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Inorganic oxysalts are chemical compounds that contain oxygen - the most abundant element in the Earth's core. Their atomic arrangement (crystal structure) has a dramatic influence upon their properties and, as a consequence, upon the inorganic part of the world around us. This book is the first systematic survey of structures of inorganic oxysalts considered from the viewpoint of modern scientific methods of description and visualization of complex atomic arrangements.

to the Fundamental and Applied Catalysis Series Catalysis is important academically and industrially. It plays an essential role in the manufacture of a wide range of products, from gasoline and plastics to fertilizers and herbicides, which would otherwise be unobtainable or prohibitively expensive. There are few chemical- or oil-based material items in modern society that do not depend in some way on a

catalytic stage in their manufacture. Apart from manufacturing processes, catalysis is finding other important and over-increasing uses; for example, successful applications of catalysis in the control of pollution and its use in environmental control are certain to increase in the future. The commercial importance of catalysis and the diverse intellectual challenges of catalytic phenomena have stimulated study by a broad spectrum of scientists including chemists, physicists, chemical engineers, and material scientists. Increasing research activity over the years has brought deeper levels of understanding, and these have been associated with a continually growing amount of published material. As recently as sixty years ago, Rideal and Taylor could still treat the subject comprehensively in a single volume, but by the 1950s Emmett required six volumes, and no conventional multivolume text could now cover the whole of catalysis in any depth. In dem Lehrbuch für Studenten der Chemie werden wichtige Aspekte und Zusammenhänge der Strukturen anorganisch-chemischer Verbindungen dargelegt. Die Strukturmerkmale von Molekülverbindungen wie auch von Festkörpern werden behandelt und an anschaulichen Beispielen erläutert. So weit wie möglich werden diese Strukturen mit einfachen und eingängigen Theorien erklärt (Gillespie-Nyholm-Theorie, Ligandenfeldtheorie, Ionenradienverhältnisse,

Pauling-Regeln, (8-N)-Regel u.ä.), es wird aber auch auf die moderne Bindungstheorie eingegangen.

Wichtige Festkörperstrukturen werden wiederholte Male und dabei jedes Mal von einem anderen Standpunkt betrachtet. Zusammenhänge zwischen Struktur und physikalischen Eigenschaften werden herausgearbeitet.

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.

This volume compiles and discusses the fundamental and multidisciplinary knowledge on adsorption and separation processes using zeolites as adsorbents. Over the last decade, a large amount of research has been carried out for the

development of zeolites as adsorbents. However, there is still a growing interest to increase the understanding of such selective adsorbents.

Therefore, synthesis strategies and new approaches for developing new selective zeolite adsorbents for gas separation are presented in the first chapter. In addition, a chapter focused on adsorption characterization techniques of microporous materials is included. This will be helpful for advanced readers, since the new IUPAC recommendations for microporous characterization are not still widely employed by the zeolite community. Experimental and theoretical aspects of economically and environmentally relevant separations, which have been successfully carried out with zeolites, are discussed in detail in subsequent chapters. Finally, industrial zeolite based adsorption and separation processes as well as current perspectives for new zeolite based separations, and improvements of current technologies are presented.

Volume 57 of Reviews in Mineralogy and Geochemistry highlights the present knowledge on micro- and mesoporous mineral phases, with focus on their crystal-chemical aspects, occurrence and porous activity in nature and experiments. As zeolites are the matter of numerous ad hoc meetings and books - including two volumes in this series - they do not specifically appear in the present volume. The phases of the sodalite and cancrinite-

davyne groups, which mineralogists consider distinct from zeolites, are instead considered (in the order, chapter 7 by W. Depmeier and part of chapter 8 by E. Bonaccorsi and S. Merlino, respectively).

The only book to provide a complete survey -- from the crystallographic fundamentals right up to recent high-tech applications in aerospace technology. Following a general introduction to the topic, the authors go on to cover the crystal chemistry of mullite and related phases, as well as its basic properties, phase equilibria and stability. One whole section is devoted to the synthesis and processing of mullite ceramics, while later ones cover mullite coatings, fibers and matrix composites. For materials scientists, solid state chemists and physicists, crystallographers and mineralogists.

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 concepts with the most sophisticated data for each scientific subtopic and budding technology. Supplying over 750 figures, and 350 display equations, this impressive achievement in zeolite science observes synthesis through the lens of MFI (ZSM-5 and silicalite). Chapters progress from

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conceptual building blocks to complex research presentations.

