Zeolites And Related Materials Trends Targets And Challengesset Volume 174 4th International Feza Conference 2 6 September 2008 Paris France Studies In Surface Science And Catalysis

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.

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.

The present book "Zeolites and Related Materials: Trends, Targets and Challenges" reports the communications that have been presented at the 4th International FEZA (Federation of European Zeolite Associations) Conference in Paris, September 3-6, 2008. It gives an excellent overview of the present state of the art of ordered nanoporous solids including zeolites as well as synthetic layered materials (clays), nanosized molecular sieves, ordered mesoporous solids, metal-organic-framework compounds (MOFs), carbons, etc. with emphasis on the synthesis, comprehensive characterization and advanced applications. The significant research activities in this domain are due to the outstanding properties of those nanoporous materials that concentrate the collaborative efforts of researchers from material science, chemistry, physical chemistry and physics. The understanding and development of the unique properties of porous materials relies on a unique blend of multidisciplinary knowledge covering material science, with the implication of organic and colloid chemistry, to prepare micro- and mesoporous materials; surface and adsorption sciences 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. * This book summarizes the developments in the area of nanoporous solids at the dawn of the 21st century, useful for both students/young researchers entering the field of nanoporous materials, as well as for senior scientists * Also summarizes the new family of porous compounds, e.g. MOF's and ordered porous carbon * The present state-of-the-art and prospects of nanoporous solids for advanced applications is discussed.

ZEOCAT '95 is the eleventh in the series of symposia devoted to special fields of zeolite chemistry. Six plenary lectures, forty oral and forty-two poster presentations were included in the program. The accepted papers cover every aspect of catalysis on microporous materials. A significant number of the contributions describe the synthesis, modification, instrumental and chemical characterisation of zeolites and other micro- and mesoporous materials. Catalytic reactions involve hydrocarbon cracking, nucleophilic aromatic substitution, methanol to hydrocarbon conversion, hydration of acetylene, various alkylation reactions, redox transformations, Claisen rearrangement, etc.

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

Zeolites and Related MaterialsTrends, Targets and Challenges : Proceedings of the 4th International FEZA Conference, Paris, France, 2-6 September 2008

The Proceedings of the 24th International Solvay Conference on Chemistry comprise contributed short personal statements and transcripts of in-depth discussions on 'Catalysis in Chemistry and Biology' from a by-invitation-only select group of 48 eminent scientists, including four Nobel Laureates, from all parts of the world. The theme of the conference was presented in six sessions, along which the Proceedings are organized. The first session on 'Homogeneous Catalysis,' chaired by Professor Robert Grubbs, is devoted to basic research on catalysis in homogeneous solutions and applications thereof. 'Heterogeneous Catalysis and Characterization of Catalyst Surfaces,' chaired by Professor Gerhard Ertl, includes extensive references to industrial applications of catalysis on solid supports, and discussions on the experimental techniques used in this field. 'Catalysis by Microporous Materials,' chaired by Professor Mark E. Davis, is devoted to a detailed characterization of this particular class of solid support catalysts, with special emphasis on model analysis of the processes catalyzed by these materials. 'Catalysis under Extreme Conditions: Studies at High Pressure and High Temperatures -- Relations with Processes in Nature,' chaired by Professor Henk N W Lekkerkerker, broadens the scope of the two preceding sessions with exciting illustrations. The sessions on 'Catalysis by Protein Enzymes,' chaired by Prof. JoAnne Stubbe, and 'Catalysis by Ribozymes in Molecular Machines,' chaired by Prof. David Lilley, present at the same time an exciting extension of and a contrast to the initial four sessions. The combination of the six sessions provides an impressive overview, giving innovative insights into relationships between catalysis in chemical processes and in biological systems, and a unique outlook to anticipated developments in the coming years and the more distant future.

Waste minimisation has a number of aims which include enhancing the intrinsic selectivity of any given process, providing a means of recovering reagents in a form which allows easy regeneration and the replacement of stoichiometric processes with catalytic ones. Solids, as catalysts or as supports for other reagents, offer potential for benefit in all these areas. This

monograph provides an overview of the properties of the more useful solid catalysts and supported reagents, and highlights their most valuable applications in the preparation of organic chemicals in liquid phase reactions. Clean Synthesis Using Porous Inorganic Solid Catalysts and Supported Reagents is concerned with the use of solid catalysts in the clean synthesis of organic chemicals. The emphasis is on chemical processes of importance to the manufacture/preparation of fine and speciality chemicals, chemical intermediates and pharmaceutical intermediates, especially where catalysis is not currently used or where current catalysts are homogeneous, leading to difficult separation procedures and unacceptable levels of waste. This book focuses on solid catalysts based on inorganic supports and covers the emerging area of chemically modified mesoporous solid catalysts.

