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Perovskite Materials Synthesis, Characterisation, Properties, and Applications *BoD - Books on Demand* The book summarizes the current state of the know-how in the field of perovskite materials: synthesis, characterization, properties, and applications. Most chapters include a review on the actual knowledge and cutting-edge research results. Thus, this book is an essential source of reference for scientists with research fields in energy, physics, chemistry and materials. It is also a suitable reading material for graduate students. **Lead-Free Piezoelectrics** *Springer Science & Business Media* Ecological restrictions in many parts of the world are demanding the elimination of Pb from all consumer items. At this moment in the piezoelectric ceramics industry, there is no issue of more importance than the transition to lead-free materials. The goal of Lead-Free Piezoelectrics is to provide a comprehensive overview of the fundamentals and developments in the field of lead-free materials and products to leading researchers in the world. The text presents chapters on demonstrated applications of the lead-free materials, which will allow readers to conceptualize the present possibilities and will be useful for both students and professionals conducting research on ferroelectrics, piezoelectrics, smart materials, lead-free materials, and a variety of applications including sensors, actuators, ultrasonic transducers and energy harvesters. **Fundamentals of Ceramic Powder Processing and Synthesis** *Elsevier* Ceramic powder synthesis and processing are two of the most important technologies in chemical engineering and the ceramics-related area of materials science. This book covers both the processing and the synthesis of ceramic powders in great depth and is indeed the only up-to-date, comprehensive source on the subject available. The application of modern scientific and engineering methods to the field of ceramic powder synthesis has resulted in much greater control of properties. Fundamentals of Ceramic Powder Processing and Synthesis presents examples of these modern methods as they apply to ceramic powders. The book is organized to describe the natural and synthetic raw materials that comprise contemporary ceramics. It covers the three reactant processes used in synthetic ceramic powder synthesis: solid, liquid, and gas. Ceramic powder processing, as a field of materials processing, is undergoing rapid expansion. The present volume is intended as a complete and useful source on this subject of great current interest. It provides comprehensive coverage from a strong chemistry and chemical engineering perspective and is especially applicable to materials scientists, chemical engineers, and applied chemists. Key Features * The most complete and updated reference source on the subject * Comprehensive coverage from a strong chemical engineering and chemistry perspective * Emphasis on both natural and synthetic raw materials in ceramic powder synthesis * Information on reaction kinetics * Superior, more comprehensive coverage than that in existing texts * Sample problems and exercises * Problems at the end of each chapter which supplement the material **Piezoelectric Ceramics Advances in Lead-Free Piezoelectric Materials** *Springer* This book systematically reviews the history of lead-free piezoelectric materials, including the latest research. It also addresses a number of important issues, such as new types of materials prepared in a multitude of sizes, structural and physical properties, and potential applications for high-performance devices. Further, it examines in detail the state of the art in lead-free piezoelectric materials, focusing on the pathways to modify different structures and achieve enhanced physical properties and new functional behavior. Lastly, it discusses the prospects for potential future developments in lead-free piezoelectric materials across disciplines and for multifunctional applications. Given its breadth of coverage, the book offers a comprehensive resource for graduate students, academic researchers, development scientists, materials producers, device designers and applications engineers who are working on or are interested in advanced lead-free piezoelectric materials. **Piezoelectric Energy Harvesting** *John Wiley & Sons* The transformation of vibrations into electric energy through the use of piezoelectric devices is an exciting and rapidly developing area of research with a widening range of applications constantly materialising. With Piezoelectric Energy Harvesting, world-leading researchers provide a timely and comprehensive coverage of the electromechanical modelling and applications of piezoelectric energy harvesters. They present principal modelling approaches, synthesizing fundamental material related to mechanical, aerospace, civil, electrical and materials engineering disciplines for vibration-based energy harvesting using piezoelectric transduction. Piezoelectric Energy Harvesting provides the first comprehensive treatment of distributed-parameter electromechanical modelling for piezoelectric