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EAE - TY AINSLEY

The Encyclopedia is a complete and authoritative reference work for this rapidly evolving field. Over 200 international scientists, each experts in their specialties, have written over 330 separate topics on different aspects of geochemistry including geochemical thermodynamics and kinetics, isotope and organic geochemistry, meteorites and cosmochemistry, the carbon cycle and climate, trace elements, geochemistry of high and low temperature processes, and ore deposition, to name just a few. The geochemical behavior of the elements is described as is the state of the art in analytical geochemistry. Each topic incorporates cross-referencing to related articles, and also has its own reference list to lead the reader to the essential articles within the published literature. The entries are arranged alphabetically, for easy access, and the subject and citation indices are comprehensive and extensive. Geochemistry applies chemical techniques and approaches to understanding the Earth and how it works. It touches upon almost every aspect of earth science, ranging from applied topics such as the search for energy and mineral resources, environmental pollution, and climate change to more basic questions such as the Earth's origin and composition, the origin and evolution of life, rock weathering and metamorphism, and the pattern of ocean and mantle circulation. Geochemistry allows us to assign absolute ages to events in Earth's history, to trace the flow of ocean water both now and in the past, trace sediments into subduction zones and arc volcanoes, and trace petroleum to its source rock and ultimately the environment in which it formed. The earliest of evidence of life is chemical and isotopic traces, not fossils, preserved in rocks. Geochemistry has allowed us to unravel the history of the ice

ages and thereby deduce their cause. Geochemistry allows us to determine the swings in Earth's surface temperatures during the ice ages, determine the temperatures and pressures at which rocks have been metamorphosed, and the rates at which ancient magma chambers cooled and crystallized. The field has grown rapidly more sophisticated, in both analytical techniques that can determine elemental concentrations or isotope ratios with exquisite precision and in computational modeling on scales ranging from atomic to planetary.

In this book, a synthesis of old and new notions straddling the disciplines of physics and chemistry is described.

Comprehensive Coordination Chemistry II (CCC II) is the sequel to what has become a classic in the field, Comprehensive Coordination Chemistry, published in 1987. CCC II builds on the first and surveys new developments authoritatively in over 200 newly comissioned chapters, with an emphasis on current trends in biology, materials science and other areas of contemporary scientific interest.

With more than 40% new and revised materials, this second edition offers researchers and students in the field a comprehensive understanding of fundamental molecular properties amidst cutting-edge applications. Including ~70 Example-Boxes and summary notes, questions, exercises, problem sets, and illustrations in each chapter, this publication is also suitable for use as a textbook for advanced undergraduate and graduate students. Novel material is introduced in description of multi-orbital chemical bonding, spectroscopic and magnetic properties, methods of electronic structure calculation, and quantum-classical modeling for organometallic and metallobiochemical systems. This is an excellent reference for chemists, researchers and teachers, and advanced undergraduate and graduate students in inorganic, coordination, and organometallic chemistry.

Inorganic Complexes describes the particular features of inorganic complex chemistry, as it has developed since 1950. The chemical information recorded in this book is intimately connected with the theoretical approach applying M.O. theory, which is also called ligand field theory in the special case of transition group complexes with a partly filled shell, for classification of the energy levels and rationalization of the absorption spectra. This text also discusses the aqua, hydroxo, oxo, fluoro, chloro, bromo, and iodo complexes; nitrogen-, oxygen-, and sulfur--containing ligands; amino acids and other N,O-containing ligands; and intermetallic bonding and co-operative effects. This publication is a good source for chemists and students conducting work on inorganic complex chemistry.

The seventh edition of General Chemistry continues the tradition of presenting only the material that is essential for a one-year general chemistry course. It strikes a balance between theory and application by incorporating real-world examples; helping students visualize the three-dimensional atomic and molecular structures that are the basis of chemical activity; and developing problem--solving and critical thinking skills. Although the seventh edition incorporates many impressive features, such as conceptual idea review, animations correlated to the text, and hand-sketched worked examples, General Chem-

istry is still 200 to 300 pages shorter and much less expensive than other two-semester textbooks. Dr. Chang and Dr. Goldsby' concise-but-thorough approach will appeal to efficiency-minded instructors and value-conscious students.

