Catalysis

The Proceedings of the 15th International Zeolite Conference contain 291 full papers, including the full papers of 5 plenary lecture, 12 keynote lectures, and 4 invited lectures at the R. M. Barrer Symposium. The topics of these full papers include synthesis, modifications, structures, characterization, adsorption, separation and diffusion, catalysis, host-guest chemistry and advanced materials, industrial applications, theory and modeling, mesostructured materials, MOF materials, and natural zeolites. The other 271 full papers were selected from the about 1000 contributions submitted to the 15th IZC. - Most recent research results in zeolite science - Full indexes - Wide coverage of zeolite science and technology

Organic Synthesis Engineering

To leave our planet liveable in the next millennium mankind is forced to find environmentally friendly ways in solving the problems of everyday life. Among others, technologies of producing chemicals, absolutely necessary for maintaining a comfortable life, have to be modified, in some instances fundamentally changed now, or in the very near future. Developing new technologies requires strong and innovative fundamental research. In order to provide opportunity for crossfertilization the Federation of European Zeolite Associations (FEZA) decided to organise a conference, where researchers from academia as well as industry can meet, exchange ideas, show and discuss research efforts and results concerning the development of environmentally friendly processes and technologies. The conference, and thus the proceedings are divided into two main parts. The first part contains works concerning the synthesis, modification and characterisation of zeolitic materials as catalyst candidates in environmentally friendly technologies. The other 271 full papers were selected from the about 1000 contributions submitted to the 15th IZC. - Most recent research results in zeolite science - Full indexes - Wide coverage of zeolite science and technology

Zeolites in Catalysis

Catalyst Deactivation 1994 was an expansion of earlier, highly successful symposia. The objective of the symposium was to promote a scientific approach of the phenomenon of catalyst deactivation which will contribute to the development of catalysts which are less subject to structural transformations and more resistant to poisons and coke formation. These aspects are dealt with in 12 plenary lectures, 48 oral presentations and 35 poster papers, which were critically selected from an impressive response from some 30 countries. Both fundamental and applied aspects were covered. The deactivation of catalysts in important industrial processes like fluid bed catalytic cracking, hydrodesulfurization, catalytic reforming, hydrogenation, steam reforming, hydrodemetalization, hydrocracking, Fischer-Tropsch synthesis, propane dehydrogenation, phthalic anhydride synthesis received considerable attention. Mechanisms of poisoning, sintering and coking were further investigated and modelled and new experimental techniques for the characterization and the quantification of deactivation were also introduced.

Solid-State NMR in Zeolite Catalysis

Presented in an easy-to-read form, this book on zeolite catalysis cover all aspects of the subject. It focuses on synthesis, structure, diffusion, deactivation, and industrial applications. This book is an ideal text for courses on
Catalysis or as a supplementary text for those studying applied or industrial chemistry. It is also a useful resource for anyone who works with zeolites as catalysts in the laboratory, pilot plants, or commercial installations.