energy harvesting with extensive case studies including experimental validations, and is the first book to address modelling of various forms of excitation in piezoelectric energy harvesting, ranging from airflow excitation to moving loads, thus ensuring its relevance to engineers in fields as disparate as aerospace engineering and civil engineering. Coverage includes: Analytical and approximate analytical distributed-parameter electromechanical models with illustrative theoretical case studies as well as extensive experimental validations Several problems of piezoelectric energy harvesting ranging from simple harmonic excitation to random vibrations Details of introducing and modelling piezoelectric coupling for various problems Modelling and exploiting nonlinear dynamics for performance enhancement, supported with experimental verifications Applications ranging from moving load excitation of slender bridges to airflow excitation of aeroelastic sections A review of standard nonlinear energy harvesting circuits with modelling aspects. **Chemically Deposited Nanocrystalline Metal Oxide Thin Films Synthesis, Characterizations, and Applications** *Springer Nature* This book guides beginners in the areas of thin film preparation, characterization, and device making, while providing insight into these areas for experts. As chemically deposited metal oxides are currently gaining attention in development of devices such as solar cells, supercapacitors, batteries, sensors, etc., the book illustrates how the chemical deposition route is emerging as a relatively inexpensive, simple, and convenient solution for large area deposition. The advancement in the nanostructured materials for the development of devices is fully discussed. **Fundamentals of Ceramics** *CRC Press* Updated and improved, this revised edition of Michel Barsoum's classic text Fundamentals of Ceramics presents readers with an exceptionally clear and comprehensive introduction to ceramic science. Barsoum offers introductory coverage of ceramics, their structures, and properties, with a distinct emphasis on solid state physics and chemistry. Key equations are derived from first principles to ensure a thorough understanding of the concepts involved. The book divides naturally into two parts. Chapters 1 to 9 consider bonding in ceramics and their resultant physical structures, and the electrical, thermal, and other properties that are dependent on bonding type. The second part (Chapters 11 to 16) deals with those factors that are determined by microstructure, such as fracture and fatigue, and thermal, dielectric, magnetic, and optical properties. Linking the two sections is Chapter 10, which describes sintering, grain growth, and the development of microstructure. Fundamentals of Ceramics is ideally suited to senior undergraduate and graduate students of materials science and engineering and related subjects. **Perovskite and Piezoelectric Materials** *BoD - Books on Demand* Investigating in the area of perovskite materials and the fabrication of devices for properties in optoelectronics, we have presented a brief outline of perovskite materials. The authors present a fairly comprehensive arrangement of this very active area of research, with its past changes and present position and outlooks. Discussions are presented regarding photocatalysis, fabrication of solar cell devices and their stability, lead-free materials, as well as thermoelectric and piezoelectric applications. In view of the present status of perovskite materials, I am assured that each chapter of the book will be of boundless encouragement for researchers, scientists, and academicians working in this field. **Electroceramics Materials, Properties, Applications** *John Wiley & Sons* Electroceramics, Materials, Properties, Applications, Second Edition provides a comprehensive treatment of the many aspects of ceramics and their electrical applications. The fundamentals of how electroceramics function are carefully introduced with their properties and applications also considered. Starting from elementary principles, the physical, chemical and mathematical background of the subject are discussed and wherever appropriate, a strong emphasis is placed on the relationship between microstructure and properties. The Second Edition has been fully revised and updated, building on the foundation of the earlier book to provide a concise text for all those working in the growing field of electroceramics. fully revised and updated to include the latest technological changes and developments in the field includes end of chapter problems and an extensive bibliography an Invaluable text for all Materials Science students. a useful reference for physicists, chemists and engineers involved in the area of electroceramics. **Waste Energy Harvesting Mechanical and Thermal Energies** *Springer Science & Business Media* Waste Energy Harvesting overviews the latest progress in waste energy harvesting technologies, with specific focusing on waste thermal mechanical energies. Thermal energy harvesting technologies include thermoelectric effect, storage through phase change materials and