of Silica and Zeolite-Based Materials - Abderrazzak Douhal 2019-07

Chemistry of Silica and Zeolite-Based Materials: Synthesis, Characterization and Applications covers a wide range of topics related to silica-based materials-from design and synthesis, to applications in different fields of science and technology. As an earth-abundant oxide, silica is an ideal and basic material for the application of various oxides, thus the science and technology of silica-based materials are fundamentally important for understanding other oxide-based materials. The book examines nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, photonics, photosensors, photovoltaics, energy, environmental sciences, drug delivery, and health. Written by a highly experienced and internationally renowned team from around the world, this book is ideal for chemists, material scientists, chemical engineers, physicists, biologists, biomedical sciences, environmental scientists, toxicologists and pharma scientists. Discusses the most important advances in various fields using silica materials, including nanosolvation and confined molecules in silica hosts, catalysis and photocatalysis, and other topics Written by a global team of experts from a variety of science and technology disciplines Presents an ideal resource for chemists, material scientists and chemical engineers working with oxide-based materials

Bioresource Utilization and Management - Hrudayanath Thatoi 2021-10-07

The need for exploration, conservation, and sustainable utilization of bioresources is undeniable for the survival and growth of mankind. This new book throws light on new and recent research on and development of effective strategies for sustainable utilization of bioresources using modern tools and techniques to help meet this challenge. This volume addresses the utilization of bioresources in therapeutics, in biofuel, in agriculture, and in environmental protection. Beginning with the diverse potential applications of bioresources in food, medicine, and cosmetics, the volume goes on to address the various different underutilized bioresources and their sustainable uses. It discusses important advances in biofuel and patents that highlight recent developments that address the energy crises and the continuously fluctuating cost of petroleum. It explores new renewable energy sources from bioresources and their sustainable utilization in the bioenergy and biofuel industry. Several chapters focus on the sustainable utilization of bioresources in the agricultural sector. The volume considers that developing countries have huge agricultural resources that could be employed for production of value-added byproducts for the sustainable development of a bio-based economy. The book discusses efficient use of underexploited natural bioresources, new chemical approaches for the generation of novel biochemicals, and the applications of genetics approaches for bioresource conservation and production of value-added products. Further, strategies for the production of biopesticides utilizing bioresources are also discussed.

Encyclopedia of Supramolecular Chemistry - J. L. Atwood 2004

Covers the fundamentals of supramolecular chemistry; supramolecular advancements and methods in the areas of chemistry, biochemistry, biology, environmental and materials science and engineering, physics, computer science, and applied mathematics.

Zeolites - Moisey K. Andreyev 2012-06-01

Zeolites, mainly consisting of silicon, aluminium, and oxygen atoms that connect in three-dimensional frameworks, are three-dimensional microporous or mesoporous materials. They are widely used in many applications, such as catalysts, catalyst supports, membranes, etc. In this book, the authors present current research in the study of the synthesis, chemistry and applications of zeolites. Topics include the conversion of ethanol to hydrocarbons over zeolite catalysts; air pollution catalytic control by metal promoted zeolites; zeolite from fly ash-iron oxide magnetic nanocomposites; application of zeolite containing rocks in berry crop growing; and dealuminated zeolites in biological systems.

Advanced Zeolite Science and Applications - Michael Stöcker 1994-07-19

Zeolites and related microporous materials are used in oil processing and in the fine and petrochemical industries on a large scale. New applications of zeolites contribute to environmentally friendly processes and refined zeolites such as catalytic zeolite membranes and zeolites containing exhaust-pipe reactors are being introduced. Recent diversity in zeolite research has been fueled by the increase in number of microporous materials and the combination with interfacing science areas. The possibility to accommodate ions, large molecules or nanostructures in the crystalline matrix has been explored and the performance of electronic, acoustic and photonic modified response of the materials has been tested. This volume provides up-to-date information on new zeolite and related materials and composites, their applications, testing of new processes and techniques, and promising laboratory results as well. A vast amount of work from a fundamental aspect is incorporated. In particular, the combination of science and application offers useful information for readers interested in molecular sieves.