A volume which includes entries on quasicrystals, icosahedral packing, other packing considerations, extended structures, data treatment and data mining is presented by luminaries from the crystallography community. Several of the contributions are from the schools of such trend-setting crystallographers as J. Desmond Bernal and Aleksandr I. Kitaigorodskii. Internationally renowned scientists contributed such as Tom L. Blundell, Johann Jacob Burckhardt, John L. Finney, Jenny P. Glusker, Nobel laureate Herbert A. Hauptman, the 2014 Ewald-Prize winner A. Janner, Aminoff-Prize winner Isabella Karle, Nobel laureate Jerome Karle, Buckley-Prize winner Alan L. Mackay, Ewald-Prize winner David Sayre, Vladimir Shevchenko, and J. Fraser Stoddart. A few frontier topics dominate the selected material. Pioneers of the direct methods describe the phase problem and how it was solved, including the mathematical approach and the utilization of experience with gas-phase electron diffraction. The reviews by Herbert Hauptman, Jerome and Isabella Karle, and David Sayre reach to the present day in assessing the possibilities of X-ray crystallography. Another focus topic is the investigation of systems that are outside the so-called classical system of crystals. They include quasicrystals, imperfect and very small crystals, supramolecular species, crystal structures

without lattice, clusters, nanomaterials among others. Application of synchrotron and cryoprotection techniques, the free-electron laser flash technique and others are mentioned in addition to X-ray crystallography. The relationship between structural and materials properties are examined and uncovered. The broader topics of the so-called generalized crystallography include polymers, clusters, polydisperse chain assemblies, and giant icosahedral fullerenes. There are some key contributions related to the structural investigation of biological macromolecules.

The International Multidisciplinary Microscopy Congress (INTERM2013) was organized on October 10-13, 2013. The aim of the congress was to bring together scientists from various branches to discuss the latest advances in the field of microscopy. The contents of the congress have been broadened to a more "interdisciplinary" scope, so as to allow all scientists working on related subjects to participate and present their work. These proceedings include 39 peer-reviewed technical papers, submitted by leading academic and research institutions from over 12 countries and representing some of the most cutting-edge research available. The 39 papers are grouped into the following sections: - Applications of Microscopy in the Physical Sciences - Applications of Microscopy in the Biological Sciences

Die Autoren stellen die Geschichte der Landolt-

Börnstein-Sammlung von den Anfängen bis zur Gegenwart in einem kurzen Abriss dar. Sie erzählen in folgenden Kapiteln die Erfolgsgeschichte einer wissenschaftlichen Datensammlung im Springer-Verlag: Die Vorgeschichte - Die erste Auflage (1883) - Von der zweiten bis zur fünften Auflage - Die sechste Auflage - Die Neue Serie - Die Darmstädter Redaktion - Die achtziger Jahre - Die neunziger Jahre: Der Computer hält Einzug in die Redaktion - Nach der Jahrtausendwende: Landolt-Börnstein Online - Ausblick.

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.

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

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researchers will appreciate its in-depth coverage of the zeolite spectrum, including the latest views on zeolite structure, characterization and applications.

Although ceramics have been known to mankind literally for millennia, research has never ceased. Apart from the classic uses as a bulk material in pottery, construction, and decoration, the latter half of the twentieth century saw an explosive growth of application fields, such as electrical and thermal insulators, wear-resistant bearings, surface coatings, lightweight armour, or aerospace materials. In addition to plain, hard solids, modern ceramics come in many new guises such as fabrics, ultrathin films, microstructures and hybrid composites. Built on the solid foundations laid down by the 20-volume series *Materials Science and Technology, Ceramics Science and Technology* picks out this exciting material class and illuminates it from all sides. Materials scientists, engineers, chemists, biochemists, physicists and medical researchers alike will find this work a treasure trove for a wide range of ceramics knowledge from theory and fundamentals to practical approaches and problem solutions.

Zeolites and zeolite-like became important because of their ion exchange capacities and their outstanding catalytic properties. Millions of tons of zeolites have been produced in the past years for the oil refining industry alone and, in even greater

quantities, as ion-exchanging softening agents for detergents. Numerous other applications, e.g. in environmental protection, farming, gas separation, medicine, and pharmacy, are known, making zeolites almost a necessity of daily life.

Consequently, there are many, research activities dealing with zeolites properties and characterization. However, a strictly systematic description of zeolite-type crystal structures was not available but is now presented in this series of volumes. It is designed as a reference work for zeolite chemists and materials scientists, but it also serves as a tool to interpret structural similarities and to derive new structures from known topologies.