pyroelectric effect. Waste mechanical energy harvesting technologies include piezoelectric (ferroelectric) effect with ferroelectric materials and nanogenerators. The book aims to strengthen the syllabus in energy, materials and physics and is well suitable for students and professionals in the fields. **Handbook of Thermoluminescence** *World Scientific* This second edition of the Handbook of Thermoluminescence enlarges on all the subjects which were treated in the first edition and adds further arguments, including the theory of thermoluminescent dose measurement, several examples concerning the kinetics parameters determination using various methods such as peak shape, isothermal decay, and so on. A special section is devoted to food irradiation, an important subject at the present time, and to the thermoluminescent characterization of the minerals extracted from the irradiated food. Another new section is devoted to the thermoluminescent phosphors and their main characteristics. The analytical treatments of the various thermoluminescent models are fully developed. As in the first edition, the arguments are given in alphabetical order to ease research. This second edition therefore aims to provide real practical support for researchers, students and personnel involved in radiation protection services, as well as in medical applications. **Phase Transitions in Ferroelastic and Co-elastic Crystals** *Cambridge University Press* This textbook describes the fundamental principles of structural phase transitions in materials in an easily understandable form, suitable for both undergraduate and graduate students. **Advances in Ceramics Synthesis and Characterization, Processing and Specific Applications** *BoD - Books on Demand* The current book contains twenty-two chapters and is divided into three sections. Section I consists of nine chapters which discuss synthesis through innovative as well as modified conventional techniques of certain advanced ceramics (e.g. target materials, high strength porous ceramics, optical and thermo-luminescent ceramics, ceramic powders and fibers) and their characterization using a combination of well known and advanced techniques. Section II is also composed of nine chapters, which are dealing with the aqueous processing of nitride ceramics, the shape and size optimization of ceramic components through design methodologies and manufacturing technologies, the sinterability and properties of ZnNb oxide ceramics, the grinding optimization, the redox behaviour of ceria based and related materials, the alloy reinforcement by ceramic particles addition, the sintering study through dihedral surface angle using AFM and the surface modification and properties induced by a laser beam in pressings of ceramic powders. Section III includes four chapters which are dealing with the deposition of ceramic powders for oxide fuel cells preparation, the perovskite type ceramics for solid fuel cells, the ceramics for laser applications and fabrication and the characterization and modeling of protonic ceramics. **Frontiers of Ferroelectricity A Special Issue of the Journal of Materials Science** *Springer Science & Business Media* This book presents theory, fundamentals and applications of ferroelectricity. 24 chapters gather reviews and research reports covering the spectrum of ferroelectricity. It describes the current levels of understanding of various aspects of ferroelectricity as presented by authorities in the field. Topics include relaxors, piezoelectrics, microscale and nanoscale studies, polymers and composites, unusual properties, and techniques and devices. The book is intended for physicists, engineers and materials scientists working with ferroelectric materials. **Ferroelectric Phenomena in Crystals Physical Foundations** *Springer Science & Business Media* The expansion of the application of ferroelectric crystals in engineering as well as of a number of fundamental problems of solid-state physics, which have not yet been solved and which bear a direct relation to ferroelectricity, has lately stimulated much interest in the problem of ferroelectricity. In courses of solid-state physics ferroelectricity is studied today along with traditional disciplines, such as magnetism, superconductivity, and 'semiconducting phenomena. Moreover, new

specialities have been born concerned directly with the development and utilization of ferroelectric material~ in optics, acoustics, computer technology, and capacitor engineering. Special courses in the physics of ferroelectrics are read in a number of colleges and universities. The study of the nature of ferroelectricity has currently reached such a level of development that we may speak of having gained a rather deep insight into the physical essence of a number of phenomena, which contribute to the generation of a spontaneous electric polarization in crystals. It is exactly at this level that it has become possible to single out that part of the problem, the physical picture of which can be depicted in a rather unsophisticated manner and which is the foundation for the construction of a building of "complete understanding".