Modern Inorganic Synthetic Chemistry - Ruren Xu 2017-02-11

Modern Inorganic Synthetic Chemistry, Second Edition captures, in five distinct sections, the latest advancements in inorganic synthetic chemistry, providing materials chemists, chemical engineers, and materials scientists with a valuable reference source to help them advance their research efforts and achieve breakthroughs. Section one includes six chapters centering on synthetic chemistry under specific conditions, such as high-temperature, low-temperature and cryogenic, hydrothermal and solvothermal, high-pressure, photochemical and fusion conditions. Section two focuses on the synthesis and related chemistry problems of highly distinct categories of inorganic compounds, including superheavy elements, coordination compounds and coordination polymers, cluster compounds, organometallic compounds, inorganic polymers, and nonstoichiometric compounds. Section three elaborates on the synthetic chemistry of five important classes of inorganic functional materials, namely, ordered porous materials, carbon materials, advanced ceramic materials, host-guest materials, and hierarchically structured materials. Section four consists of four chapters where the synthesis of functional inorganic aggregates is discussed, giving special attention to the growth of single crystals, assembly of nanomaterials, and preparation of amorphous materials and membranes. The new edition's biggest highlight is Section five where the frontier in inorganic synthetic chemistry is reviewed by focusing on biomimetic synthesis and rationally designed synthesis. Focuses on the chemistry of inorganic synthesis, assembly, and organization of wide-ranging inorganic systems Covers all major methodologies of inorganic synthesis Provides state-of-the-art synthetic methods Includes real examples in the organization of complex inorganic functional materials Contains more than 4000 references that are all highly reflective of the latest advancement in inorganic synthetic chemistry Presents a comprehensive coverage of the key issues involved in modern inorganic synthetic chemistry as written by experts in the field

Advances in Geopolymer-Zeolite Composites - Petrică Vizureanu 2021-10-13

Geopolymers and zeolites as eco-friendly materials can participate in cutting-edge research and applications due to their tailored properties, including superabsorbent capacity, heavy metals encapsulation, flame retardancy, mechanical performance, electrokinetic behaviour, corrosion resistance, and thermal properties. This book joins activities and knowledge of researchers from multiple fields to

present a comprehensive overview of the advances in synthesis and characterization of geopolymers and zeolites, including base chemistry concepts, nanoscale characterization, and applications in top-level industry.

Oxide-based Systems at the Crossroads of Chemistry - C. Colella 2001-11-27

This volume includes papers presented at the second International Workshop on Oxide-based Systems at the Crossroads of Chemistry, held at Villa Olmo in Como, Italy, 8-11 October. The selected papers present the highlights of recent research in the field of oxide structure. A wide range of oxidic materials, including real oxides, zeolites and layer-structured systems, is considered and described in terms of preparation methods, structural characterization and the relation between active sites, structure and catalytic properties. The application of the most powerful simulation and physical-chemical techniques show their usefulness in discovering and explaining structural and dynamic properties of complex materials. Moreover the development of sophisticated spectroscopical and analytical techniques are shown to significantly improve the growth of surface oxide science, generating new tools for the knowledge of catalyst structure and reaction mechanisms. An interesting feature is the inclusion of papers which show the mutual roles of experiment and theoretical models.

Zeolites in Industrial Separation and Catalysis - S. Kulprathipanja 2010-01-26

This first book to offer a practical overview of zeolites and their commercial applications provides a practical examination of zeolites in three capacities. Edited by a globally recognized and acclaimed leader in the field with contributions from major industry experts, this handbook and ready reference introduces such novel separators as zeolite membranes and mixed matrix membranes. The first part of the book discusses the history and chemistry of zeolites, while the second section focuses on separation processes. The third and final section treats zeolites in the field of catalysis. The three sections are unified by an examination of how the unique properties of zeolites allow them to function in different capacities as an adsorbent, a membrane and as a catalyst, while also discussing their impact within the industry.