The Actinides: Electronic Structure and Related Properties, Volume I reviews major advances that have been made concerning the electronic structure and properties of actinide elements, alloys, and compounds. The electronic energy band structure and magnetic properties of the actinides are examined, and results of hyperfine and neutron scattering studies are presented. Comprised of six chapters, this book opens with a historical introduction to actinide research followed by a chapter on crystal field theory that discusses the behavior of 5f electrons in actinide compounds when exposed to strong crystal-field interactions, with emphasis on the strong intra-atomic correlation between electrons. The following chapters discuss the electronic energy band structure of the actinide metals, as derived from energy band theory; the magnetic properties of the actinide compounds in relation to their electronic structure; and the microscopic electronic properties of actinide metals and compounds obtained from nuclear magnetic resonance and neutron scattering studies. The final chapter summarizes the unique contribution by slow neutron-scattering experiments. This volume will be useful to scientists involved in work on the actinides as well as newcomers in the field.

This book describes in detail the main concepts of theoretical spectroscopy of transition metal and rare-earth ions. It shows how the energy levels of different electron configurations are formed and calculated for the ions in a free state and in crystals, how group theory can help in solving main spectroscopic problems, and how the modern DFT-based methods of calculations of electronic structure can be combined with the semi-empirical crystal field models. The style of presentation makes the book helpful for a wide audience ranging from graduate students to experienced researchers. Performance of optical materials crucially depends on the impurity ions intentionally introduced into the crystalline host materials. The color of these materials, their emission and absorption spectra can be understood by analyzing the relations between the electronic properties of impurity ions and host crystal structure, which constitutes the main content of this book. It describes in detail the main concepts of theoretical spectroscopy of transition metal and rare earth ions.

Crystallization is used at some stage in nearly all process industries as a method of production, purification or recovery of solid materials. In recent years, a number of new applications have also come to rely on crystallization processes such as the crystallization of nano and amorphous materials. The articles for this book have been contributed by the most respected researchers in this area and cover the frontier areas of research and developments in crystallization processes. Divided into five parts this book provides the latest research developments in many aspects of crystallization including: chiral crystallization, crystallization of nanomaterials and the crystallization of amorphous and glassy materials. This book is of interest to both fundamental research and

also to practicing scientists and will prove invaluable to all chemical engineers and industrial chemists in the process industries as well as crystallization workers and students in industry and academia.

To appreciate the chemistry and physical properties of complexes of the transition series, an understanding of metal-ligand interactions applied to complexes of the d-block is needed. Metal Ligand Bonding aims to provide this through an accessible, detailed, non-mathematical approach. Initial chapters detail the crystal-field model, using it to describe the use of magnetic measurements to distinguish complexes with different electronic configurations and geometries. Subsequent chapters look at the molecular orbital theory of transition metal complexes using a pictorial approach. Bonding in octahedral complexes is explored and electronic spectra and magnetic properties are given extensive coverage. The material addressed in this book forms the foundation of undergraduate lecture courses on d-block chemistry and facilitates learning through various key features, including: full colour diagrams; in-text questions with answers; revision exercises and clearly defined learning outcomes to encourage a reflective approach to study; an associated website; and experimental data and observations from everyday life. A basic knowledge of atomic and molecular orbitals as applied to main group elements is assumed.

GEORGE CHRISTOU Indiana University, Bloomington I am no doubt representative of a large number of current inorganic chemists in having obtained my undergraduate and postgraduate degrees in the 1970s. It was during this period that I began my continuing love affair with this subject, and the fact that it happened while I was a student in an organic laboratory is beside the point. I was always enchanted by the more physical aspects of inorganic chemistry; while being captivated from an early stage by the synthetic side, and the measure of creation with a small c that it entails, I nevertheless found the application of various theoretical, spectroscopic and physicochemical techniques to inorganic compounds to be fascinating, stimulating, educational and downright exciting. The various bonding theories, for example, and their use to explain or interpret spectroscopic observations were more or less universally accepted as belonging within the realm of inorganic chemistry, and textbooks of the day had whole sections on bonding theories, magnetism, kinetics, electron--transfer mechanisms and so on. However, things changed, and subsequent inorganic chemistry teaching texts tended to emphasize the more synthetic and descriptive side of the field. There are a number of reasons for this, and they no doubt include the rise of diamagnetic organometallic chemistry as the dominant subdiscipline within inorganic chemistry and its relative narrowness vis-d-vis physical methods required for its prosecution.