Heterogeneous Photocatalysis Using Inorganic Semiconductor Solids *Springer Science & Business Media* This book underscores the essential principles of photocatalysis and provides an update on its scientific foundations, research advances, and current opinions, and interpretations. It consists of an introduction to the concepts that form the backbone of photocatalysis, from the principles of solid-state chemistry and physics to the role of reactive oxidizing species. Having recognised the organic link with chemical kinetics, part of the book describes kinetic concepts as they apply to photocatalysis. The dependence of rate on the reaction conditions and parameters is detailed, the retrospective and prospective aspects of the mechanism of photocatalysis are highlighted, and the adsorption models, photocatalytic rate expressions, and kinetic disguises are examined. This book also discusses the structure, property, and activity relationship of prototypical semiconductor photocatalysts and reviews how to extend their spectral absorption to the visible region to enable the effective use of visible solar spectrum. Lastly, it presents strategies for deriving substantially improved photoactivity from semiconductor materials to support the latest applications and potential trends.

Piezoelectricity Evolution and Future of a Technology *Springer Science & Business Media* Discovered in 1880, piezoelectric materials play a key role in an innovative market of several billions of dollars. Recent advances in applications derive from new materials and their development, as well as to new market requirements. With the exception of quartz, ferroelectric materials are used for they offer both high efficiency and sufficient versatility to meet adequately the multidimensional requirements for application. Consequently, strong emphasis is placed on tailoring materials and technology, whether one deals with single crystals, ceramics or plastic materials. Tailoring requires a basic understanding of both physical principles and technical possibilities and limitations. This report elucidates these developments by a broad spectrum of examples, comprising ultrasound in medicine and defence industry, frequency control, signal processing by SAW-devices, sensors, actuators, including novel valves for modern motor management. It delivers a mutual fertilization of technology push and market pull that should be of interest not only to materials scientists or engineers but also to managers who dedicate themselves to a sound future-oriented R&D policy.

Data-Based Methods for Materials Design and Discovery Basic Ideas and General Methods *Morgan & Claypool Publishers* Machine learning methods are changing the way we design and discover new materials. This book provides an overview of approaches successfully used in addressing materials problems (alloys, ferroelectrics, dielectrics) with a focus on probabilistic methods, such as Gaussian processes, to accurately estimate density functions. The authors, who have extensive experience in this interdisciplinary field, discuss generalizations where more than one competing material property is involved or data with differing degrees of precision/costs or fidelity/expense needs to be considered.

Sensors and Microsystems Proceedings of the AISEM 2020 Regional Workshop *Springer Nature* This book showcases the state of the art in the field of sensors and microsystems, revealing the impressive potential of novel methodologies and technologies. It covers a broad range of aspects, including: bio-, physical and chemical sensors, actuators, micro- and nano-structured materials, mechanisms of interaction and signal transduction, polymers and biomaterials, sensor electronics and instrumentation, analytical microsystems, recognition systems and signal analysis and sensor networks as well as manufacturing technologies, environmental, food, energy and biomedical applications. The book gathers a selection of papers presented at the AISEM Regional Workshop on Sensors and Microsystems, held in Portici (Naples), Italy in February 2020.

Domains in Ferroic Crystals and Thin Films *Springer Science & Business Media* At present, the marketplace for professionals, researchers, and graduate students in solid-state physics and materials science lacks a book that presents a comprehensive discussion of ferroelectrics and related materials in a form that is suitable for experimentalists and engineers. This book proposes to present a wide coverage of domain-related issues concerning these materials. This coverage includes selected theoretical topics (which are covered in the existing literature) in addition to a plethora of experimental data which occupies over half of the book. The book presents experimental findings and theoretical understanding of ferroic (non-magnetic) domains developed during the past 60 years. It addresses the situation by looking specifically at bulk crystals and thin films, with a particular focus on recently-developed microelectronic applications and methods for observations of domains with techniques such as scanning force microscopy, polarized light microscopy, scanning optical microscopy, electron microscopy, and surface decorating techniques. "Domains in Ferroic Crystals and Thin Films" covers a large area of material properties and effects connected with static and dynamic properties of domains, which are extremely relevant to materials referred to as ferroics. In other textbooks on solid state physics, one large group of ferroics is customarily covered: those in which magnetic properties play a dominant role. Numerous books are specifically devoted to magnetic ferroics and cover a wide spectrum of magnetic domain phenomena. In contrast, "Domains in Ferroic Crystals and Thin Films" concentrates on domain-related phenomena in nonmagnetic ferroics. These materials are still inadequately represented in solid state physics textbooks and monographs.