Synthesis of Inorganic Materials - Ulrich Schubert 2012-03-26

Due to their use and importance in many fields, a great deal of research focuses on developing inorganic materials. For example, a computer contains many types of inorganic materials, including the glass in the display or a layer of the LCD screen, the metal wires, and semiconductor materials in the chips and other electronic components. Computers can even be powered by solar cells, which also include inorganic materials. Zeolites also belong to this class and are found in applications ranging from catalysts to cat litter. This third edition of the popular textbook contains 30% new and/or revised content to reflect the latest developments in this fast developing field. Written from the chemist's point of view, the well-known and experienced authors provide a thorough and pedagogical introduction, now including example real-life applications of the syntheses, as well as new sections on nanomaterials, templating methods and biomineralization. A valuable resource for advanced undergraduates as well as masters and graduate students in inorganic chemistry and materials science.

Zeolites and Related Microporous Materials: State of the Art 1994 - W. Hölderich 1994-07-08

These proceedings, comprising 7 plenary lectures, 100 oral and 175 poster presentations, reflect present activities in the field of microporous materials. The International Zeolite Conferences are devoted to all aspects of zeolite science and technology. The term zeolite is to be understood in its broadest sense comprising all kinds of crystalline microporous materials regardless of their composition (e.g. aluminosilicates and other metasilicates, silica, aluminophosphates, gallophosphates etc.), occurring in nature or synthesized by man. Mesoporous silica, aluminosilicates and other metasilicates, as recently discovered are also included. Zeolite catalysis continues to be an area of particular interest, not only the classical hydrocarbon conversions but also zeolite catalysis of oxidation reactions, formation of a greater variety of organic compounds and environmental catalysis. Much work has been done on the synthesis of zeolites and zeolite-like materials, which is reflected in the large number of contributions to these proceedings. Improvement of techniques for investigation has stimulated interest in adsorption and diffusion studies. Other areas enjoying increasing attention are modelling, theory, and novel materials.

Chemistry of Zeolites and Related Porous Materials - Ruren Xu 2009-05-29

Widely used in adsorption, catalysis and ion exchange, the family of molecular sieves such as zeolites has

been greatly extended and many advances have recently been achieved in the field of molecular sieves synthesis and related porous materials. Chemistry of Zeolites and Related Porous Materials focuses on the synthetic and structural chemistry of the major types of molecular sieves. It offers a systematic introduction to and an in-depth discussion of microporous, mesoporous, and macroporous materials and also includes metal-organic frameworks. Provides focused coverage of the key aspects of molecular sieves Features two frontier subjects: molecular engineering and host-guest advanced materials Comprehensively covers both theory and application with particular emphasis on industrial uses This book is essential reading for researchers in the chemical and materials industries and research institutions. The book is also indispensable for researchers and engineers in R&D (for catalysis) divisions of companies in petroleum refining and the petrochemical and fine chemical industries.

Essentials of Inorganic Materials Synthesis - C. N. R. Rao 2015-04-06

This compact handbook describes all the important methods of synthesis employed today for synthesizing inorganic materials. Some features: Focuses on modern inorganic materials with applications in nanotechnology, energy materials, and sustainability Synthesis is a crucial component of materials science and technology; this book provides a simple introduction as well as an updated description of methods Written in a very simple style, providing references to the literature to get details of the methods of preparation when required

Zeolites and Their Applications - Mohamed Nageeb Rashed 2018-06-27

Zeolites are hydrated aluminosilicate minerals of the family of microporous solids. According to the US Geological Survey, there are about 40 naturally occurring zeolites, forming in sedimentary and volcanic rocks. The most commonly mined forms include clinoptilolite, chabazite and mordenite. There are over 200 synthetic zeolites. For their abundance, natural and synthetic zeolites are widely used in the industry, agriculture, water treatment, wastewater treatment and as dietary supplements to treat diarrhea, autism, cancer and other. This book Zeolites and Their Applications deals with several aspects of zeolite morphology, synthesis and applications. The book is divided into three sections and structured into nine chapters. The first section includes the introductory chapter, the second section explains mineralogy, morphology and synthesis of zeolites and the third section focuses on the different applications of both natural and synthetic zeolites. So, in this book, the readers will obtain updated information on mineralogy, morphology, synthesis and application of zeolites. Scientists from different scientific fields reported in this book their findings.

