Introduction To Molecular Symmetry Donain

Optimal analysis is defined as an analysis that creates and uses sparse, well-structured and well-conditioned matrices. The focus is on efficient methods for eigensolution of matrices involved in static, dynamic and stability analyses of symmetric and regular structures, or those general structures containing such components. Powerful tools are also developed for configuration processing, which is an important issue in the analysis and design of space structures and finite element models. Different mathematical concepts are combined to make the optimal analysis of structures feasible. Canonical forms from matrix algebra, product graphs from graph theory and symmetry groups from group theory are some of the concepts involved in the variety of efficient methods and algorithms presented. The algorithms elucidated in this book enable analysts to handle large-scale structural systems by lowering their computational cost, thus fulfilling the requirement for faster analysis and design of future complex systems. The value of the presented methods becomes all the more evident in cases where the analysis needs to be repeated hundreds or even thousands of times, as for the optimal design of structures by different metaheuristic algorithms. The book is of interest to anyone engaged in computer-aided analysis and design and software developers in this field. Though the methods are demonstrated mainly through skeletal structures, continuum models have also been added to show the generality of the methods. The concepts presented are not only applicable to different types of structures but can also be used for the analysis of other systems such as hydraulic and electrical networks.

Molecular similarity searching is fast becoming a key tool in organic chemistry. In this book, the editor has brought together an international team of authors, each working at the forefront of this technology, providing a timely and concise overview of current research. The chapters focus principally on those methods which have reached sufficient maturity to be of immediate practical use in molecular design.

Introduction to Molecular VaccinologySpringer

Although chemists, biochemists, biologists, and material scientists are often interested in using nonlinear optical techniques for characterizing their samples, they seldom have the necessary background to exploit these methods. Designed for nonspecialists, Second-Order Nonlinear Optical Characterization Techniques: An Introduction focuses on the potential of second-order nonlinear optics as a powerful characterization tool. Avoiding extensive mathematical details, this multidisciplinary book does not require a background in advanced mathematics or physics. After introducing linear optics from the perspective of polarizability and linear susceptibility, the authors cover incoherent second-harmonic generation. They then deal with the study of surfaces and interfaces, exploiting the intrinsic surface sensitivity of second-harmonic generation and sum-frequency generation. The final chapter discusses second-order imaging techniques, including confocal microscopy and two-photon excited fluorescence microscopy. Accessible to a wide range of scientists, this concise book stresses the reliability of nonlinear optical processes for probing surfaces and interfaces. Drawing on the insight offered in the text, scientists from many disciplines can now clearly understand and use second-order nonlinear optical methods.

Scattering, Two-Volume Set

Fundamentals of Crystallography

Second-order Nonlinear Optical Characterization Techniques

Nonlinear Dielectric Phenomena in Complex Liquids

Handbook of Molecular Descriptors

Making And Breaking Symmetry In Chemistry: Syntheses, Mechanisms And Molecular Rearrangements

This textbook provides an easy-to-understand introduction to the complex topic of vaccine research and development. It gives a comprehensive though clearly arranged insight to the most important aspects of molecular vaccinology, leading from the basics in immunology, to design of vaccines and mode of action of vaccines to the actual formulation, manufacturing and registration of vaccines. The volume is therefore a valuable text about modern vaccinology for graduate students and a basic introduction for newcomers in vaccine design and development.

Quantitative studies on structure-activity and structure-property relationships are powerful tools in directed drug research. In recent years, various strategies have been developed to characterize and classify structural patterns by means of molecular descriptors. It has become possible not only to assess diversities or similarities of structure databases, but molecular descriptors also facilitate the identification of potential bioactive molecules from the rapidly increasing number of compound libraries. They even allow for a controlled de-novo design of new lead structures. This is the most comprehensive collection of molecular descriptors and presents a detailed review from the origins of this research field up to present day. This practically oriented reference book gives a thorough overview of the different molecular descriptors representations and their corresponding molecular descriptors. All descriptors are listed with their definition, symbols and labels, formulas, some numerical examples, data and molecular graphs, while numerous figures and tables aid comprehension of the definitions. Cross-references throughout, a list of acronyms and notations allow easy access to the information needed to solve a specific research problem. Examples of descriptor calculations along with tables of descriptor values for a set of selected reference compounds and an up-to-date reference list add to the practical value of the book, making it an invaluable guide for all those dealing with bioactive molecules as well as for researchers.