Advances in Ceramics Electric and Magnetic Ceramics, Bioceramics, Ceramics and Environment *BoD - Books on Demand* The current book consists of twenty-four chapters divided into three sections. Section I includes fourteen chapters in electric and magnetic ceramics which deal with modern specific research on dielectrics and their applications, on nanodielectrics, on piezoceramics, on glass ceramics with para-, anti- or ferro-electric active phases, of varistors ceramics and magnetic ceramics. Section II includes seven chapters in bioceramics which include review information and research results/data on biocompatibility, on medical applications of alumina, zirconia, silicon nitride, ZrO₂, bioglass, apatite-wollastonite glass ceramic and b-tri-calcium phosphate. Section III includes three chapters in applications of ceramics in environmental improvement and protection, in water cleaning, in metal bearing wastes stabilization and in utilization of wastes from ceramic industry in concrete and concrete products.

Recent Advances in Porous Ceramics *BoD - Books on Demand* Porous ceramics have recently gained growing importance in industry because of their many applications like filters, absorbers, dust collectors, thermal insulation, hot gas collectors, dielectric resonators, bioreactors, bone replacement and automobile engine components. Generally, porous ceramics have good properties such as mechanical strength, abrasion resistance, and chemical and thermal stability. These porous network ceramic structures also have relatively low density, low mass and low thermal conductivity. Furthermore, permeability is one of the most important properties of porous ceramics for different applications such as membranes because this property directly relates to the pressure drop during filtration. Pore size control is one key factor in fabrication of porous ceramics. The size of particles and their distribution of the raw materials, manufacturing techniques, types of binder used, distribution of binder, and sintering affect the final porosity and pore connectivity, are important things that must be considered during the manufacturing of a porous ceramic body. Therefore, the development of porous ceramic research requires sufficient mechanical and chemical stability as well as permeability. This book covers a wide range of topics such as porous ceramic structure and properties, preparation, simulation and fabrication, sintering, applications for bioceramics, sensors, magnetics and energy saving.

Oxide Electronics *John Wiley & Sons* Oxide Electronics Multiple disciplines converge in this insightful exploration of complex metal oxides and their functions and properties Oxide Electronics delivers a broad and comprehensive exploration of complex metal oxides designed to meet the multidisciplinary needs of electrical and electronic engineers, physicists, and material scientists. The distinguished author eschews complex mathematics whenever possible and focuses on the physical and functional properties of metal oxides in each chapter. Each of the sixteen chapters featured within the book begins with an abstract and an introduction to the topic, clear explanations are presented with graphical illustrations and relevant equations throughout the book. Numerous supporting references are included, and each chapter is self-contained, making them perfect for use both as a reference and as study material. Readers will learn how and why the field of oxide electronics is a key area of research and exploitation in materials science, electrical engineering, and semiconductor physics. The book encompasses every application area where the functional and electronic properties of various genres of oxides are exploited. Readers will also learn from topics like: Thorough discussions of High-k gate oxide for silicon heterostructure MOSFET devices and semiconductor-dielectric interfaces An exploration of printable high-mobility transparent amorphous oxide semiconductors Treatments of graphene oxide electronics, magnetic oxides, ferroelectric oxides, and materials for spin electronics Examinations of the calcium aluminate binary compound, perovskites for photovoltaics, and oxide 2D Degs Analyses of various applications for oxide electronics, including data storage, microprocessors, biomedical devices, LCDs, photovoltaic cells, TFTs, and sensors Suitable for researchers in semiconductor technology or working in materials science, electrical engineering, and physics, Oxide Electronics will also earn a place in the libraries of private industry researchers like device engineers working on electronic applications of oxide electronics. Engineers working on photovoltaics, sensors, or consumer electronics will also benefit from this book.