An advanced-level textbook of inorganic chemistry for the graduate (B.Sc) and postgraduate (M.Sc) students of Indian and foreign universities. This book is a part of four volume series, entitled "A Textbook of Inorganic Chemistry – Volume I, II, III, IV". CONTENTS: Chapter 1. Stereochemistry and Bonding in Main Group Compounds: VSEPR theory, dπ -pπ bonds, Bent rule and energetic of hy-

bridization. Chapter 2. Metal-Ligand Equilibria in Solution: Stepwise and overall formation constants and their interactions, Trends in stepwise constants, Factors affecting stability of metal complexes with reference to the nature of metal ion and ligand, Chelate effect and its thermodynamic origin, Determination of binary formation constants by pH-metry and spectrophotometry. Chapter 3. Reaction Mechanism of Transition Metal Complexes – I: Inert and labile complexes, Mechanisms for ligand replacement reactions, Formation of complexes from aquo ions, Ligand displacement reactions in octahedral complexes- acid hydrolysis, Base hydrolysis, Racemization of tris chelate complexes, Electrophilic attack on ligands. Chapter 4. Reaction Mechanism of Transition Metal Complexes – II: Mechanism of ligand displacement reactions in square planar complexes, The trans effect, Theories of trans effect, Mechanism of electron transfer reactions – types; Outer sphere electron transfer mechanism and inner sphere electron transfer mechanism, Electron exchange. Chapter 5. Isopoly and Heteropoly Acids and Salts: Isopoly and Heteropoly acids and salts of Mo and W: structures of isopoly and heteropoly anions. Chapter 6. Crystal Structures: Structures of some binary and ternary compounds such as fluorite, antifluorite, rutile, antirutile, crystobalite, layer lattices- CdI2, BiI3; ReO3, Mn2O3, corundum, pervoskite, Ilmenite and Calcite. Chapter 7. Metal-Ligand Bonding: Limitation of crystal field theory, Molecular orbital theory, octahedral, tetrahedral or square planar complexes, π-bonding and molecular orbital theory. Chapter 8. Electronic Spectra of Transition Metal Complexes: Spectroscopic ground states, Correlation and spin-orbit coupling in free ions for Ist series of transition metals, Orgel and Tanabe-Sugano diagrams for transition metal complexes (d1 – d9 states), Calculation of Dq, B and β parameters, Effect of distortion on the d-orbital energy levels, Structural evidence from electronic spectrum, John-Tellar effect, Spectrochemical and nephalauxetic series, Charge transfer spectra, Electronic spectra of molecular addition compounds. Chapter 9. Magantic Properties of Transition Metal Complexes: Elementary theory of magneto - chemistry, Guoy's method for determination of magnetic susceptibility, Calculation of magnetic moments, Magnetic properties of free ions, Orbital contribution, effect of ligand-field, Application of magneto-chemistry in structure determination, Magnetic exchange coupling and spin state cross over. Chapter 10. Metal Clusters: Structure and bonding in higher boranes, Wade's rules, Carboranes, Metal Carbonyl Clusters - Low Nuclearity Carbonyl Clusters, Total Electron Count (TEC). Chapter 11. Metal-π Complexes: Metal carbonyls, structure and bonding, Vibrational spectra of metal carbonyls for bonding and structure elucidation, Important reactions of metal carbonyls; Preparation, bonding, structure and important reactions of transition metal nitrosyl, dinitrogen and dioxygen complexes; Tertiary phosphine as ligand.

With contributions by numerous experts

The importance of metals in biology, the environment and medicine has become increasingly evident over the last twenty five years. The study of the multiple roles of metal ions in biological systems, the rapidly expanding interface between inorganic

chemistry and biology constitutes the subject called Biological Inorganic Chemistry. The present text, written by a biochemist, with a long career experience in the field (particularly iron and copper) presents an introduction to this exciting and dynamic field. The book begins with introductory chapters, which together constitute an overview of the concepts, both chemical and biological, which are required to equip the reader for the detailed analysis which follows. Pathways of metal assimilation, storage and transport, as well as metal homeostasis are dealt with next. Thereafter, individual chapters discuss the roles of sodium and potassium, magnesium, calcium, zinc, iron, copper, nickel and cobalt, manganese, and finally molybdenum, vanadium, tungsten and chromium. The final three chapters provide a tantalising view of the roles of metals in brain function, biomineralization and a brief illustration of their importance in both medicine and the environment. Relaxed and agreeable writing style. The reader will not only fiind the book easy to read, the fascinating anecdotes and footnotes will give him pegs to hang important ideas on. Written by a biochemist. Will enable the reader to more readily grasp the biological and clinical relevance of the subject. Many colour illustrations. Enables easier visualization of molecular mechanisms Written by a single author. Ensures homgeneity of style and effective cross referencing between chapters