This issue of ECS Transactions presents the latest research on systems and processes involving molten salts and room temperature ionic liquids. The studies compiled include both basic and applied research covering a wide range of topics. The main topics discussed in this volume include solution properties; reactions and separations; biochemical, biomedical, and green processes; electrodeposition; electrochemical power; corrosion and other electrochemical processes; and nuclear chemistry.

Materials chemistry is a growing interdisciplinary field which interfaces with and draws from many disciplines including solid state chemistry and physics, materials science and crystallography. This volume provides a review of the main techniques and topical materials presented by leading workers in the field. The survey of techniques includes in-depth coverage of diffraction, microscopy, NMR and IR spectroscopic methods; and special emphasis is given to the growing role of computational and theoretical techniques. The development of new materials with specific applications is a major feature of contemporary materials chemistry. Later chapters of the book emphasize ionic conductors, superconductors, colossal magneto-resistance materials and catalytic systems (including micro- and meso-porous materials), to which several chapters are devoted. Synthetic aspects of the field are also emphasized.

The twelfth Congress on Catalysis was held in Granada (Spain) under the auspices of the International Association of Catalysis Societies and the Spanish Society of Catalysis. These four-volume Proceedings are the expression of the Scientific Sessions which constituted the main body of the Congress. They include 5 plenary lectures, 1 award lecture, 8 keynote lectures, 124 oral presentations and 495 posters. The oral and poster contributions have been selected on the basis of the reports of at least two international reviewers, according to standards comparable to those used for specialised journals.

Zeolites are attracting a great deal of attention in various fields of science and technology. Many exciting new developments have occurred in their industrial application and these developments have in turn inspired much new significant fundamental research. This proceedings volume, containing 121 contributed papers, an introductory talk, two plenary lectures and nine invited lectures, is valuable not only for the quantity but also for the high quality and originality of the contents. The topics addressed cover all fields of science and technology related

to natural and synthetic zeolites, namely: mineralogy, geology, structure, synthesis, ion-exchange and modification, sorption, catalysis, and technical applications (including agricultural uses). The numerous new results and concepts presented and the particularly timely publication of the volume make it a must for all involved with zeolites.

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.

Zeolite synthesis is an active field of research. As long as this continues, new phases will be discovered and new techniques for preparing existing phases will appear. This edition of Verified Synthesis of Zeolitic Materials contains all the recipes from the first edition plus 24 new recipes. Five new introductory articles have been included plus those from the first edition, some of which have been substantially revised. The XRD patterns have been recorded using different instrument settings from those in the first edition and are intended to conform to typical X-ray diffraction practice. In most cases, only the XRD pattern for the productas synthesised is printed here. The exceptions are those phases which show marked changes in the XRD pattern upon calcination.

This book collects recent results about research activities on zeolites, from synthesis to application. It is composed of two sections. The first is devoted to articles and brief review articles on the synthesis of zeolite from fly ash and final application of these newly formed minerals to solve environmental problems. The second part of the book provides useful information on different applications both of natural and synthetic zeolites ranging from environmental pollution to industrial and commercial applications. The performance of zeolite molecular sieves, hollow titanium zeolites and luminescent zeolites is interesting considering the new frontiers reached by the research on zeolites. This book is a useful instrument for researchers, teachers and students who are interested in investigating innovative aspects of the studies on zeolite.

In this collection, the author has compiled a set of his papers representing some of the highlights of materials chemistry. It features a section on oxidic materials, which includes high-temperature superconductivity, colossal magnetoresistance, electronic phase separation and multiferroics. The author has also included novel methods for making gallium nitride, boron nitride and such materials, by using precursors and the urea decomposition route. Moreover, there is a section dealing with open-framework and hybrid materials of which the latter has a great future since one can make use of the rigidity of inorganic structures and the

functionality and flexibility of the organic residues to design materials with novel properties.

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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.

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.