Additives for Coatings *Wiley-VCH* No doubt: A perfect coating has to look brilliant! But other properties of coatings are also most important. Coatings have to be durable, tough and easily applicable. Additives are the key to success in achieving these characteristics, even though the amounts used in coating formulations are small. It is not trivial at all to select the best additives. In practice, many series of tests are often necessary, and the results do not explain, why a certain additive improves the quality of a coating and another one impairs the coating. This book is dedicated to developers and applicants of coatings working in research or production, and it is aimed at providing a manual for their daily work. It will answer the following questions: How do the most important groups of additives act? Which effects can be achieved by their addition? Scientific theories are linked to practical applications. Emphasis is put on the optical aspects that are most important for the applications in practice. This book is a milestone in quality assurance in the complete field of coatings!

Laser Precision Microfabrication *Springer* Miniaturization and high precision are rapidly becoming a requirement for many industrial processes and products. As a result, there is greater interest in the use of laser microfabrication technology to achieve these goals. This book composed of 16 chapters covers all the topics of laser precision processing from fundamental aspects to industrial applications to both inorganic and biological materials. It reviews the state of the art of research and technological development in the area of laser processing.

Polymer and Ceramic Composite Materials Emergent Properties and Applications *CRC Press* This book summarizes recent advances in the fabrication methods, properties, and applications of various ceramic-filled polymer matrix composites. Surface-modification methods and chemical functionalization of the ceramic fillers are explored in detail, and the outstanding thermal and mechanical properties of polymer-ceramic composites, the modeling of some of their thermal and mechanical parameters, and their major potential applications are discussed along with detailed examples. Aimed at researchers, industry professionals, and advanced students working in materials science and engineering, this work offering a review of a vast number of references in the polymer-ceramic field, this work helps readers easily advance their research and understanding of the field.

Computerised Glow Curve Deconvolution Application to Thermoluminescence Dosimetry Dielectric Materials for Wireless Communication *Elsevier* Microwave dielectric materials play a key role in our global society with a wide range of applications, from terrestrial and satellite communication including software radio, GPS, and DBS TV to environmental monitoring via satellite. A small ceramic component made from a dielectric material is fundamental to the operation of filters and oscillators in several microwave systems. In microwave communications, dielectric resonator filters are used to discriminate between wanted and unwanted signal frequencies in the transmitted and received signal. When the wanted frequency is extracted and detected, it is necessary to maintain a strong signal. For clarity it is also critical that the wanted signal frequencies are not affected by seasonal temperature changes. In order to meet the specifications of current and future systems, improved or new microwave components based on dedicated dielectric materials and new designs are required. The recent progress in microwave telecommunication, satellite broadcasting and intelligent transport systems (ITS) has resulted in an increased demand for Dielectric Resonators (DRs). With the recent revolution in mobile phone and satellite communication systems using microwaves as the propagation media, the research and development in the field of device miniaturization has been a major challenge in contemporary Materials Science. In a mobile phone communication, the message is sent from a phone to the nearest base station, and then on via a series of base stations to the other phone. At the heart of each base station is the combiner/filter unit which has the job of receiving the messages, keeping them separate, amplifying the signals and sending them onto the next base station. For such a microwave circuit to work, part of it needs to resonate at the specific working frequency. The frequency determining component (resonator) used in such a high frequency device must satisfy certain criteria. The three important characteristics required for a dielectric resonator are (a) a high dielectric constant which facilitates miniaturization (b) a high quality factor (Q_x) which improves the signal-to-noise ratio, (c) a low temperature coefficient of the resonant frequency which determines the stability of the transmitted frequency. During the past 25 years scientists the world over have developed a large number of new materials (about 3000) or improved the properties of known materials. About 5000 papers have been published and more than 1000 patents filed in the area of dielectric resonators and related technologies. This book brings the data and science of these several useful materials together, which will be of immense benefit to researchers and engineers the world over. The topics covered in the book includes factors affecting the dielectric properties, measurement of dielectric properties, important low loss dielectric material systems such as perovskites, tungsten bronze type materials, materials in BaO-TiO₂ system, (Zr,Sn)TiO₄, alumina, rutile, AnBn-1O_{3n} type materials, LTCC, ceramic-polymer composites etc. The book also