**Zeolites and Related Microporous Materials: State of the Art 1994**

**Combinatorial Catalysis and High Throughput Catalyst Design and Testing**

The effects of metal cation on the skeletal isomerization of 1-butene to isobutene was investigated. H-ZSM-5 was synthesized with the initial SiO2/Al2O3 ratio of 30. MFI-50, MFI-90 and Ferrierite zeolite catalysts were commercially supplied. The zeolites were ion exchanged with cobalt, nickel, zinc, copper (magnesium and manganese only for synthesized ZSM-5) salts, impregnated with cobalt, in order to change their acidity. The H-ZSM-5 zeolite was additionally ion exchanged with cobalt using different metal loading amounts. Then, the catalysts were tested for their activity in a fixed bed tubular quartz reactor at 375°C at weight hourly space velocity (WHSV) of 22 h⁻¹. Scanning Electron Microscopy images and X-Ray Powder Diffraction patterns of the zeolites showed that their crystallinity was not affected with ion exchange, even with the increase in the loading amount (2.68 w%). But with the impregnation method, the intensity of the characteristic peaks for zeolites were decreased. Impregnating the zeolite also resulted in a decrease in the surface area. The acidity measurements of the catalysts were made by IR spectroscopy with pyridine adsorption method. The tests showed that the acidities of the catalysts were changed with ion exchange and impregnation of metal ions. The catalytic tests for H-ZSM-5 showed that different metal loadings with ion exchange lowered the yield for isobutene. H-ZSM-5 showed a conversion of 59 % and 33.2 % yield for isobutene. The lowest yield was obtained from magnesium and manganese with 12.2 % and 9.6 %, respectively. The H-ZSM-5 zeolite catalysts were also tested for Co ion exchanged with different amounts (2.68, 1.45, 0.63 and 0.23 w%). 1.45 w% loaded catalyst showed the best activity for the reaction with a conversion of 59.1 %, and yield for isobutene 24.5 %. Both increased and decreased loading decreased yield 17.8 %, 2.5 % and 0.48 %, respectively. H-MFI-50 and its modified forms showed high conversions compared to H-ZSM-5. But low yields and selectivities were obtained. H-MFI-50 showed the highest conversion with 82.7 % and yield of 21.5 %. Co-MFI-50 showed similar conversion as the parent zeolite with 82.7 %, and yield of 17.9 %. The lowest conversion is obtained by Cu-MFI-50 with 76.5 % and yield for isobutene was 21 %. H-MFI-90 and its modified samples showed alike conversions around 76.1 %, but Cu loading decreased conversion as low as 65.9 %. Like MFI-50, the yield of isobutene was also affected by the metal ion exchange. H-MFI-90 showed 24.8 % yield of isobutene. However, Co-MFI-90 had a yield of 27.6 %. The worst yield was obtained from copper loaded catalyst with 20.4 %. As would be expected, changing the metal ion loaded to ferrierite also changed the activity of the catalyst. The highest conversion was obtained by H-FER with 57 % and a yield of 39 %. Co-FER and Ni-FER showed similar conversions 52 % and 53 %, respectively. Zn-FER and Cu-FER showed the lowest conversions with 47 % and 45 %, respectively. Yields for the metal loaded catalysts lowered to 27 %. Impregnation with Co, severely decreased the activity of the catalysts both compared to H form and ion exchanged form of the catalysts. Impregnated H-ZSM-5, H-MFI-50, H-MFI-90 and ferrierite showed conversions of 48.1 %, 66.8 %, 60.7 % and 45.4 %, respectively. The yields for isobutene were 11 %, 13.8 %, 15.5 % and 13.7 %, respectively.

**Zeolite Catalysts**

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.

**Official Gazette of the United States Patent and Trademark Office**

This volume comprises the proceedings of the International Symposium on Zeolites and Microporous Crystals (ZMPC '93). At this meeting progress in the following areas was discussed: crystal chemistry; synthesis; ion exchange and modification; adsorption and diffusion; intercalation and cross-linking; host-guest interaction; catalysis; applications.

**Post-Synthesis Modification I**

Solid-State NMR Characterization of Heterogeneous Catalysts and Catalytic Reactions provides a comprehensive account of state-of-the-art solid-state NMR techniques and the application of these techniques in heterogeneous catalysts and related catalytic reactions. It includes an introduction to the basic theory of solid-state NMR and various frequently used techniques. Special emphasis is placed on characterizing the framework and pore structure, active sites, guest-host interaction, and synthesis mechanisms of heterogeneous catalysts using multinuclear one- and two-dimensional solid-state NMR spectroscopy. Additionally, various in-situ solid-state NMR techniques and their applications in investigation of the mechanism of industrially important catalytic reactions are also discussed. Both the fundamentals and the latest research results are covered, making the book suitable as a reference guide for both experienced researchers in and newcomers to this field. Feng Deng is a Professor at Wuhan Institute of Physics and
Mathematics, Chinese Academy of Sciences.