Solid-state NMR covers an enormous range of material types and experimental techniques. Although the basic instrumentation and techniques of solids NMR are readily accessible, there can be significant barriers, even for existing experts, to exploring the bewildering array of more sophisticated techniques. In this unique volume, a range of experts in different areas of modern solid-state NMR explain about their area of expertise, emphasising the “practical aspects” of implementing different techniques, and illustrating what questions can and cannot be addressed. Later chapters address complex materials, showing how different NMR techniques discussed in earlier chapters can be brought together to characterise important materials types. The volume as a whole focusses on topics relevant to the developing field of “NMR crystallography” – the use of solids NMR as a complement to diffraction crystallography. This book is an ideal complement to existing introductory texts and reviews on solid-state NMR. New researchers wanting to understand new areas of solid-state NMR will find each chapter to be the equivalent to spending time in the laboratory of an internationally leading expert, learning the hints and tips that make the difference between knowing about a technique and being ready to put it into action. With no equivalent on the market, it will be of interest to every solid-state NMR researcher (academic and postgraduate) working in the chemical sciences.

Topics Covered Include: X-ray crystallography of ligands. Catalytic antibodies. Nature of the antigen. Antibody binding sites. Maturation of the immune response. Computational biochemistry of antibodies and T-cell receptors. Antigen-specific T-cell receptors and their reactions. Key Features * X-Ray Crystallography of Ligands * Catalytic Antibodies * Nature of the Antigen * Antibody Binding Sites * Maturtion of the Immune Response * Computational Biochemistry of Antibodies and * T-Cell Receptors * Antigen-Specific T-Cell Receptors and Their Reactions

Infrared Spectroscopy of Triatomics for Space Observation

Structure and Dynamics of Non-Rigid Molecular Systems

STM Investigation of Molecular Architectures of Porphyrinoids on a Ag(111) Surface

Molecular Electronic Structures of Transition Metal Complexes II

Molecular Plant Virology

Symmetries in Science VII

The elucidation of reaction mechanisms generally requires the carefully designed control of molecular symmetry to distinguish between the many possible reaction pathways. Making and Breaking Symmetry in Chemistry emphasises the crucial role played by symmetry in modern synthetic chemistry. After discussion of a number of famous classical experiments, the advances brought about by the introduction of new techniques, in particular NMR spectroscopy, are exemplified in numerous cases taken from the recent literature. Experimental verification of many of the predictions made in Woodward and Hoffmann's explication of the Conservation of Orbital Symmetry are described. Applications that involve the breaking of molecular symmetry to resolve these and other mechanistic problems in organic, inorganic and organometallic chemistry are presented in the first sections of the book, together with many examples of the detection of hitherto hidden rearrangement processes.Subsequently, under the aegis of making molecular symmetry, examples of the preparation of highly symmetrical molecules found in the organic, organometallic or inorganic domains are discussed. These include Platonic hydrocarbons or boranes, tetrahedranes, cubanes, prismanes, dodecahedrane, fullerene fragments such as corannulene, sumanene or semibuckminsterfullerene, and other systems of unusual geometries or bonding characteristics (Möbius strips, molecular brakes and gears, Chauvin's carbomers, Fitjer's rotanes, persubstituted rings, metal-metal multiple bonds, etc.). The text also contains vignettes of many of the scientists who made these major advances, as well as short sections that briefly summarise key features of important topics that underpin the more descriptive material. These include some aspects of chirality, NMR spectroscopy, and the use of isotopic substitution to break molecular symmetry. A brief appendix on point group symmetry and nomenclature is also helpfully provided.