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Zeolite scientists, whether they are working in synthesis, catalysis, characterization or application development, use the Atlas of Zeolite Framework Types as a reference. It describes the main features of all of the confirmed zeolite framework structures, and gives references to the relevant primary structural literature. Since the last edition 34 more framework types have been approved and are described in this new edition. A further new feature will be that characteristic building units will be listed for each of the framework types. Zeolites and their analogs are used as desiccants, as water softeners, as shape-selective acid catalysts, as molecular sieves, as concentrators of radioactive isotopes, as blood clotting agents, and even as additives to animal feeds. Recently, their suitability as hosts for nanometer spacing of atomic clusters has also been demonstrated. These diverse applications are a reflection of the fascinating structures of these microporous materials. Each time a new zeolite framework structure is reported, it is examined by the Structure Commission of the International Zeolite Association (IZA-SC), and if it is found to be unique and to conform to the IZA-SC's definition of a zeolite, it is assigned a 3-letter framework type code. This

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code is part of the official IUPAC nomenclature for microporous materials. The Atlas of Zeolite

Framework Types is essentially a compilation of data for each of these confirmed framework types. These data include a stereo drawing showing the framework connectivity, features that characterize the idealized framework structure, a list of materials with this framework type, information on the type material that was used to establish the framework type, and stereo drawings of the pore openings of the type material. * Clear stereo drawings of each of the framework types * Description of the features of the framework type, allowing readers to quickly see if the framework type is suitable to their needs *

References to isotopic materials, readers can quickly identify related materials and consult the appropriate reference

Relates how to remove contaminants from effluent streams. The book discusses separation of environmental pollutants - enriching, stripping, clarification, benefication, remediation, removal, concentration, purification, and more - and critiques both tried-and-true and newer methods. It covers classical as well as newly emerging means of separating industrial waste and by-products from environmental streams.

This classic text is devoted to describing crystal structures, especially periodic structures, and their symmetries. Updated material prepared by author

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enhances presentation, which can serve as text or reference. 1996 edition.

Modified Clay and Zeolite Nanocomposite Materials: Environmental and Pharmaceutical Applications retraces the most important knowledge gaps that the scientific community is facing, including a drawback of real-world applications. This valuable resource explores the novel applications of this group of nanomaterials that can be suitably surface-modified to obtain properties that can be applied in environmental and pharmaceutical fields. For example, modification with surfactants has given new motivation to the study of these materials by producing an inversion in the ion exchange behavior from cationic to anionic. This strategy has paved the way for new uses highlighted in this timely resource. Explores the combination of both minerals (clay and zeolite) together, with their application in two broad areas of emerging research Explains better utilization and applications for modified clay and zeolite through detailed comparative studies Consolidates information on the modification and tuning of clay and zeolite materials for novelty applications Helps users in the selection of materials, surface features, and other functionalization for diverse applications Zeolites and zeolite-like materials became important because of their ion exchange capacities and their outstanding catalytic properties. Millions of tons of

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Consequently, there are many research activities dealing with zeolite properties and characterization. However, a strictly systematic description of zeolite-type crystal structures was not available but is now presented in this series of volumes. It is designed as a reference work for zeolite chemists and materials scientists, but it also serves as a tool to interpret structural similarities and to derive new structures from known topologies.

What can we learn from nature? The study of the physical, chemical and structural properties of well-known minerals in the geo- and biosphere creates new opportunities for innovative applications in technology, environment or medicine. This book highlights today's research on outstanding minerals such as garnets used as components in all solid state batteries, delafossite formation during wastewater treatment, monazites for the immobilization of high level radioactive waste or hydroxylapatite as bioactive material for medical implant applications. Contents Part I: High-technology materials Lithium ion-conducting oxide