**Kinetics and Catalysis**

In view of the substantial progress made in the last decade in the fields of zeolites and related materials it was decided to go for an extended 2nd Edition of "Introduction to Zeolite Science and Practice". Unfortunately - as often is the case - this process took more time than expected by the Editors. In the mean time some new texts on zeolites were issued. Nevertheless, the combination of data, discussion and dedication provided by the present book is a unique feature of the field, in the opinion of the Editors. In the present Edition the number of chapters rose from 16-22. The contributions are divided into three categories: updated chapters by the original authors, updated chapters by an expanded or new team of authors and completely new chapters. This 2nd Edition also contains new chapters on "Zeolite-based supramolecular assemblies" (by Dirk De Vos and Pierre Jacobs, experts in this area) and on "The use of bulky probe molecules" (by Paul Kunkeler, Roger Downing and one of the Editors). Finally, the super large pore zeolites and the fast growing area of ordered mesoporous materials are dealt with by Eelco Vogt, Charlie K. Resse and Jim Vartuli. The latter two authors belong to the discoverers of the M 41S family of mesoporous materials.

**The Chemistry of Catalytic Hydrocarbon Conversions**

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. Martinez)
- Preparation of Zeolite Catalysts (T. G. Robie et al.)
- Refining Processes: Setting the Scene (R. H. Jensen)
- Advances in Fluid Catalytic Cracking (E. T. Habib et al.)
- Hydrocracking (A. R. V. Van Veen)
- C4-C6 Aikane Isomerisation (F. Schmidt & E. Köhler)
- Base Oil Production and Processing (M. Daage)
- Para-Xylene Manufacturing Catalystic Reactions and Processes (F. Alario & M. Guisnet)
- Separation of Paraxylene by Adsorption (A. M. E. Thievery)
- Aromatic Alkylation: Towards Cleaner Processes (J. S. Beck et al.)
- M ethanol to Olefins (MTO) and Beyond (P. Barger)
- 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 Abatement Using Zeolites: State of the Art and Further Needs (G. Delahay & M. Cog)
- Readership: Undergraduates, graduate students, academics and researchers in catalyst chemistry.

**Structure and Modeling of Complex Petroleum Mixtures**

Catalysis by Zeolites: International Symposium Proceedings (Studies in surface science and catalysis)

**Introduction to Zeolite Science and Practice**

This book provides state-of-the-art reviews, current research, prospects and challenges of the production of biofuels and chemicals such as furanic biofuels, biodiesel, carboxylic acids, polyols and others from lignocellulosic biomass, furfurals, syngas and 7-valerolactone with bifunctional catalysts, including catalytic, and combined biological and chemical catalysis processes. The bifunctionality of catalytic materials is a concept of not only using multifunctional solid materials as activators, but also design of materials in such a way that the catalytic materials have synergistic characteristics that promote a cascade of transformations with performance beyond that of mixed mono-functional catalysts. This book is a reference designed for researchers, academicians and industrialists in the area of catalysis, energy, chemical engineering and biomass conversion. Readers will find the wealth of information contained in chapters both useful and essential, for assessing the production and application of various biofuels and chemicals by chemical catalysis and biological techniques.

**Introduction to Zeolite Molecular Sieves**

This book is a special collection of articles dedicated to the preparation and characterization of nanoporous materials, such as zeolitic-type materials, mesoporous silica (SBA-15, MCM-41, and KIT-6), mesoporous metallic oxides, metal-organic framework structures (MOFs), and pillared clays, and their applications in adsorption, catalysis, and separation processes. This book presents a global vision of researchers from international universities, research centers, and industries working with nanoporous materials and shares the latest results on the
synthesis and characterization of such materials, which have given rise to the special interest in their applications in basic and industrial processes.

**Heterogeneous Catalysis and Fine Chemicals**

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 NO\textsubscript{x} 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. www.rsc.org/spr

**Catalyst Deactivation 1994**

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

**From Zeolites to Porous MOF Materials - the 40th Anniversary of International Zeolite Conference, 2 Vol Set**

This book will formally launch "organic synthesis engineering" as a distinctive field in the armory of the reaction engineer. Its main theme revolves around two developments: catalysis and the role of process intensification in enhancing overall productivity. Each of these two subjects are becoming increasingly useful in organic synthesis engineering, especially in the production of medium and small volume chemicals and enhancing reaction rates by extending laboratory techniques, such as ultrasound, phase transfer catalysts, membrane reactor, and microwaves, to industrial scale production. This volume describes the applications of catalysis in organic synthesis and outlines different techniques of reaction rate and/or selectivity enhancement against a background of reaction engineering principles for both homogeneous and heterogeneous systems.