Continuing the tradition of its previous editions, the third edition of Introduction to Polymer Chemistry provides a well-rounded presentation of the principles and applications of natural, synthetic, inorganic, and organic polymers. With an emphasis on the environment and green chemistry and materials, this third edition offers detailed coverage of natural and synthetic giant molecules, inorganic and organic polymers, biomacromolecules, elastomers, adhesives, coatings, fibers, plastics, blends, caulks, composites, and ceramics. Using simple fundamentals, the book demonstrates how the basic principles of one polymer group can be applied to all of the other groups. It covers reactivities, synthesis and polymerization reactions, techniques for characterization and analysis, energy absorption and thermal conductivity, physical and optical properties, and practical applications. This edition addresses environmental concerns and green polymeric materials, including biodegradable polymers and microorganisms for synthesizing materials. Case studies woven within the text illustrate various developments and the societal and scientific contexts in which these changes occurred. Now including new material on environmental science, Introduction to Polymer Chemistry, Third Edition remains the premier book for understanding the behavior of polymers. Building on undergraduate work in foundational courses, the text fulfills the American Chemical Society Committee on Professional Training (ACS CPT) in-depth course requirement.

This book presents a detailed look at experimental and computational techniques for accurate structure determination of free molecules. The most fundamental property of a molecule is its structure – it is a prerequisite for determining and understanding most other important properties of molecules. The determination of accurate structures is hampered by a myriad of factors, subjecting the collected data to non-negligible systematic errors. This book explains the origin of these errors and how to mitigate and even avoid them altogether. It features a detailed comparison of the different experimental and computation methods, explaining their interplay and the advantages of their combined use. Armed with this information, the reader will be able to choose the appropriate methods to determine – to a great degree of accuracy – the relevant molecular structure.

This volume continues the tradition of the Advances series. It contains contributions from experts in the field of atomic, molecular, and optical (AMO) physics. The articles contain some review material, but are intended to provide a comprehensive picture of recent important developments in AMO physics. Both theoretical and experimental articles are included in the volume. International experts Comprehensive articles New developments

Optimal Analysis of Structures by Concepts of Symmetry and Regularity

Quantum Chemistry of Solids

From Langmuir--Blodgett to Self--Assembly

Advances in Quantum Chemical and Spectroscopical Studies of Molecular Structures and Dynamics

Introduction to Macromolecular Binding Equilibria

Correlation and Localization

This book reviews current and future trends in modern chemical research, focusing on chemical structure and bonding. Covers development of electronic structure theories for transition metal complexes, orbital models and electronic structure theory and more.

In recent years crystallographic techniques have found applications in a wide range of subjects, and these applications in turn have led to exciting developments in the field of crystallography itself. This completely revised text offers a rigorous treatment of the theory and describes experimental applications in many fields: crystal symmetry, crystallographic computing, X-ray diffraction, crystal structure solution, mineral and inorganic crystal chemistry, protein crystallography, crystallography of real crystals, and crystal physics. A set of pedagogical tools on CD-ROM has been added to this new edition.

The Symposium "Symmetries in Science VII: Spectrum Generating Algebras and Dynamic Symmetries in Physics" was held at the Southern Illinois University at Carbondale in Niigata, Japan Campus, during the period August 28-31, 1992. The Symposium was held in honor of Professor Francesco Iachello on the occasion of his 50th birthday. We wish to thank the colleagues and friends of Franco for their participation in the Symposium as well as for contributing articles to this volume honoring him. It was their commitment and involvement which made this Symposium a success. We also wish to thank Dr. Jared H. Dorn, the director of SIUC-N, for his support in the planning and the execution of the Symposium. Moreover we wish to thank Mayor Nobuo Kumakura of Nakajo town and Mr. Kaichi Suzuki of the school entity "The Pacific" for their friendly support. Bruno Gruber, SIUC-N Takaharu Otsuka, University of Tokyo v LAUDATIO ON THE OCCASION OF THE 50TH BIRTHDAY OF PROFESSOR FRANCESCO IACHELLO I first met Franco Iachello in 1974. Driving a smart Alfa-Romeo, he came to meet me at the station at Groningen where I was to spend a summer conducting research.