A complete, up-to-date treatment of ligand field theory and its applications Ligand Field Theory and Its Applications presents an up-to-date account of ligand field theory, the model currently used to describe the metal-ligand interactions in transition metal compounds, and the way it is used to interpret the physical properties of the complexes. It examines the traditional electrostatic crystal field model, still widely used by physicists, as well as covalent approaches such as the angular overlap model, which interprets the metal ligand interactions using parameters relating directly to chemical behavior. Written by internationally recognized experts in the field, this book provides a comparison between ligand field theory and more sophisticated treatments as well as an account of the methods used to calculate the energy levels in compounds of the transition metals. It also covers physical properties such as stereochemistry, light absorption, and magnetic behavior. An emphasis on the interpretation of experimental results broadens the book's field of interest beyond transition metal chemistry into the many other areas where these metal ions play an important role. As clear and accessible as Brian Figgis's 1966 classic Introduction to Ligand Fields, this new book provides inorganic and bioinorganic chemists as well as physical chemists, chemical physicists, and spectroscopists with a much-needed overview of the many significant changes that have taken place in ligand field theory over the past 30 years.

The second edition of this classic book provides an updated look at crystal field theory and its applications.

Twenty years ago Tanabe and Sugano published the first ligand field energy diagrarns which are applicable to dN electronic configurations. These diagrams are limited in scope in that they can be used only for octahedral symmetry and for a limited

number of terms. The present volume is an attempt to fill the gap by providing a reasonable nurober of complete and accurate ligand field energy diagrarns for dN configurations in the most commonly encountered symmetries. Despite their limited nature, the diagrarns of Tanabe and Sugano were exten sively used in the past in order to rationalize optical and luminescence spectra and to discuss various electronic properties of transition metal ions, their coordination compounds and solids. Moreover, Tanabe-Sugano diagrams have an established place in the theory of transition metal compounds and are included in most textbooks of inorganic and coordination chemistry. It is expected that the present diagrarns will be found useful for a similar purpose.

The Advances in Chemical Physics series provides the chemical physics and physical chemistry fields with a forum for critical, authoritative evaluations of advances in every area of the discipline. Filled with cutting-edge research reported in a cohesive manner not found elsewhere in the literature, each volume of the Advances in Chemical Physics series serves as the perfect supplement to any advanced graduate class devoted to the study of chemical physics.

Emphasises on contemporary applications and an intuitive problem-solving approach that helps students discover the exciting potential of chemical science. This book incorporates fresh applications from the three major areas of modern research: materials, environmental chemistry, and biological science.

An applications-oriented approach gives graduate students and researchers in the physical sciences the tools needed to analyze any physical system.

This book, divided into two parts, now in its second edition, presents the basic principles of group theory and their applications in chemical theories. While retaining the thorough coverage of the previous edition, the book in Part I, discusses the symmetry elements, point groups and construction of character tables for different point groups. In Part II, it describes the concept of hybridization to explain the shapes of molecules and analyzes the character tables to predict infrared and Raman active vibrational modes of molecules. It also brings into fore the molecular orbital theory and the techniques of group theory to interpret bonding in transition metal complexes and their electronic spectra. Finally, the book describes the crystal symmetry in detail as well as the Woodward–Hoffmann rules to determine the pathways of electrocyclic and cycloaddition reactions. NEW TO THE SECOND EDITION • New sections on Direct Product, Group–sub--group Relationships, Effect of Descent in Octahedral Symmetry on Degeneracy, Jahn–Teller Distortion, Group–sub-group Relationships and Electronic Spectra of Complexes and Influence of Coordination on the Infrared Spectra of Oxoanionic Ligands, Space Groups • Revised sections on Projection Operator, SALC Molecular Orbitals of Benzene and π--Molecular Orbitals of 1, 3-Butadiene KEY FEATURES • Provides mathematical foundations to understand group theory. • Includes several examples to illustrate applications of group theory. • Presents chapter-end exercises to help the students check their understanding of the subject matter. The book is designed for the senior undergraduate students and postgraduate stu-

dents of Chemistry. It will also be of immense use to the researchers in the fields where group theory is applied.