**Structure and Reactivity of Metals in Zeolite Materials**

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.

**Zeolites for Cleaner Technologies**

**Core-Shell and Yolk-Shell Nanocatalysts**

Zeolites occur in nature and have been known for almost 250 years as alumino silicate minerals. Examples are
clinoptilolite, mordenite, offretite, ferrierite, erionite and chabazite. Today, most of these and many other zeolites are of great interest in heterogeneous catalysis, yet their naturally occurring forms are of limited value as catalysts because nature has not optimized their properties for catalytic applications and the naturally occurring zeolites almost always contain undesired impurity phases. It was only with the advent of synthetic zeolites in the period from about 1948 to 1959 (thanks to the pioneering work of R. M. Barrer and R. M. Milton) that this class of porous materials began to play a role in catalysis. A landmark event was the introduction of synthetic faujasites (zeolite X at first, zeolite Y slightly later) as catalysts in fluid catalytic cracking (FCC) of heavy petroleum distillates in 1962, one of the most important chemical processes with a worldwide capacity of the order of 500 million t/a. Compared to the previously used amorphous silica-alumina catalysts, the zeolites were not only orders of magnitude more active, which enabled drastic process engineering improvements to be made, but they also brought about a significant increase in the yield of the target product, viz. motor gasoline. With the huge FCC capacity worldwide, the added value of this yield enhancement is of the order of 10 billion US$ per year.

**Zeolites and Microporous Crystals**

This volume provides the reader with the most up-to-date and relevant knowledge on the reactivity of metals located in zeolite materials, either in framework or extra-framework positions, and the way it is connected with the nature of the chemical environment provided by the host. Since the first report of the isomorphous substitution of titanium in the framework of zeolites giving rise to materials with unusual catalytic properties, the incorporation of many other metals have been investigated with the aim for developing catalysts with improved performance in different reactions. The continuous expansion of the field, both in the variety of metals and zeolite structures, has been accompanied by an increasing focus on the relationship between the reactivity of metal centers and their unique chemical environment. The concepts covered in this volume are of interest to people working in the field of inorganic and physical chemistry, catalysis and chemical engineering, but also for those more interested in theoretical approaches to chemical reactivity. In particular the volume is useful to postgraduate students conducting research in the design, synthesis and catalytic performance of metal-containing zeolites in both academic and application contexts.

**Introduction to Green Chemistry**

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.

**Biomass Valorization**

Introduction to Zeolite Molecular Sieves, 3rd Edition presents a collection of the most important results and ideas in the field of molecular sieve chemistry and technology, the most important experimental techniques related to the research activities in molecular sieves, and identifies new areas of molecular sieve chemistry. Chapters start at a reasonably simple entry level, but also covers the present state-of-the-art in the field. Topics covered include structure, synthesis, characterization, ion exchange, adsorption, diffusion, separations, and natural zeolites. * 6 years since the last edition this book brings together the rapid development within the field of molecular sieve chemistry and applications * Accessible to newcomers to the field, also containing valuable information for experienced researchers * 27 chapters written by renowned scientists in their field, including updates on some 2nd edition chapters

**Production of Biofuels and Chemicals with Bifunctional Catalysts**

Nowadays, the chemical industry is under increased pressure to develop cleaner production processes and technologies. Much effort is devoted to the development of heterogeneous catalysts and their application in industrial-scale organic synthesis. This handbook concentrates on current attempts, focusing on fine chemical production. With contributions from an impressive array of international experts, this is essential reading for everyone interested in the advances in this field.