Subject Scope: Condensed Matter. This book presents a review of an original Hierarchic theory of condensed matter, general for liquids and solids and its numerous applications. Computer programs based on a new theory were used for comprehensive simulations of water and ice physical properties and validation of the theory. Condensed matter is considered as a system of 3D standing waves (collective excitations) of different nature: thermal de Broglie waves, IR photons and thermal phonons. Quantitative interrelation between microscopic, mesoscopic (as intermediate) and macroscopic properties of condensed matter were found. New theories of total internal energy, including contributions of kinetic and potential energies, heat capacity, surface tension, vapour pressure, thermal conductivity, viscosity and self-diffusion are described.

A Practitioner's Guide

Introduction to Polymer Chemistry, Third Edition

Introduction to Zeolite Molecular Sieves

Modern Methods in Solid-state NMR

Exploiting Symmetry in Applied and Numerical Analysis

This book delivers a comprehensive account of the main features and possibilities of LCAO methods for the first principles calculations of electronic structure of periodic systems. The first part describes the basic theory underlying the LCAO methods applied to periodic systems and the use of wave-function-based, density-based (DFT) and hybrid hamiltonians. The second part deals with the applications of LCAO methods for calculations of bulk crystal properties.

Scattering is the collision of two objects that results in a change of trajectory and energy. For example, in particle physics, such as electrons, photons, or neutrons are "scattered off" of a target specimen, resulting in a different energy and direction. In the field of electromagnetism, scattering is the random diffusion of electromagnetic radiation from air masses is an aid in the long-range sending of radio signals over geographic obstacles such as mountains. This type of scattering, applied to the field of acoustics, is the spreading of sound in many directions due to irregularities in the transmission medium. Volume I of Scattering will be devoted to basic theoretical ideas, approximation methods, numerical techniques and mathematical modeling. Volume II will be concerned with basic experimental techniques, technological practices, and comparisons with relevant theoretical work including seismology, medical applications, meteorological phenomena and astronomy. This reference will be used by researchers and graduate students in physics, applied physics, biophysics, chemical physics, medical physics, acoustics, geosciences, optics, mathematics, and engineering. This is the first encyclopedic-range work on the topic of scattering theory in quantum mechanics, elastodynamics, acoustics, and electromagnetics. It serves as a comprehensive interdisciplinary presentation of scattering and inverse scattering theory and applications in a wide range of scientific fields, with an emphasis, and details, up-to-date developments. Scattering also places an emphasis on the problems that are still in active current research. The first interdisciplinary reference source on scattering to gather all world expertise in this technique Covers the major aspects of scattering in a common language, helping to widening the knowledge of researchers across disciplines The list of editors, associate editors and contributors reads like an international Who's Who in the interdisciplinary field of scattering

This book is dedicated to the application of the different theoretical models described in Volume 1 to identify the near-, mid- and far-infrared spectra of linear and nonlinear triatomic molecules in gaseous phase or subjected to environmental constraints, useful for the study of environmental sciences, planetology and astrophysics. The Van Vleck contact transformation method, described in Volume 1, is applied in the calculation and analysis of IR transitions between vibration–rotation energy levels. The extended Lakhlifi–Dahoo substitution model is used in the framework of Liouville’s formalism and the line profiles of triatomic molecules and their isotopologues subjected to environmental constraints are calculated by applying the cumulant expansion. The applications presented in this book show how interactions at the molecular level modify the infrared spectra of triatomics trapped in a nano-cage (substitution site of a rare gas matrix, clathrate, fullerene, zeolite) or adsorbed on a surface, and how these interactions may be used to identify the characteristics of the perturbing environment.