has a data table listing all reported low loss dielectric materials with properties and references arranged in the order of increasing dielectric constant. Collects together in one source data on all new materials used in wireless communication Includes tabulated properties of all reported low loss dielectric materials In-depth treatment of dielectric resonator materials **Microwave Materials and Applications, 2 Volume Set** John Wiley & Sons 12.2.2 Composite Preparation **Nanogenerators** *BoD - Books on Demand* This book provides an introduction to nanogenerators, which are the newest technological advancement in the field of energy conversion. Chapters discuss the physics behind energy conversion using detailed research results and experimental techniques for fabricating triboelectric and piezoelectric devices, as well as nanogenerators in the field of biomedicine and the construction of stretchable electrodes for wearable devices. **Magnetic, Ferroelectric, and Multiferroic Metal Oxides** Elsevier Magnetic, Ferroelectric, and Multiferroic Metal Oxides covers the fundamental and theoretical aspects of ferroics and magnetoelectrics, their properties, and important technological applications, serving as the most comprehensive, up-to-date reference on the subject. Organized in four parts, Dr. Biljana Stojanovic leads expert contributors in providing the context to understand the material (Part I: Introduction), the theoretical and practical aspects of ferroelectrics (Part II: Ferroelectrics: From Theory, Structure and Preparation to Application), magnetic metal oxides (Part III: Magnetic Oxides: Ferromagnetics, Antiferromagnetics and Ferrimagnetics), multiferroics (Part IV: Multiferroic Metal Oxides) and future directions in research and application (Part V: Future of Metal Oxide Ferroics and Multiferroics). As ferroelectric materials are used to make capacitors with high dielectric constant, transducers, and actuators, and in sensors, reed heads, and memories based on giant magnetoresistive effects, this book will provide an ideal source for the most updated information. Addresses ferroelectrics, ferromagnetics and multiferroelectrics, providing a one-stop reference for researchers Provides fundamental theory and relevant, important technological applications Highlights their use in capacitors with high dielectric constant, transducers, and actuators, and in sensors, reed heads, and memories based on giant magnetoresistive effects **Chemical Synthesis of Advanced Ceramic Materials** Cambridge University Press The first book devoted to the role of chemical synthesis techniques in advanced ceramic materials development. **Nanotechnology and the Environment** *BoD - Books on Demand* Nanotechnology is a vibrant area of research and a growing industry. The core scientific principles and applications of this interdisciplinary field bring together chemists, physicists, materials scientists, and engineers to meet the potential future challenges for sustainable development through new technologies and preparation of advanced materials with sustainable environmental protection. This book on Nanotechnology and the Environment includes the design and the sophisticated fabrication of nanomaterials along with their potential energy and environmental applications. This book is a significant contribution towards the development of the knowledge for all advanced undergraduate, graduate level students, researchers, and professional engineers leading in the fields of nanotechnology, nanochemistry, macromolecular science and those who have interest in energy and environmental science. **Lead Chemistry, Analytical Aspects, Environmental Impact and Health Effects** Elsevier Lead covers the salient aspects of the chemistry of lead, its environmental impact, and its effects on health. The technical, economic and social importance of Lead, at the present time, is beyond all doubt. However, over the last few decades little attention has been given to its behaviour (the properties and applications of its compounds, the environmental distribution of these derivatives, and their impacts on living creatures), this book addresses that gap. It includes coverage of historical aspects, lead mining and production, metal properties, common lead compounds, uses