Formerly, the catalytic use of zeolites was exclusive to the field of acid catalysis. Nowadays, zeolites also find applications as catalysts in a wide array of chemical reactions such as; base catalyzed reactions, Redox reactions and catalytic reactions on transition metals and their complexes in confined environments. The concepts of Brønsted or Lewis acid-base pairs are adequately illustrated in the literature and well-understood in terms of structural and electronic properties of zeolites. By contrast, properties of chemically modified silicates, aluminosilicates and aluminophosphates have not yet been fully explored. The list of oxydo-reduction reactions performed in the presence of these new materials is growing as demonstrated by the selective catalytic reduction of nitrogen oxides or the numerous oxidations employing hydrogen peroxide. Much effort is currently being made to get a better insight into the nature of the sites involved. The zeolite lattice may also be used as a host for encapsulated complexes or metallic clusters allowing the control of nuclearity of these active species and the steric constraints imposed on the reactants. Molecular sieve and shape selectivity effects have also constituted fascinating aspects of zeolite properties. Recent developments leading to increasingly large pore sizes with VPI-5, cloverite and more recently mesoporous molecular sieves have broadened the spectrum of these applications. Indeed, larger and larger reactant and product molecules can be accommodated in these lattices. These new adsorbant/adsorbate systems create additional needs for experimental data and theoretical descriptions of transport properties, in particular of mono- and multi-components diffusion coefficients in the zeolite pore lattice. All these themes, representing the forefront and current trends in zeolite research, were discussed in the submitted papers to the symposium and are widely represented in the selected papers contained in this volume. A feature common to most of these contributions is the combined use of a variety of analytical techniques. Some of these techniques are at the frontier of the latest analytical developments such as multiple scattering EXAFS and bidimensional MAS-NMR.

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.

Molecular Sieves - Science and Technology covers, in a comprehensive manner, the science and technology of zeolites and all related microporous and mesoporous materials. Authored by renowned experts, the contributions are grouped together topically in such a way that each volume of the book series deals with a specific sub-field. Volume 4 covers the characterization of molecular sieves with the help of the most important spectroscopic techniques (Characterization I), i.e. IR, Raman, NMR, EPR, UV-VIS Spectroscopy, X-ray absorption, photoelectron and Mössbauer Spectroscopy. Theory, experiment and application in selected examples are discussed.

This book shows the promising future and essential issues on the storage of the supercritical gases, including hydrogen, methane and carbon dioxide, by adsorption with controlling the gas-solid interaction by use of designed nanoporous materials. It explains the reason why the storage of these gases with adsorption is difficult from the fundamentals in terms of gas-solid interaction. It consists of 14 chapters which describe fundamentals, application, key nanoporous materials (nanoporous carbon, metal organic frame works, zeolites) and their storage performance for hydrogen, methane, and carbon dioxide. Thus, this book appeals to a wide readership of the academic and industrial researchers and it can also be used in the classroom for graduate students focusing on clean energy technology, green chemistry, energy conversion and storage, chemical engineering, nanomaterials science and technology, surface and interface science, adsorption science and technology, carbon science and technology, metal organic framework science, zeolite science, nanoporous materials science, nanotechnology, environmental protection, and gas sensors.

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 researches in the chemical and materials industries and research institutions. The book is also indispensable for researches and engineers in R&D (for catalysis) divisions of companies in petroleum refining and the petrochemical and fine chemical industries.

Recent Advances in Science and Technology of Zeolites and Related Materials is a collection of oral and poster communications, presented during the 14th International Zeolite Conference (IZC). The conference was hosted by the Catalysis Society of South Africa. In the tradition of the IZC series, this Conference provides a forum for the presentation of new knowledge in the science and technology of zeolites and related materials. Papers presented cover a wide range of topics that include synthesis, structure determination,

characterisation, modelling, and catalysis. This highly visual book is a must for readers looking to stay up-to-date on zeolite science. * This three-part volume provides valuable information on zeolites and related materials * Includes papers that cover topics such as structure determination, modelling and separation processes * Contains new and exciting developments in the field

