

Crystal Faces

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Adsorption at Crystal Faces Frank Gilbert Keenen,1926

Surface Forces at Crystal Faces Charles Allen Sloat,Alan Wilfred Cranbrook Menzies,1931

Crystals Ichiro Sunagawa,2007-08-13 How do crystals nucleate and grow? Why and how do crystals form such a wide variety of morphologies, from polyhedral to dendritic and spherulitic forms? These are questions that have been posed since the seventeenth century, and are still of vital importance today both for modern technology, and to understand the Earth's interior and the formation of minerals by living organisms. In this book, Ichiro Sunagawa sets out clearly the atomic processes behind crystal growth, and describes case studies of complex systems from diamond, calcite and pyrite, to crystals formed through biomineralization, such as the aragonite of shells, and apatite of teeth. Essential reading for advanced graduates and researchers in mineralogy and materials science.

Handbook of Raman Spectroscopy Ian R. Lewis,Howell Edwards,2001-08-08 This work covers principles of Raman theory, analysis, instrumentation, and measurement, specifying up-to-the-minute benefits of Raman spectroscopy in a variety of industrial and academic fields, and how to cultivate growth in new disciplines. It contains case studies that illustrate current techniques in data extraction and analysis, as well as over 500 drawings and photographs that clarify and reinforce critical text material. The authors discuss Raman spectra of gases; Raman spectroscopy applied to crystals, applications to gemology, in vivo Raman spectroscopy, applications in forensic science, and collectivity of vibrational modes, among many other topics.

The New International Encyclopædia Daniel Coit Gilman,Harry Thurston Peck,Frank Moore Colby,1902

Morphology of Crystals Ichiro Sunagawa,1988-02-29 The molecular mechanisms underlying the fact that a crystal can take a variety of external forms is something we have come to understand only in the last few decades. This is due to recent developments in theoretical and experimental investigations of crystal growth mechanisms. Morphology of Crystals is divided into three separately available volumes. Part A contains chapters on roughening transition; equilibrium form; step pattern theory; modern PBC; and surface microtopography. This part provides essentially theoretical treatments of the problem, particularly the solid-liquid interface. Part B contains chapters on ultra-fine particles; minerals; transition from polyhedral to dendrite; theory of dendrite; and snow crystals. All chapters are written by world leaders in their respective areas, and some can be seen as representing the essence of a life's work. This is the first English-language work which covers all aspects of the morphology of crystals - a topic which has attracted top scientific minds for centuries. As such, it is indispensable for anyone seeking an answer to a question relating to this fascinating problem: mineralogists, petrologists, crystallographers, materials scientists, workers in solid-state physics and chemistry, etc. In Parts A: Fundamentals and B: Fine Particles, Minerals and Snow equilibrium and kinetic properties of crystals are generally approached from an 'atomistic' point of view. In contrast, Part C: The Geometry of Crystal Growth follows the alternative and complementary 'geometrical' description, where bulk phases are considered as continuous media and their interfaces as mathematical surfaces with orientation-dependent properties. Equations of motion for a crystal surface are expressed in terms of vector and tensor operators working on surface free energy and growth rate, both expressed as functions of surface orientation and driving force, or 'affinity' for growth. This approach emphasizes the interrelation between equilibrium and kinetic behavior. Part 1 establishes the theoretical framework. Part 2 gives a construction toolbox for explicit (analytic) functions. An extra chapter is devoted to experimental techniques for measuring such functions: a new approach to sphere growth experiments. The emphasis throughout is on principles and new concepts. Audience: Advanced readers familiar with traditional aspects of crystal growth theory. Can be used as the basis for an advanced course, provided supplementation is provided in the areas of atomistic models of the advancing surface, diffusion fields, etc.

Rock & Gem DK,2023-06-27 Your compact guide to more than 450 rocks, crystals, gemstones, and fossils Explore the treasures of the Earth—sparkling crystals, vibrant gemstones, and age-old fossils—with this illustrated guide that's sure to captivate every rockhound and budding gemmologist. From primeval origins to their astonishing modern-day uses and appeal, this is the ultimate portrait of Earth's geological riches. Also included is a focused look at other precious materials often prized for their beauty, such as amber, coral, ivory, and fossils. Learn how to identify more than 450 rock and gem specimens through stunning photographs and detailed characteristics. Discover more about rocks and gems through folklore and historical artifacts and find out the fascinating stories behind some of the amazing natural treasures, including the Hope Diamond and the Great Mogul emerald. It also contains information on polishing and displaying your finds to further equip you with all the knowledge needed to delve into the arena of rock and mineral collecting. Rocks & Gems was produced in association with the Smithsonian in Washington, D.C., the world's largest museum complex, ensuring the guide's accuracy.