of lead and its derivatives, coordination chemistry, organometallic chemistry, environmental chemistry, toxicity mechanisms, and treatment strategies for lead poisoning. Finally, describing analytical procedures for the determination of lead in chemical, biological and environmental samples. Written by a team of university teachers and researchers with extensive experience in the fields of the chemistry, analytical determination and environmental and health impact of lead and other heavy metals For readers interested in the chemistry and biochemistry of lead and its effects on ecosystems Provides comprehensive knowledge about lead toxicity and preventive measures against lead poisoning **Zeolites for Cleaner Technologies** Catalytic Science 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. Included is a chapter on the very dynamic field of oxidations. In the area of fine chemicals, the emerging field of zeolite applications is introduced in a general lecture and specific applications are discussed. **Ferroelectrics and Antiferroelectrics Handbook of Advanced Dielectric, Piezoelectric and Ferroelectric Materials Synthesis, Properties and Applications** Elsevier This comprehensive book covers recent developments in advanced dielectric, piezoelectric and ferroelectric materials. Dielectric materials such as ceramics are used to manufacture microelectronic devices. Piezoelectric components have been used for many years in radioelectronics, time-keeping and, more recently, in microprocessor-based devices. Ferroelectric materials are widely used in various devices such as piezoelectric/electrostrictive transducers and actuators, pyroelectric infrared detectors, optical integrated circuits, optical data storage and display devices. The book is divided into eight parts under the general headings: High strain high performance piezo- and ferroelectric single crystals; Electric field-induced effects and domain engineering; Morphotropic phase boundary related phenomena; High power piezoelectric and microwave dielectric materials; Nanoscale piezo- and ferroelectrics; Piezo- and ferroelectric films; Novel processing and new materials; Novel properties of ferroelectrics and related materials. Each chapter looks at key recent research on these materials, their properties and potential applications. Advanced dielectric, piezoelectric and ferroelectric materials is an important reference tool for all those working in the area of electrical and electronic materials in general and dielectrics, piezoelectrics and ferroelectrics in particular. Covers the latest developments in advanced dielectric, piezoelectric and ferroelectric materials Includes topics such as high strain high performance piezo and ferroelectric single crystals Discusses novel processing and new materials, and novel properties of ferroelectrics and related materials **Nanocrystalline Ceramics Synthesis and Structure** Springer Science & Business Media Nanocrystalline materials are three-dimensional ultrafine, polycrystalline microstructures. They give rise to interesting and useful chemical and physical-size effects. This book describes the development of a method of synthesizing chemical vapor for the production of nanocrystalline ceramic powders. The development of the microstructure during sintering is studied and the influence of the synthesis parameters on the structure and properties of the nanocrystalline ceramics from the atomic to the microstructural level is investigated. The emerging unified view, from powder synthesis and ceramic processing to structural characterization and determination of properties, provides a detailed understanding of the materials and enables better quality control of the end products. **Ferroelectric Materials for Energy Harvesting and Storage** Woodhead Publishing The need to more efficiently harvest energy for electronics has spurred investigation into materials that can harvest energy from locally abundant sources. Ferroelectric Materials for Energy Harvesting and Storage is the first book to bring together fundamental mechanisms for harvesting various abundant energy sources using ferroelectric and piezoelectric materials. The authors discuss strategies of designing materials for efficiently harvesting energy sources like solar, wind, wave, temperature fluctuations, mechanical vibrations, biomechanical motion, and stray magnetic fields. In addition, concepts of the high density energy storage using ferroelectric materials is explored. Ferroelectric Materials for Energy Harvesting and Storage is appropriate for those working in materials science and engineering, physics, chemistry and electrical engineering disciplines. Reviews wide range of energy harvesting including solar, wind, biomechanical and more Discusses ferroelectric materials and their application to high energy density capacitors Includes review of fundamental mechanisms of energy harvesting and energy solutions, their design and current applications, and future trends and challenges