**Nanoporous Materials and Their Applications**

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

**Recent Advances in the Science and Technology of Zeolites and Related Materials**

Interest in green chemistry and clean processes has grown so much in recent years that topics such as fluorous biphasic catalysis, metal organic frameworks, and process intensification, which were barely mentioned in the First Edition, have become major areas of research. In addition, government funding has ramped up the development of fuel cells and biofuels. This reflects the evolving focus from pollution remediation to pollution prevention. Copiously illustrated with more than 800 figures, the Third Edition provides an update from the frontiers of the field. It features supplementary exercises at the end of each chapter relevant to the chemical examples introduced in each chapter. Particular attention is paid to a new concluding chapter on the use of green metrics as an objective tool to demonstrate proof of synthesis plan efficiency and to identify where further improvements can be made through fully worked examples relevant to the chemical industry. NEW AND EXPANDED RESEARCH TOPICS M etal-organic frameworks M etrics Solid acids for alkylation of isobutene by butanes Carbon molecular sieves M ixed micro- and mesoporous solids Organocatalysis Process intensification and gas phase enzymatic reactions Hydrogen storage for fuel cells Reactive distillation Catalysts in action on an atomic scale UPDATED AND EXPANDED CURRENT EVENTS TOPICS Industry resistance to inherently safer chemistry Nuclear power Removal of mercury from vaccines Removal of mercury and lead from primary explosives Biofuels Uses for surplus glycerol New hard materials to reduce wear Electronic waste Smart growth The book covers traditional green chemistry topics, including catalysis, benign solvents, and alternative feedstocks. It also discusses relevant but less frequently covered topics with chapters such as "Chemistry of Long Wear" and "Population and the Environment." This coverage highlights the importance of chemistry to everyday life and demonstrates the benefits the expanded exploitation of green chemistry can have for society.

**Porous Materials in Environmentally Friendly Processes**

The Chemistry of Catalytic Hydrocarbon Conversions covers the various chemical aspects of catalytic conversions of hydrocarbons. This book is composed of eight chapters that include catalytic synthesis of hydrocarbons from carbon monoxide, hydrogen, and methanol. The opening chapters examine various acid- and base-catalyzed reactions, such as isomerization, polymerization, oligomerization, alkylation, catalytic cracking, reforming, hydrocracking, and hydrogenation. The subsequent chapters are devoted to specific catalytic reactions, including heterogeneous hydrogenation, dehydrogenation, aromatization, and oxidation. Other chapters describe the homogeneous catalysis by transition metal organometallic catalysts and the metathesis of unsaturated hydrocarbons. The concluding chapter deals with the synthesis of liquid hydrocarbon fuels from carbon monoxide, hydrogen, methanol, and dimethyl ether. This book is of great benefit to petroleum chemists, engineers, and researchers.

**Chemistry of Silica and Zeolite-Based Materials**

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 metallosilicates, silica, aluminophosphates, galliumphosphates etc.), occurring in nature or synthesized by man. Mesoporous silica, aluminosilicates and other metallosilicates, 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.

**Fine Chemicals through Heterogeneous Catalysis**

The proceedings of ZEOCAT 90 reflect the wide-ranging aspects of the rapidly expanding field of zeolite science and technology. The invited plenary lectures given by eminent zeolite scientists summarize current knowledge and address topical areas of zeolite research, including a contribution on the use of zeolites as membranes. The field of investigations described in the submitted articles in this volume covers a wide area of problems ranging from the influence of the synthesis process on the properties to questions of acidity, adsorption, diffusion, and catalysis. Of special interest are the newly developed applications of zeolites in the synthesis of fine chemicals, the use of zeolites for sensors and solid electrolytes, and the sophisticated zeolite-based separation processes.

**Zeolites and Catalysis**

Aniline is the parent molecule of a vast family of aromatic amines. Since its discovery in 1826 it has become one of
the hundred most important building blocks in chemistry. Aniline is used as an intermediate in many different fields
of applications, such as isocyanates, rubber processing chemicals, dyes and pigments, agricultural chemicals and
pharmaceuticals. The understanding of functional groups is key for the understanding of all organic chemistry. In the
tradition of the Patai Series, this volume treats all aspects of this functional group. It contains chapters on the
theoretical and computational foundations; on analytical and spectroscopical aspects with dedicated chapters on
Mass Spectrometry, NMR, IR/UV, etc.; on reaction mechanisms; on applications in syntheses.