At the heart of coordination chemistry lies the coordinate bond, inits simplest sense arising from donation of a pair of electronsfrom a donor atom to an empty orbital on a central metalloid ormetal. Metals overwhelmingly exist as their cations, but these arerarely met 'naked' – they are clothed in an arrayof other atoms, molecules or ions that involve coordinate covalentbonds (hence the name coordination compounds). These metal ioncomplexes are ubiquitous in nature, and are central to an array ofnatural and synthetic reactions. Written in a highly readable, descriptive and accessible styleIntroduction to Coordination Chemistry describes propertiesof coordination compounds such as colour, magnetism and reactivityas well as the logic in their assembly and nomenclature. It isillustrated with many examples of the importance of coordinationchemistry in real life, and includes extensive references and abibliography. Introduction to Coordination Chemistry is a comprehensiveand insightful discussion of one of the primary fields of study inInorganic Chemistry for both undergraduate and non-specialistreaders.

Atoms and Molecules describes the basic properties of atoms and molecules in terms of group theoretical methods in atomic and molecular physics. The book reviews mathematical concepts related to angular momentum properties, finite and continuous rotation groups, tensor operators, the Wigner-Eckart theorem, vector fields, and vector spherical harmonics. The text also explains quantum mechanics, including symmetry considerations, second quantization, density matrices, time-dependent, and time-independent approximation methods. The book explains atomic structure, particularly the Dirac equation in which its nonrelativistic approximation provides the basis for the derivation of the Hamiltonians for all important interactions, such as spin-orbit, external fields, hyperfine. Along with multielectron atoms, the text discusses multiplet theory, the Hartree-Fock formulation, as well as the electromagnetic radiation fields, their interactions with atoms in first and higher orders. The book explores molecules and complexes, including the Born-Oppenheimer approximation, molecular orbitals, the self-consistent field method, electronic states, vibrational and rotational states, molecular spectra, and the ligand field theory. The book can prove useful for graduate or advanced students and academicians in the field of general and applied physics.

Numerous essential biological functions involve metalloproteins; therefore, understanding metalloproteins and how to manipulate them is significant in the biological and medical fields. An examination of current research, Metalloproteins: Theory, Calculations, and Experiments explores the interplay between theory and experiment, detailing the role of theoretical modeling in the field and explaining how it aids experiments. The text also presents the current state of computational protein modeling, enabling researchers to adopt computation as an integral component of their studies. This book addresses two different aspects on metalloproteins in unison. It reviews the development of theoretical and computational methods for metalloprotein simulation with spe-

cific examples. The authors also present some of the most intriguing and important experimental results on metalloprotein systems. Although a connection can be made between these two aspects of the research, the authors do not do so explicitly. Rather, they provide the platform required to ignite further collaboration between experimentalists and theoreticians. A collection of works from top researchers in this field, the text presents diverse subjects that comprehensively reflect the current state of metalloprotein research. With these advances in structural information, theory and computation are starting to play a more significant role, particularly in identifying the reaction mechanism. The book summarizes some of the recent progress in both experiments and theory/computation showing the synergy that is now developing.

This book is based on the modern conceptual understanding of crystal fields. It clarifies several issues that have historically produced confusion in this area, particularly the effects of covalency and ligand polarization on the energy spectra of magnetic ions. This comprehensive volume provides readers with clear instructions and a set of computer programs for the phenomenological analysis of energy spectra of magnetic ions in solids. Readers are shown how to employ a hierarchy of parametrized models to extract as much information as possible from observed lanthanide and actinide spectra. All computer programs included in the volume are freely available on the Internet. It will be of particular interest to graduate students and researchers working in the development of opto-electronic systems and magnetic materials.

This volume was originally published in 1973. The nature of the non-symmetry determined aspects of ligand-field theory receives inadequate treatment in most texts. This book is concerned with the nature of the ligand-field parameters used to describe the electronic properties of transition metal complexes having cubic and lower symmetries. These radial parameters constitute the non-symmetry-determined part of ligand-field theory. Symmetry-based properties are discussed here only to emphasize the separate roles of splitting factors and symmetry. The reader is assumed to be familiar with the usual approach to ligand-field theory and with elementary group theory.

This is a complete and authoritative reference text on an evolving field. Over 200 international scientists have written over 340 separate topics on different aspects of geochemistry including organics, trace elements, isotopes, high and low temperature geochemistry, and ore deposits, to name just a few.