Nature Guide: Rocks and Minerals DK,2012-06-18 Did you know culinary salt is the mineral halite? Or that the pigment vermilion is powdered cinnabar, a mineral whose name comes from the Persian for dragon's blood? Discover the extraordinary mineral treasures that form our planet and that today we use in everything, from makeup and cookery to agriculture and high-tech. Nature Guide Rocks and Minerals is your essential collector's companion, with illustrated entries on hundreds of minerals, gems, and rocks from actinium to zirconium. Its breathtaking array includes organic minerals, such as pearls and corals, as well as silicates and native elements like gold. Browse to find wonderful gems, including opals, or pyropes - a deep-red garnet the size of a hen's egg. Nature Guide Rocks and Minerals reveals each mineral's defining characteristics and explains how and where they were formed, how they were first identified, their uses, and their chemical composition. Whether you are a geology student or starting your own collection, this fact-packed book is both a fascinating read and an essential identification guide.

Earth Materials Kevin Hefferan,John O'Brien,2022-06-08 Earth Materials Earth materials encompass the minerals, rocks, soil and water that constitute our planet and the physical, chemical and biological processes that produce them. Since the expansion of computer technology in the last two decades of the twentieth century, many universities have compressed or eliminated individual course offerings such as mineralogy, optical mineralogy, igneous petrology, sedimentology and metamorphic petrology and replaced them with Earth materials courses. Earth materials courses have become an essential curricular component in the fields of geology, geoscience, Earth science, and many related areas of study. This textbook is designed to address the needs of a one- or two-semester Earth materials course, as well as individuals who want or need an expanded background in minerals, rocks, soils and water resources. Earth Materials, Second Edition, provides: Comprehensive descriptive analysis of Earth materials Color graphics and insightful text in a logical integrated format Field examples and regional relationships with graphics that illustrate concepts discussed Examples of how concepts discussed can be used to address real world issues Contemporary references from current scientific journals related to developments in Earth materials research Summative discussions of how Earth materials are interrelated with other science and non-science fields of study Additional resources, including detailed descriptions of major rock-forming minerals and keys for identifying minerals using macroscopic and/or optical methods, are available online at www.wiley.com/go/hefferan/earthmaterials Earth Materials, Second Edition, is an innovative, visually appealing, informative and readable textbook that addresses the full spectrum of Earth materials.

Group Theory and Its Application to Physical Problems Morton Hamermesh,2012-04-26 One of the best-written, most skillful expositions of group theory and its physical applications, directed primarily to advanced undergraduate and graduate students in physics, especially quantum physics. With problems.

Pharmaceutical Crystallography Andrew Bond, 2019-07-24 The pharmaceutical industry has become acutely aware of the importance of the solid state, but pharmaceutical scientists often lack specific training in topics related to solid-state structure and crystallography. This book provides needed support in this topical area. Taking an intuitive and informal approach to solid-state structure and crystallographic concepts, this book is written for anyone who needs a clear understanding of modern crystallography, with specific reference to small-molecule pharmaceutical solids. The author describes molecular crystals and crystal structures, symmetry, space groups, single-crystal and powder X-ray diffraction techniques and the analysis and interpretation of crystallographic data. Useful technical details are presented where necessary and case studies from the pharmaceutical literature put theory into a practical context. Written by an internationally leading figure and with its focus on molecular crystals, this book is equally applicable to chemists with a need to understand and apply X-ray crystal-structure determination.

Biom mineralization I Kensuke Naka, 2007 In nature, biological organisms produce mineralized tissues such as bone, teeth, diatoms, and shells. Biom mineralization is the sophisticated process of production of these inorganic minerals by living organisms. Construction of organic-inorganic hybrid materials with controlled mineralization analogous to those produced by nature has recently received much attention because it can aid in understanding the mechanisms of the biom mineralization process and development of biomimetic materials processing. The biom mineralization ? processes use aqueous solutions at temperatures below 100 C and no toxic intermediates are produced in these systems. From a serious global en- ronmental problem point of view, the development of processes inspired by biom mineralization would offer valuable insights into material science and en- neering to reduce energy consumption and environmental impact. One of the most challenging scienti'c problems is to gain greater insight into the mol- ular interactions occurring at the interface between the inorganic mineral and the macromolecular organic matrix. Model systems are often regarded as a straight-forward experimental approach toward biomimetic crystallization. Hierarchical architectures consisting of small building blocks of inorganic cr- tals are often found in biom minerals. Studies of nanocrystal self-organization in solution systems would also be helpful for understanding biom mineralization. In these volumes, we focus on construction of organic-inorganic hybrid - terials with controlled mineralization inspired by natural biom mineralization. In the'rst volume, thereader will ?nd contributionsproviding abasic scopeof the mineralization process in aqueous solution.