Official Gazette of the United States Patent and Trademark Office

Catalysts are central in modern industrial chemistry and there is an urgent need to develop new catalysts. Such a
rapid pace of development brings with it a new set of challenges at all levels of research, from synthesis and
characterization to testing and modelling. This book reviews the current status of combinatorial catalysis, scientific
catalyst design techniques, methods for preparing inorganic combinatorial libraries, experimental design methods,
data processing, system modelling an simulation, and catalyst testing. The individual contributions reveal the
development of high throughput catalyst design and test methods and identify the main challenges in the field,
including new catalyst preparation techniques, rapid performance evaluation, and new microreactor configurations.
Readership: All those working in catalytic process analysis and development. The extensive review of catalysis
principles is especially relevant for postgraduate students seeking to pursue studies in catalysis.

Chemistry of Microporous Crystals

This book introduces recent progress in preparation and application of core-shell and yolk-shell structures for
attractive design of catalyst materials. Core-shell nanostructures with active core particles covered directly with an
inert shell can perform as highly active and selective catalysts with long lifetimes. Yolk-shell nanostructures
consisting of catalytically active core particles encapsulated by hollow materials are an emerging class of
nanomaterials. The enclosed void space is expected to be useful for encapsulation and compartmentation of guest
molecules, and the outer shell acts as a physical barrier to protect the guest molecules from the surrounding
environment. Furthermore, the tunability and functionality in the core and the shell regions can offer new catalytic
properties, rendering them attractive platform materials for the design of heterogeneous catalysts. This book
describes the recent development of such unique nanostructures to design effective catalysts which can lead to new
chemical processes. It provides an excellent guide for design and application of core-shell and yolk-shell structured
catalysts for a wide range of readers working on design of attractive catalysts, photocatalysts, and electrocatalysts
for energy, environmental, and green chemical processes.

Introduction to Green Chemistry, Second Edition

This comprehensive series covers the science and technology of zeolites and all related microporous and
mesoporous materials. Authored by renowned experts, volume 3 deals with the most widely employed techniques for
the post-synthesis modification of molecular sieves.

Catalysis by Zeolites: International Symposium Proceedings (Studies in surface science and catalysis)

The Chemistry of Anilines

In the nearly 10 years since the publication of the bestselling first edition of Introduction to Green Chemistry, interest
in green chemistry and clean processes has grown so much that topics, such as fluoruous biphasic catalysis, metal
organic frameworks, and process intensification, barely mentioned in the first edition, have become major areas of
research. In addition, government funding has ramped up the development of fuel cells and biofuels. It reflects the
evolving focus from pollution remediation to pollution prevention. Copiously illustrated with over 800 figures, this
second edition provides an update from the frontiers of the field. New and expanded research topics: Metal-organic
frameworks Solid acids for alkylation of isobutene by butanes Carbon molecular sieves Mixed micro- and
mesoporous solids Organocatalysis Process intensification and gas phase enzymatic reactions Hydrogen storage for
fuel cells Reactive distillation Catalysts in action on an atomic scale Updated and expanded current events topics:
Industry resistance to inherently safer chemistry Nuclear power Removal of mercury from vaccines Removal of
mercury and lead from primary explosives Biofuels Uses for surplus glycerol New hard materials to reduce wear
Electronic waste Smart growth The book covers traditional green chemistry topics, including catalysis, benign
solvents, and alternative feedstocks. It also discusses relevant but less frequently covered topics with chapters such
as Chemistry of Longer Wear and Population and the Environment. This coverage highlights the importance of
chemistry to everyday life and demonstrates the benefits the expanded exploitation of green chemistry can have for
society.