Handbook of Nanomaterials for Wastewater Treatment: Fundamentals and Scale up Issues provides coverage of the nanomaterials used for wastewater treatment, covering photocatalytic nanocomposite materials, nanomaterials used as adsorbents, water remediation processes, and their current status and challenges. The book explores the major applications of nanomaterials for effective catalysis and adsorption, also providing in-depth information on the properties and application of new advanced nanomaterials for wastewater treatment processes. This is an important reference source for researchers who need to solve basic and advanced problems relating to the use of nanomaterials for the development of wastewater treatment processes and technologies. As nanotechnology has the potential to substantially improve current water and wastewater treatment processes, the synthesis methods and physiochemical properties of nanomaterials and noble metal nanoparticles make their performance and mechanisms efficient for the treatment of various pollutants. Explains the properties of the most commonly used nanomaterials used for wastewater treatment Describes the major nanoscale synthesis and processing techniques for wastewater treatment Assesses the major challenges for using nanomaterials on a mass scale for wastewater treatment

It is estimated that a large fraction of natural gas reserves are found in locations from where transport is not economical. If these isolated natural gas reserves could be converted to synthetic fuels, they would generate around 250 billion barrels of synthetic oil—a quantity equal to one-third of the Middle East’s proven oil reserves. Small-Scale Gas to Liquid Fuel Synthesis explores next-generation technologies geared toward overcoming the significant cost and technical barriers prohibiting the extensive use of conventional gas to liquid (GTL) processes for the exploitation of small and/or isolated natural gas reservoirs. The book highlights key research activities in the framework of two large European projects—Innovative Catalytic Technologies & Materials for Next Gas to Liquid Processes (NEXT-GTL) and Oxidative Coupling of Methane followed by Oligomerization to Liquids (OCMOL)—examining novel technical developments that reduce the costs associated with air fractioning and syngas production. Featuring contributions from internationally respected experts, Small-Scale Gas to Liquid Fuel Synthesis discusses innovative GTL technologies based on recent advances in catalytic membrane systems, reaction engineering, and process design. The book provides academic and industrial researchers with a concise presentation of the current state of the art of low-cost, energy-efficient GTL technologies for small-scale applications.

Zeolites are the most frequently used industrial catalysts. Their applications

range from oil refining, petrochemistry and the synthesis of special chemicals to environmental catalysis. Rapid progress in basic research and the development of new processes has resulted in the first Federation of European Zeolite Associations (FEZA) School on Zeolites. Zeolites and Ordered Mesoporous Materials: Progress and Prospects reflects the programme of the first School on Zeolites, held in Prague on August 20-21, 2005. Readers gain insight into the synthesis of the ever-expanding spectrum of zeolites, zeotypes and ordered mesoporous materials including the use of zeolites and mesoporous materials as catalysts in organic conversions. These range from the fascinating ship-in-bottle systems via cascade reactions to bulk applications in oil-refining and petrochemistry. Contributions from world experts enhance the book, with select chapters on trends in the molecular sieves field, zeolite structures, ion-exchange properties of zeolites, advanced applications (with unique technologies and opportunities) and a chapter on natural zeolites. * Contains contributions from world experts in the field * Includes an account of the frontier topic of high-throughput techniques * Reviews the application of quantum-chemical methods to zeolite science to show the necessity of combining experimental and theoretical approaches

This two-volume book on biomass is a reflection of the increase in biomass related research and applications, driven by overall higher interest in sustainable energy and food sources, by increased awareness of potentials and pitfalls of using biomass for energy, by the concerns for food supply and by multitude of potential biomass uses as a source material in organic chemistry, bringing in the concept of bio-refinery. It reflects the trend in broadening of biomass related research and an increased focus on second-generation bio-fuels. Its total of 40 chapters spans over diverse areas of biomass research, grouped into 9 themes.

Microporous materials, including both zeolites and aluminophosphates are amongst the most fascinating classes of materials, with wide ranging important applications in catalysis, gas separation and ion exchange. The breadth of the field has, moreover, been extended in the last ten years by the discovery of the versatile and exciting ranges of mesoporous materials. Computational methods have a long and successful history of application in solid state and materials science, where they are indeed established tools in modelling structural and dynamic properties of the bulk and surfaces of solids; and where they are playing an increasingly important role in understanding reactivity. Their application to zeolite science developed strongly in the 1980's, with the initial successes in modelling structure and sorption, and with emerging capability in quantum mechanical methods. The field was reviewed over ten years, since then there have been major developments in techniques and of course the power of the available hardware, which have promoted a whole range of new applications to real complex problems in the science of microporous materials. Computer Modelling of Microporous Materials aims to summarise and illustrate the current capabilities of atomistic computer modelling methods in this growing field. Details

advances in the rapidly expanding field of microporous materials Summarises key current techniques in this type of modelling Illustrates the current capabilities of atomistic computer modelling methods