Crystal Structure Analysis Jenny Pickworth Glusker, Kenneth N. Trueblood, 2010-05-27 The purpose of this book is to explain why molecular structure can be determined by single-crystal diffraction of X rays. It is not an account of the practical procedural details, but rather an account of the underlying physical principles, and the kinds of experiments and methods of handling the experimental data that are used.

Ammonia Synthesis Catalysts Huazhang Liu, 2013-03-21 This book provides a review of worldwide developments in ammonia synthesis catalysts over the last 30 years. It focuses on the new generation of Fe1-xO based catalysts and ruthenium catalysts – both are major breakthroughs for fused iron catalysts. The basic theory for ammonia synthesis is systematically explained, covering topics such as the chemical components, crystal structure, preparation, reduction, performance evaluation, characterization of the catalysts, the mechanism and kinetics of ammonia synthesis reaction. Both theory and practice are combined in this presentation, with emphasis on the research methods, application and exploitation of catalysts. The comprehensive volume includes an assessment of the economic and engineering aspects of ammonia plants based on the performance of catalysts. Recent developments in photo-catalysis, electro-catalysis, biocatalysis and new uses of ammonia are also introduced in this book. The author, Professor Huazhang Liu, has been engaged in research and practice for more than 50 years in this field and was the inventor of the first Fe1-xO based catalysts in the world. He has done a lot of research on Fe3O4 based- and ruthenium based-catalysts, and has published more than 300 papers and obtained 21 patents during his career. Contents:Historical Evolution of Catalysts for Ammonia SynthesisCatalytic Reaction Mechanisms of Ammonia SynthesisChemical Composition and Structure of Fused Iron CatalystsPreparation of Fused Iron CatalystsReduction of Fused Iron CatalystsRuthenium Based Ammonia Synthesis CatalystsPerformance Evaluation and Characterization of CatalystsPerformance and Application of CatalystsEffect of Catalyst Performance on the Economic Benefits of Catalytic ProcessInnovation and Speculation Readership: Researchers in academia and industry working on catalysts for ammonia synthesis. Keywords:Ammonia Synthesis;Catalysts;Catalytic;Iron Catalyst;Fused Iron Catalyst;Ruthenium CatalystKey Features:Provides a review of worldwide developments in ammonia synthesis catalysts over the last 30 yearsFocuses on the new generation of Fe1-xO based catalysts and ruthenium catalystsCombines theory and practice, with emphasis on research methods and industrial exploitation

Advances in Industrial Crystallization Heike Lorenz, Erik Temmel, 2021-06-15 This Special Issue is result of a call for papers of the Section Industrial Crystallization of MDPI's scientific journal Crystals. It addresses scientists and engineers active in research and process & product development in life-science industries (e.g. pharmaceuticals, fine chemicals and biotechnology products) and bulk chemical applications (e.g. desalination) as well. The contributions comprise several fundamental and application-oriented facets of crystallization providing an overview of industrially relevant subjects in the field. Main issues cover phase equilibria and solid-state behavior of crystalline compounds, crystal shape and size and related measurement techniques. Melt and solution crystallization are considered specifically addressing contemporary aspects of continuous crystallization and process intensification.

Applied Mineralogy Swapna Mukherjee, 2012-03-05 This book covers the entire spectrum of mineralogy and consolidates its applications in different fields. Part I starts with the very basic concept of mineralogy describing in detail the implications of the various aspects of mineral chemistry, crystallographic structures and their effects producing different mineral properties. Part II of the book describes different aspects of mineralogy like geothermobarometry, mineral thermodynamics and phase diagrams, mineral exploration and analysis, and marine minerals. Finally Part III handles the applications in industrial, medicinal and environmental mineralogy along with precious and semiprecious stone studies. The various analytical techniques and their significance in handling specific types of mineralogical problems are also covered.

Geology for Engineers and Environmental Scientists Alan E. Kehew, 2021-12-29 The fourth edition of Geology for Engineers and Environmental Scientists provides students with a basic foundation in the principles of geology, along with an illustration of how engineers must design and build their projects with natural geologic materials and protect them from potentially hazardous geologic processes. Kehew introduces engineering topics including soil and rock mechanics with a quantitative approach that will give students a head start in more advanced engineering courses. The book is prefaced with a discussion of engineering and environmental challenges that our society must face in the current century, such as population growth, scarcity of water and mineral resources, transition to renewable energy, and effects of climate change. Numerous examples of engineering and environmental applications ranging from short descriptions to extensive case histories, such as the “Big Dig” in Boston to the effects of Hurricane Katrina and reconstruction afterward, are included in every chapter. A full chapter is devoted to subsurface contamination and cleanup technologies. For the first time, a large color insert will highlight geological features in the field.