12th International Congress on Catalysis
Catalysis and Zeolites

Explore the potential of biomass-based chemicals with this comprehensive new reference from leading voices in the field. With the depletion of fossil raw materials a readily ascertainable inevitability, the exploitation of biomass-based renewable derivatives becomes ever more practical and realistic. In Biomass Valorization: Sustainable Methods for the Production of Chemicals, accomplished researchers and authors Davide Ravelli and Chiara Samorì deliver a thorough compilation of state-of-the-art techniques and most advanced strategies used to convert biomass into useful building blocks and commodity chemicals. Each chapter in this collection of insightful papers begins by detailing the core components of the described technology, along with a fulsome description of its advantages and limitations, before moving on to a discussion of recent advancements in the field. The discussions are grouped by the processed biomass, such as terrestrial biomass, aquatic biomass, and biomass-deriving waste. Readers will also benefit from the inclusion of: A thorough introduction to the role of biomass in the production of chemicals An exploration of biomass processing via acid, base, and metal catalysis, as well as biocatalysis A practical discussion of biomass processing via pyrolysis and thermochemical-biological hybrid processes A concise treatment of biomass processing assisted by ultrasound and via electrochemical, photochemical and mechanochemical means Perfect for chemical engineers, catalytic chemists, biotechnologists, and polymer chemists, Biomass Valorization: Sustainable Methods for the Production of Chemicals will also earn a place in the libraries of environmental chemists and professionals working with organometallics and natural products chemists.

Zeolites and Related Materials: Trends Targets and Challenges (SET)

This volume is a collection of 14 plenary lectures and 25 invited and contributed papers which were presented at the International Symposium on Chemistry of Microporous Crystals (CMPC) held at Sophia University in Tokyo, Japan. The symposium was organized by the Japan Association of Zeolite in collaboration with twelve major academic Japanese societies dealing with the chemistry of microporous crystals. The symposium was attended by over 250 researchers from 13 countries. The objective of the symposium was to present new horizons and developments in the chemistry and application of natural and synthetic crystalline materials having microporous structures. At this meeting the following trends were noted: new possibilities for highly selective oxidation of hydrocarbon and synthesis of fine chemicals using modified zeolites and metallosilicates; sophisticated syntheses of some valuable hydrocarbons such as 2,6-dimethylnaphthalene and styrene which could not be obtained successfully by conventional catalysts; detailed mechanism of decomposition and aromatization of paraffinic hydrocarbons on zeolitic catalysts; methanol conversion on zeolite catalysts; syntheses of novel wide pore aluminophosphates and their isomorphously substituted porous crystals; detailed analysis of the state of cations in zeolites and metallosilicates; application to direct decomposition of nitric oxide; dynamic behavior of molecules in zeolite pores; chemistry and reaction performance of clay minerals. This proceedings volume contains thorough reviews and original contributions, each of which includes an extensive list of references. The result is a comprehensive overview of the chemistry of zeolite and zeolite-like crystalline materials and clay minerals, including pillared clays.

Effects of Metal Cation on the Skeletal Isomerization of N-Butene Over ZSM-5 and Ferrierite

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 scientists, 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
Catalysis and Adsorption by Zeolites

The recession in the traditional heavy industries along with the development of advanced technologies in all the industrial countries has meant that the impact of heterogeneous catalysis in the synthesis of fine chemicals is becoming increasingly noticeable. The first International Symposium on Heterogeneous Catalysis and Fine Chemicals is to be seen in this perspective. Organised by the Laboratory of Catalysis in Organic Chemistry of the University of Poitiers within the framework of the International Symposia of the ‘Centre National de la Recherche Scientifique’ (CNRS), the symposium provided an opportunity for contact between academic researchers and manufacturers, users (or potential users) of solid catalysts for fine chemical synthesis. Two panels of industrial and academic researchers - one on selective hydrogenation, the other on selective synthesis of substituted aromatics - showed that heterogeneous catalysis already plays a significant role in fine organic chemistry. The main topics of the symposium were introduced in six plenary lectures and three invited communications, maintaining a balance between the industrial and the academic points of view. Some 60 research papers were submitted from which the Scientific Committee selected the 35 communications (oral or poster) which fitted most closely the theme of the symposium. All are reproduced in full in this Proceedings volume.