Zeolites in Catalysis - Jiří Čejka 2017-06-07

Covering the breadth of zeolite chemistry and catalysis, this book provides the reader with a complete introduction to field, covering synthesis, structure, characterisation and applications. Beginning with the history of natural and synthetic zeolites, the reader will learn how zeolite structures are formed, synthetic routes, and experimental and theoretical structure determination techniques. Their industrial applications are covered in-depth, from their use in the petrochemical industry, through to fine chemicals and more specialised clinical applications. Novel zeolite materials are covered, including hierarchical zeolites and two-dimensional zeolites, showcasing modern developments in the field. This book is ideal for newcomers who need to get up to speed with zeolite chemistry, and also experienced researchers who will find this a modern, up-to-date guide.

Insights into the Chemistry of Organic Structure-Directing Agents in the Synthesis of Zeolitic Materials - Luis Gómez-Hortigüela 2018-03-31

This edited volume focuses on the host-guest chemistry of organic molecules and inorganic systems during synthesis (structure-direction). Organic molecules have been used for many years in the synthesis of zeolitic nanoporous frameworks. The addition of these organic molecules to the zeolite synthesis mixtures provokes a particular ordering of the inorganic units around them that directs the crystallization pathway towards a particular framework type; hence they are called structure-directing agents. Their use has allowed the discovery of an extremely large number of new zeolite frameworks and compositions. This volume covers the main aspects of the use of organic molecules as structure-directing agents for the synthesis of zeolites, including first an introduction of the main concepts, then two chapters covering state-of-the-art techniques currently used to understand the structure-directing phenomenon (location of molecules by XRD and

molecular modeling techniques). The most recent trends in the types of organic molecules used as structure-directing agents are also presented, including the use of metal-complexes, the use of non-ammonium-based molecules (mainly phosphorus-based compounds) and the role of supramolecular chemistry in designing new large organic structure-directing agents produced by self-aggregation. In addition the volume explores the latest research attempting to transfer the asymmetric nature of organic chiral molecules used as structure-directing agents to the zeolite lattice to produce chiral enantioselective frameworks, one of the biggest challenges today in materials chemistry. This volume has interdisciplinary appeal and will engage scholars from the zeolite community with a general interest in microporous materials, which involves not only zeolite scientists, but also researchers working on metal-organic framework materials. The concepts covered will also be of interest for researchers working on the application of materials after encapsulation of molecules of interest in post-synthetic treatments. Further the work explores the main aspects of host-guest chemistry in hybrid organo-inorganic templated materials, which covers all types of materials where organic molecules are used as templates and are confined within framework-structured inorganic materials (intercalation compounds). Therefore the volume is also relevant to the wider materials chemistry community.

Mesoporous Zeolites - Javier García-Martínez 2015-05-26

Authored by a top-level team of both academic and industrial researchers in the field, this is an up-to-date review of mesoporous zeolites. The leading experts cover novel preparation methods that allow for a purpose-oriented fine-tuning of zeolite properties, as well as the related materials, discussing the specific characterization methods and the applications in close relation to each individual preparation approach. The result is a self-contained treatment of the different classes of mesoporous zeolites. With its academic insights and practical relevance this is a comprehensive handbook for researchers in the field and related areas, as well as for developers from the chemical industry.