Explains the underlying structure that unites all disciplinesin chemistry Now in its second edition, this book explores organic,organometallic, inorganic, solid state, and materials chemistry,demonstrating how common molecular orbital situations arisethroughout the whole chemical spectrum. The authors explore therelationships that enable readers to grasp the theory thatunderlies and connects traditional fields of study withinchemistry, thereby providing a conceptual framework with which tothink about chemical structure and reactivity problems. Orbital Interactions in Chemistry begins by developingmodels and reviewing molecular orbital theory. Next, the bookexplores orbitals in the organic-main group as

well as in solids.Lastly, the book examines orbital interaction patterns that occurin inorganic–organometallic fields as well as clusterchemistry, surface chemistry, and magnetism in solids. This Second Edition has been thoroughly revised andupdated with new discoveries and computational tools since thepublication of the first edition more than twenty-five years ago.Among the new content, readers will find: Two new chapters dedicated to surface science and magneticproperties Additional examples of quantum calculations, focusing oninorganic and organometallic chemistry Expanded treatment of group theory New results from photoelectron spectroscopy Each section ends with a set of problems, enabling readers totest their grasp of new concepts as they progress through the text.-Solutions are available on the book's ftp site. Orbital Interactions in Chemistry is written for bothresearchers and students in organic, inorganic, solid state,-materials, and computational chemistry. All readers will discoverthe underlying structure that unites all disciplines inchemistry.

The book reviews the use of spectroscopic and related methods to investigate the complex structures and mechanisms of biological inorganic systems that contain metals. Each chapter presents an overview of the technique including relevant theory, clearly explains what it is and how it works and then presents how the technique is actually used to evaluate biological structures. Practical examples and problems are included to illustrate each technique and to aid understanding. Designed for students and researchers who want to learn both the basics, and more advanced aspects of bioinorganic chemistry. Many colour illustrations enable easier visualization of molecular mechanisms and structures Worked examples and problems are included to illustrate and test the reader’s understanding of each technique Written by a multi-author team who use and teach the most important techniques used today to analyse complex biological structures

Advanced Inorganic Chemistry: Applications in Everyday Life connects key topics on the subject with actual experiences in nature and everyday life. Differing from other foundational texts with this emphasis on applications and examples, the text uniquely begins with a focus on the shapes (geometry) dictating intermolecular forces of attractions, leading to reactivity between molecules of different shapes. From this foundation, the text explores more advanced topics, such as: Ligands and Ligand Substitution Processes with an emphasis on Square-Planar Substitution and Octahedral Substitution Reactions in Inorganic Chemistry and Transition Metal Complexes, with a particular focus on Crystal-Field and Ligand--Field Theories, Electronic States and Spectra and Organometallic, Bioinorganic Compounds, including Carboranes and Metallacarboranes and their applications in Catalysis, Medicine and Pollution Control. Throughout the book, illustrative examples bring inorganic chemistry to life. For instance, biochemists and students will be interested in how coordination chemistry between the transition metals and the ligands has a direct correlation with cyanide or carbon monoxide poisoning (strong-field Cyanide or CO ligand versus weak-field Oxygen molecule). Engaging discussion of key concepts with exam-

ples from the real world Valuable coverage from the foundations of chemical bonds and stereochemistry to advanced topics, such as organometallic, bioinorganic, carboranes and environmental chemistry Uniquely begins with a focus on the shapes (geometry) dictating intermolecular forces of attractions, leading to reactivity between molecules of different shapes

Inorganic Chemistry for Geochemistry and Environmental Sciences: Fundamentals and Applications discusses the structure, bonding and reactivity of molecules and solids of environmental interest, bringing the reactivity of non-metals and metals to inorganic chemists, geochemists and environmental chemists from diverse fields. Understanding the principles of inorganic chemistry including chemical bonding, frontier molecular orbital theory, electron transfer processes, formation of (nano) particles, transition metal-ligand complexes, metal catalysis and more are essential to describe earth processes over time scales ranging from 1 nanosec to 1 Gigayr. Throughout the book, fundamental chemical principles are illustrated with relevant examples from geochemistry, environmental and marine chemistry, allowing students to better understand environmental and geochemical processes at the molecular level. Topics covered include: • Thermodynamics and kinetics of redox reactions • Atomic structure • Symmetry • Covalent bonding, and bonding in solids and nanoparticles • Frontier Molecular Orbital Theory • Acids and bases • Basics of transition metal chemistry including • Chemical reactivity of materials of geochemical and environmental interest Supplementary material is provided online, including PowerPoint slides, problem sets and solutions. Inorganic Chemistry for Geochemistry and Environmental Sciences is a rapid assimilation textbook for those studying and working in areas of geochemistry, inorganic chemistry and environmental chemistry, wishing to enhance their understanding of environmental processes from the molecular level to the global level.