This dissertation is a thermodynamic study of zeolites and zeolite-like materials. The zeolite materials include alkali and alkaline earth cation (Li+, Na+, K+, Rb+, Cs+, Ca2+, Sr2+ and Pb2+) exchanged natrolite, transition metal cation (Mn2+, Co2+, Cu2+, Zn2+) exchanged zeolite A and zeolite Y, ITQ-33 (large pore Ge-zeolite) and zeolite beta polymorph C (BEC). The zeolite-like materials are hollandites substituted by Rb+, Cs+ and Sr2+. Zeolites form a large group of aluminosilicate porous materials. They continue receiving interest in terms of crystal structure, Si/Al ratio, cation effects, ion exchange, hydration, and technological applications, such as heterogeneous catalysis and heavy metal disposal. In this dissertation, thermodynamic properties of zeolites with different topology, pore size and especially various exchanged cations are investigated. The first part is about natrolite, which is a small pore (2.6 Å) zeolite mineral. It has been applied in industrial catalysis and waste water treatment. To answer several fundamental questions about Al/(Al+Si) ratio effects, abnormal rehydration behavior of K-NAT, Rb-NAT and Cs-NAT and cation effects, and also to explore the thermal behavior of natrolite and the factors that affect its persistence, a series of synthetic natrolites with different extra-framework cations (Li, Na, K, Rb, Cs, Ca, Sr and Pb) were investigated by differential scanning calorimetry and high temperature oxide melt solution calorimetry. The formation enthalpies from constituent oxides obtained from high temperature solution calorimetry align well with those observed previously for other zeolites. Their formation enthalpies become less exothermic with increasing ionic potential (Z/r) of the cations. The hydration enthalpies obtained from differential scanning calorimetry indicate that water binding becomes weaker with increasing cation size. A formation enthalpy model for hydrous zeolites similar to that for anhydrous zeolites was developed. The further analysis of results indicates cation effects are more important than hydration effects on stability. Large pore zeolites such as the ITQ series have attracted much attention for their accommodation of larger guest molecules and promising potential in catalysis. The synthesis of large pore zeolites can be realized by using several strategies, such as large and rigid organic structure directing agents (OSDAs); concentrated gels and fluoride media, especially with Ge substitution. To explore their application in industry, thermochemical study of their stability is important. In chapter 3, energetics of large pore Ge-zeolite ITQ-33 and pure silica zeolite beta polymorph C (BEC) with two types of OSDAs were studied. The enthalpies of formation from phases with the quartz structure (SiO2 and GeO2) have been determined. The BECs made with two different structure directing agents (SDA) show energetic difference of 4 kJ/mol due to structure defects. The enthalpy of formation of ITQ-33 (Ge/(Ge+Si) = 0.3) supports the energetic trends seen in other Ge-zeolites, namely the enthalpy of formation becomes more endothermic

as the content of double four rings (D4R) increases. Also the energetic trend of porous materials versus molar volume is extended by the present data, with a diminishing destabilization for very open structures. Zeolites have good ion exchange capacity which offers a large area of study on various cations effects in different frameworks. An area of big interest is transition metal cation decorated zeolites for the double catalytic properties of transition metal cations and zeolite frameworks, and also the highly dispersed metal sites. To study the unique cation effect and energetic properties, in chapter 4, Mn, Co, Cu, Zn- exchanged zeolite A and Y were prepared and studied by thermogravimetry - differential scanning calorimetry (TG-DSC) and high temperature oxide melt solution calorimetry. All these transition metal zeolites could be synthesized by aqueous solution exchange methods. The thermodynamic results revealed an unusual trend of cation effects compared to alkali and alkaline earth containing zeolites. The formation enthalpies of Mn and Zn zeolites A and Y are less endothermic than those of Co and Cu-zeolites A and Y. Their relative stabilities are consistent with metal-oxygen bond lengths, and could be explained by the crystal field effects of transition metal ions. The enthalpies of exchange of transition metals for sodium in zeolites A and Y are strongly unfavorable. In the last part, Chapter 5, an aluminotitanate ceramic material, hollandite, that has a framework structure analogous to a zeolite is studied in terms of synthesis, structural characterization and energetics. With good tolerance for cation substitution, hollandite is a potential host to immobilize radioactive elements, particularly cesium and strontium fission products. In this study, Rb+, Cs+ and Sr2+ containing hollandite was synthesized using a sol-gel method and characterized by synchrotron XRD. Their enthalpies of formation were explored using high temperature oxide melt solution calorimetry. Their stabilities are similar but decrease slightly from Cs- to Rb- to Sr-hollandite.