Introduction to Porous Materials - Pascal Van Der Voort 2019-08-19

The first comprehensive textbook on the timely and rapidly developing topic of inorganic porous materials This is the first textbook to completely cover a broad range of inorganic porous materials. It introduces the reader to the development of functional porous inorganic materials, from the synthetic zeolites in the 50's, to today's hybrid materials such as metal-organic frameworks (MOFs), covalent organic frameworks (COFs) and related networks. It also provides the necessary background to understand how porous materials are organized, characterized, and applied in adsorption, catalysis, and many other domains. Additionally, the book explains characterization and application from the materials scientist viewpoint, giving the reader a practical approach on the characterization and application of the respective materials. Introduction to Inorganic Porous Materials begins by describing the basic concepts of porosity and the different types of pores, surfaces, and amorphous versus crystalline materials, before introducing readers to nature's porous materials. It then goes on to cover everything from adsorption and catalysis to amorphous materials such as silica to inorganic carbons and Periodic Mesoporous Organosilicas (PMOs). It discusses the synthesis and applications of MOFs and the broad family of COFs. It concludes with a look at future prospects and emerging trends in the field. The only complete book of its kind to cover the wide variety of inorganic and hybrid porous materials A comprehensive reference and outstanding tool for any course on inorganic porous materials, heterogeneous catalysis, and adsorption Gives students and investigators the opportunity to learn about porous materials, how to characterize them, and understand how they can be applied in different fields Introduction to Inorganic Porous Materials is an excellent book for students and professionals of inorganic chemistry and materials science with an interest in porous materials, functional inorganic materials, heterogeneous catalysis and adsorption, and solid state characterization techniques.

Zeolites and Catalysis - Jiri Cejka 2010-06-01

Zeolites and Catalysis Microporous, aluminosilicate minerals with regularly structured pores offer access to a wide range of applications in both academia and industry. This indispensable two-volume handbook covers everything on the hot research field of zeolites. With information spread over two volumes: Volume 1 deals with the synthesis, modification, characterization and application of catalytic active zeolites, while Volume 2 focuses on such reaction types as cracking, hydrocracking, isomerization, reforming and other industrially important topics. Edited by a highly experienced and internationally renowned team with

chapters written by the 'Who's Who' of zeolite research, this set is valuable to catalytic, solid state, physical, and industrial chemists, chemical engineers, surface chemists and materials scientists

Layered 2D Materials and Their Allied Applications - Inamuddin 2020-06-23

Ever since the discovery of graphene, two-dimensional layered materials (2DLMs) have been the central tool of the materials research community. The reason behind their importance is their superlative and unique electronic, optical, physical, chemical and mechanical properties in layered form rather than in bulk form. The 2DLMs have been applied to electronics, catalysis, energy, environment, and biomedical applications. The following topics are discussed in the book's fifteen chapters: • The research status of the 2D metal-organic frameworks and the different techniques used to synthesize them. • 2D black phosphorus (BP) and its practical application in various fields. • Reviews the synthesis methods of MXenes and provides a detailed discussion of their structural characterization and physical, electrochemical and optical properties, as well as applications in catalysis, energy storage, environmental management, biomedicine, and gas sensing. • The carbon-based materials and their potential applications via the photocatalytic process using visible light irradiation. • 2D materials like graphene, TMDCs, few-layer phosphorene, MXene in layered form and their heterostructures. • The structure and applications of 2D perovskites. •

The physical parameters of pristine layered materials, ZnO, transition metal dichalcogenides, and heterostructures of layered materials are discussed. • The coupling of graphitic carbon nitride with various metal sulfides and oxides to form efficient heterojunction for water purification. • The structural features, synthetic methods, properties, and different applications and properties of 2D zeolites. • The methods for synthesizing 2D hollow nanostructures are featured and their structural aspects and potential in medical and non-medical applications. • The characteristics and structural aspects of 2D layered double hydroxides (LDHs) and the various synthesis methods and role of LDH in non-medical applications as adsorbent, sensor, catalyst, etc. • The synthesis of graphene-based 2D layered materials synthesized by using top-down and bottom-up approaches where the main emphasis is on the hot-filament thermal chemical vapor deposition (HFTCVD) method. • The different properties of 2D h-BN and borophene and the various methods being used for the synthesis of 2D h-BN, along with their growth mechanism and transfer techniques. • The physical properties and current progress of various transition metal dichalcogenides (TMDC) based on photoactive materials for photoelectrochemical (PEC) hydrogen evolution reaction. • The state-of-the-art of 2D layered materials and associated devices, such as electronic, biosensing, optoelectronic, and energy storage applications.