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garnets Olivine-type battery materials Natural and synthetic zeolites Microstructure analysis of chalcopyrite-type CuInSe_2 and kesterite-type $\text{Cu}_2\text{ZnSnSe}_4$ absorber layers in thin film solar cells Surface-engineered silica via plasma polymer deposition Crystallographic symmetry analysis in NiTi shape memory alloys Part II: Environmental mineralogy Gold, silver, and copper in the geosphere and anthroposphere: can industrial wastewater act as an anthropogenic resource? Applied mineralogy for recovery from the accident of Fukushima Daiichi Nuclear Power Station Phosphates as safe containers for radionuclides Immobilization of high-level waste calcine (radwaste) in perovskites Titanate ceramics for high-level nuclear waste immobilization Part III: Biomineralization, biomimetics, and medical mineralogy Patterns of mineral organization in carbonate biological hard materials Sea urchin spines as role models for biological design and integrative structures Nacre: a biomineral, a natural biomaterial, and a source of bio-inspiration Hydroxylapatite coatings: applied mineralogy research in the bioceramics field A procedure to apply spectroscopic techniques in the investigation of silica-bearing industrial materials Zeolite-Type Crystal Structures and their Chemistry. 41 New Framework Type CodesSpringer

Covering the breadth of zeolite chemistry and catalysis, this book provides the reader with a

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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.

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

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The essential introduction to the understanding of the structure of inorganic solids and materials. This revised and updated 2nd Edition looks at new developments and research results within Structural Inorganic Chemistry in a number of ways, special attention is paid to crystalline solids, elucidation and description of the spatial order of atoms within a chemical compound. Structural principles of inorganic molecules and solids are described

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through traditional concepts, modern bond-theoretical theories, as well as taking symmetry as a leading principle.

Carefully designed to balance coverage of theoretical and practical principles, Fundamentals of Water Treatment Unit Processes delineates the principles that support practice, using the unit processes approach as the organizing concept. The author covers principles common to any kind of water treatment, for example, drinking water, municipal wastewater, industrial water treatment, industrial waste water treatment, and hazardous wastes. Since technologies change but principles remain constant, the book identifies strands of theory rather than discusses the latest technologies, giving students a clear understanding of basic principles they can take forward in their studies. Reviewing the historical development of the field and highlighting key concepts for each unit process, each chapter follows a general format that consists of process description, history, theory, practice, problems, references, and a glossary. This organizational style facilitates finding sections of immediate interest without having to page through an excessive amount of material. Pedagogical Features End-of-chapter glossaries provide a ready reference and add terms pertinent to topic but beyond the scope of the chapter Sidebars sprinkled throughout the chapters present the lore and history of a topic, enlarging

students' perspective Example problems emphasize tradeoffs and scenarios rather than single answers and involve spreadsheets Reference material includes several appendices and a quick-reference spreadsheet Solutions manual includes spreadsheets for problems Supporting material is available for download Understanding how the field arrived at its present state of the art places the technology in a more logical context and gives students a strong foundation in basic principles. This book does more than build technical proficiency, it adds insight and understanding to the broader aspects of water treatment unit processes.

The atlas contains an entry for each unique zeolite framework type. The term zeolite framework refers to a corner-sharing network of tetrahedrally coordinated atoms. This 5th edition is again an updated version of the previous compilation, and the number of entries has risen significantly to 133.

An updated edition of the essential guide to the technology of glass-ceramic technology Glass-ceramic materials share many properties with both glass and more traditional crystalline ceramics. The revised third edition of Glass-Ceramic Technology offers a comprehensive and updated guide to the various types of glass-ceramic materials, the methods of development, and the myriad applications for glass-ceramics. Written in an easy-to-use format, the book includes an explanation of the new generation of glass-ceramics. The updated third edition explores glass-ceramics new materials and properties and reviews the expanding regions for applying these materials. The new edition contains current information on glass/glass-ceramic forming in general

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and explores specific systems, crystallization mechanisms and products such as: ion exchange strengthening of glass-ceramics, glass-ceramics for mobile phones, new glass-ceramics for energy, and new glass-ceramics for optical and architectural application. It also contains a new section on dental materials and twofold controlled crystallization. This revised guide: Offers an important new section on glass/glass ceramic forming Includes the fundamentals and the application of nanotechnology as related to glass-ceramic technology Reviews the development of the various types of glass-ceramic materials Covers information on new glass-ceramics with new materials and properties and outlines the opportunities for applying these materials Written for ceramic and materials engineers, managers, and designers in the ceramic and glass industry, the third edition of Glass-Ceramic Technology features new sections on Glass/Glass-Ceramic Forming and new Glass-Ceramics as well as expanded sections on dental materials and twofold controlled crystallization.

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

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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.

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 coverage of the field, in the opinion of the Editors. In the present Edition the number of chapters rose from 16-22. The contributions can be 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 Kresge and and Jim Vartuli. The latter two authors belong to the discoverers of the M41S family of mesoporous materials.

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

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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

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.

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