Metallic Films for Electronic, Optical and Magnetic Applications Katayun Barmak, Kevin Coffey, 2014-02-13 Metallic films play an important role in modern technologies such as integrated circuits, information storage, displays, sensors, and coatings. Metallic Films for Electronic, Optical and Magnetic Applications reviews the structure, processing and properties of metallic films. Part one explores the structure of metallic films using characterization methods such as x-ray diffraction and transmission electron microscopy. This part also encompasses the processing of metallic films, including structure formation during deposition and post-deposition

reactions and phase transformations. Chapters in part two focus on the properties of metallic films, including mechanical, electrical, magnetic, optical, and thermal properties. Metallic Films for Electronic, Optical and Magnetic Applications is a technical resource for electronics components manufacturers, scientists, and engineers working in the semiconductor industry, product developers of sensors, displays, and other optoelectronic devices, and academics working in the field. Explores the structure of metallic films using characterization methods such as x-ray diffraction and transmission electron microscopy Discusses processing of metallic films, including structure formation during deposition and post-deposition reactions and phase transformations Focuses on the properties of metallic films, including mechanical, electrical, magnetic, optical, and thermal properties

Advanced Topics on Crystal Growth Sukarno Ferreira,2013-02-20 Crystal growth is the key step of a great number of very important applications. The development of new devices and products, from the traditional microelectronic industry to pharmaceutical industry and many others, depends on crystallization processes. The objective of this book is not to cover all areas of crystal growth but just present, as specified in the title, important selected topics, as applied to organic and inorganic systems. All authors have been selected for being key researchers in their field of specialization, working in important universities and research labs around the world. The first section is mainly devoted to biological systems and covers topics like proteins, bone and ice crystallization. The second section brings some applications to inorganic systems and describes more general growth techniques like chemical vapor crystallization and electrodeposition. This book is mostly recommended for students working in the field of crystal growth and for scientists and engineers in the fields of crystalline materials, crystal engineering and the industrial applications of crystallization processes.

Hybrid Organic Inorganic Perovskites: Physical Properties And Applications (In 4 Volumes) ,2022-01-07 This four-volume handbook gives a state-of-the-art overview of hybrid organic inorganic perovskites, both two dimensional (2D) and three dimensional (3D), from synthesis and characterization and simulation to optoelectronic devices (such as solar cells and light emitting diodes), spintronics devices and catalysis application. The editors, coming from academia and national laboratory, are known for their didactic skills as well as their technical expertise. Coordinating the efforts of 30 expert authors in 21 chapters, they construct the story of hybrid perovskite structural and optical properties, electronic and spintronic response, laser action, and catalysis from varied viewpoints: materials science, chemical engineering, and energy engineering. The four volumes are arranged according to the focus material properties. Volume 1 is focused on the material physical properties including structure, deposition characteristic and the structure of the electronic bands and excitons of these compounds. Volume 2 covers the hybrid perovskite optical properties including the ultrafast optical response, photoluminescence and laser action. Volume 3 contains the spin response of these compounds including application such as spin valves, photogalvanic effect, and magnetic response of light emitting diodes and solar cell devices. Finally, and highly relevant to tomorrow's energy challenges, volume 4 is focused on the physics and device properties of the most relevant applications of the hybrid perovskites, namely photovoltaic solar cells. The text contains many high-quality colorful illustrations and examples, as well as thousands of up-to-date references to peer-reviewed articles, reports and websites for further reading. This comprehensive and well-written handbook is a must-have reference for universities, research groups and companies working with the hybrid organic inorganic perovskites.

Whispering the Techniques of Language: An Mental Journey through **Crystal Faces**

In a digitally-driven world where displays reign great and immediate conversation drowns out the subtleties of language, the profound strategies and emotional nuances hidden within phrases often move unheard. Yet, situated within the pages of **Crystal Faces** a interesting literary value pulsing with organic feelings, lies an extraordinary quest waiting to be undertaken. Published by a skilled wordsmith, that wonderful opus attracts viewers on an introspective journey, softly unraveling the veiled truths and profound influence resonating within the very cloth of each and every word. Within the emotional depths of this emotional evaluation, we will embark upon a honest exploration of the book is primary subjects, dissect its fascinating writing model, and succumb to the strong resonance it evokes strong within the recesses of readers hearts.

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