An introduction to Molecular Neurobiology, is a textbook of contemporary cellular and molecular neurobiology written for advanced undergraduates, graduate students, and practising neurobiologists. This book describes the behaviour and properties of neurons and glia and how these arise from the molecules that constitute them. Major sections focus on the signals that neurons use and how they are produced, the molecular and cellular organization of neurons and glia, neuronal differentiation, synaptic plasticity, and the molecular basis of neuronal diseases. Each chapter is written by an expert in the field and gives an up-to-date account of major questions, experimental approaches, the present state of knowledge, and future directions. Boxes provide historical, technical, or biographical notes, and expand on points of particular interest to contemporary research. The book has been carefully edited to give uniformity of style and coverage, and is illustrated in two colours.

Spectroscopy of the earth's Atmosphere and interstellar Medium

Spectrum-Generating Algebras and Dynamic Symmetries in Physics

Computerized Applications for Ice Water and Biosytems

Supramolecular Ordering, Electronic Properties and Reactivity

An Introduction to Molecular Shape and Topology

1992 AMS-SIAM Summer Seminar in Applied Mathematics, July 26-August 1, 1992, Colorado State University

Symmetry plays an important role in theoretical physics, applied analysis, classical differential equations, and bifurcation theory. Although numerical analysis has incorporated aspects of symmetry on an ad hoc basis, there is now a growing collection of numerical analysts who are currently attempting to use symmetry groups and representation theory as fundamental tools in their work. This book contains the proceedings of an AMS-SIAM Summer Seminar in Applied Mathematics, held in 1992 at Colorado State University. The seminar, which drew about 100 scientists from around the world, was intended to stimulate the systematic incorporation of symmetry and group theoretical concepts into numerical methods. The papers in this volume have been refereed and will not be published elsewhere.

Second-harmonic generation (SHG) microscopy has shown great promise for imaging live cells and tissues, with applications in basic science, medical research, and tissue engineering. Second Harmonic Generation Imaging offers a complete guide to this optical modality, from basic principles, instrumentation, methods, and image analysis to biomedical applications. The book features contributions by experts in second-harmonic imaging, including many pioneering researchers in the field. Written for researchers at all levels, it takes an in-depth look at the current state of the art and possibilities of SHG microscopy. Organized into three sections, the book: Provides an introduction to the physics of the process, step-by-step instructions on how to build an SHG microscope, and comparisons with related imaging techniques Gives an overview of the capabilities of SHG microscopy for imaging tissues and cells—including cell membranes, muscle, collagen in tissues, and microtubules in live cells—by summarizing experimental and analytical methods Highlights representative biomedical and medical applications in imaging cancer, fibroses, autoimmune diseases, connective tissue disorders, eye pathologies, and cardiovascular disease Historically, clinical imaging at the cellular and tissue level has been performed by pathologists on ex vivo biopsies removed by the surgeon. While histology remains the "gold standard" for pathologists, its interpretation remains highly subjective. Much of SHG research has focused on developing more quantitative, objective metrics. A tutorial for newcomers and an up-to-date review for experts, this book explores how SHG may be used to more precisely image a wide range of pathological conditions and diseases.

The development of oriented organic monomolecular layers by the Langmuir-Blodgett (LB) and self-assembly (SA) techniques has led researchers toward their goal of assembling individual molecules into highly ordered architectures. Thus the continually growing contribution of LB and SA systems to the chemistry and physics of thin organic films is widely recognized. Equally well-known is the difficulty in keeping up to date with the burgeoning multidisciplinary research in this area. Dr. Ulman provides a massive survey of the available literature. The book begins with a section on analytical tools to broaden the understanding of the structure and properties of monolayers and films. Following sections discuss LB films, the preparation and properties of SA monolayers and films, the modeling of LB and SA monolayers, and the application of LB and SA films.