There is an increasing challenge for chemical industry and research institutions to find cost-efficient and environmentally sound methods of converting natural resources into fuels chemicals and energy. Catalysts are essential to these processes and the Catalysis Specialist Periodical Report series serves to highlight major developments in this area. This series provides systematic and detailed reviews of topics of interest to scientists and engineers in the catalysis field. The coverage includes all major areas of heterogeneous and homogeneous catalysis and also specific applications of catalysis such as NOx control kinetics and experimental techniques such as microcalorimetry. Each chapter is compiled by recognised experts within their specialist fields and provides a summary of the current literature. This series will be of interest to all those in academia and industry who need an up-to-date critical analysis and summary of catalysis research and applications. Catalysis will be of interest to anyone working in academia and industry that needs an up-to-date critical analysis and summary of catalysis research and applications. Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research.

Compiled by teams of leading experts in their specialist fields, this series is designed to help the chemistry community keep current with the latest developments in their field. Each volume in the series is published either annually or biennially and is a superb reference point for researchers.

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.

This handbook is a guide to current methods of computational chemistry, explaining their limitations and advantages and providing examples of their applications. The first part outlines methods, the balance of volumes present numerous important applications.

Todays chemical industry processes worldwide largely depend on catalytic reactions and the desirable future evolution of this industry toward more selective products, more environmentally friendly products, more energy-efficient processes, a smaller use of hazardous reagents, and a better use of raw materials also largely involves the development of better catalysts and, specifically, purposely designed catalytic materials. The careful study and development of the new-generation catalysts involve relatively large groups of specialists in universities, research centers, and industries, joining forces from different scientific and technical disciplines. This book has put together recent, state-of-the-art topics on current trends in catalytic materials and consists of 16 chapters.

This book, written and edited by leading authorities from academia and industrial groups, covers both preventive- and curative-zeolite-based technologies in the field of chemical processing. The opening chapter presents the state of the art in zeolite science. The two subsequent chapters summarize the chemistries involved in the processes and the constraints imposed on the catalyst/adsorbent. Three major areas are covered: oil refining, petrochemicals and fine chemicals. A chapter on the (curative) use of zeolites in pollution abatement completes this overview. In the area of oil refining, a general lecture sets the scene for present and future challenges. It is followed by in-depth case studies involving FCC, hydrocracking and light naphtha isomerization. Also, an entire chapter is devoted to the often-overlooked subject of base oils. In the area of petrochemicals, the processing of aromatics and olefins is described and special attention is paid to the synergy between catalysis and separation on molecular sieves. Contents:Introduction to Zeolite Science and Technology (M Guisnet & J-P Gilson)The Chemistry of Catalytic Processes (A Corma & A Martínez)Preparation of Zeolite Catalysts (T G Roberie et al.)Refining Processes: Setting the Scene (R H Jensen)Advances in Fluid Catalytic Cracking (E T Habib et al.)Hydrocracking (J A R Van Veen)C4-C6 Alkane Isomerisation (F Schmidt & E Köhler)Base Oil Production and Processing (M Daage)Para-Xylene ManufacturingCatalytic Reactions and Processes (F Alario & M Guisnet)Separation of Paraxylene by Adsorption (A Méthivier)Aromatic Alkylation: Towards Cleaner Processes (J S Beck et al.)Methanol to Olefins (MTO) and Beyond (P Barger)Zeolite Effects on Catalytic Transformations of Fine Chemicals (D E De Vos & P A Jacobs)Functionalization of Aromatics over Zeolite Catalysts (P Marion et al.)Zeolites and ‘Non-Zeolite’ Molecular Sieves in the Synthesis of Fragrances and Flavors (W F Hoelderich & M C Laufer)Pollution Abatment Using Zeolites: State of the Art and Further Needs (G Delahay & B Coq) Readership:

Undergraduates, graduate students, academics and researchers in catalyst chemistry. Reviews:“Chapter authors have provided a teaching text that gives excellent introductory chapters to zeolites, and to the nature and significance of the processes that they can catalyse … This excellent book should be required reading for all scientists who have an interest in improving the environment.”Chemistry & Industry