This volume contains a collection of review articles that are extended versions of invited lectures given at the First Pamporovo Winter Workshop on Cooperative Phe nomena in Condensed Matter held in villa "Orlitza" (7th-15th March 1998, Pamporovo Ski Resort, Bulgaria). Selected research works reported at the Workshop have been published in the Journal of Physical Studies - a new International Journal for research papers in experimental and theoretical physics (Lviv University, Lviv, Ukraine). These reviews are supposed to be status reports and present new insights gained from the rapidly developing research of outstanding problems in condensed matter physics such as structural properties and phase transitions in fullerene crystals, super conductivity ofstrongly interacting electrons in copper oxides, spin polarized Fermi liq uids, chaotic vortex filaments in superfluid turbulent Helium-II, desorption induced by electronic transitions in ionic compounds, fluctuation phenomena in superconductors, and quantum critical phenomena in low dimensional magnets and quantum liquids. We have set the material according to the alphabetic order of authors' names although the high temperature superconductivity seems to be the hard kernel in condensed matter physics. The authors have taken care to present the recent advances in their research in a form which is readable and useful not only to experts in the respective field, but also to young scientists. That is why the lectures include a comprehensive introduction to the matter and also an extended discussion of methodical details.

Investigation of a Metal-organic Interface - Realization and Understanding of a Molecular Switch

An Introduction to Molecular Neurobiology

Second Harmonic Generation Imaging

The LCAO First Principles Treatment of Crystals

Symmetries of Nature

Antigen Binding Molecules: Antibodies and T-Cell Receptors

The book reviews the results of vibration-rotational spectroscopy of molecules obtained recently by combining modern computational methods of quantum chemistry with the new techniques of high-resolution rotational and vibration-rotational spectroscopy. It shows for example that the tunneling vibration-rotational spectroscopy of the van der Waals complexes provides a new look at intermolecular forces while the high precision and sensitivity of the submillimeter-wave and Fourier transform microwave spectroscopy make it possible to study complex rotational spectra of molecules in excited vibrational states. New results of high level ab initio

quantum chemical computations of vibrational and rotational energy levels and dipole moment functions of unusual molecules will be discussed together with the recent discovery of clustering of energy levels in asymmetric tops. Group theoretical analysis of floppy molecules, especially the tunneling effects in nonrigid molecules, will also be discussed. Contents:High-Resolution Spectroscopy of Transient Molecules and Its Applications to Molecular Dynamics (E Hirota & Y Endo)Vibration-Rotation Spectra of Reactive Molecules: Interplay of Ab Initio Calculations and High-Resolution Experimental Studies (H Bürger & W Thiel)Rotational Spectra of Symmetric Top Molecules: Correlation-Free Reduced Forms of Hamiltonians, Advances in Measuring Techniques, and Determination of Molecular Parameters from Experimental Data (K Sarka et al.)Hot Bands in Infrared Spectra of Symmetric Top and Some Other Molecules. A Useful Tool to Reach Hidden Information (G Graner & H Bürger)The Formation of Four-Fold Rovibrational Energy Clusters in H2S, H2Se, and H2Te (P Jensen et al.)Phase Angles in the Matrix Elements of Molecular Spectroscopy (C di Lauro & F Lattanzi)High-Resolution Infrared Spectroscopy and One-Dimensional Large Amplitude Motion in Asymmetric Tops: HNO3 and H2O2 (J-M Flaud & A Perrin)Extended Molecular Symmetry Groups: Symmetry Analysis of Molecules Consisting of Two Coaxial Rotors (P Soldán)Quantum-Mechanical Studies of Radiative Association Reactions: Formation of HeH+, NeH+ and ArH+ (W P Kraemer et al.) Readership: Chemists, astrophysicists, laser physicists and other general physicists. keywords:Transient and Reactive Molecules;Reduced Hamiltonians;Hot Bands;Rovibrational Energy Clusters;Phase Angles in Matrix Elements;Large Amplitude Vibrations;Molecular Symmetry Groups;Radiation Association Reactions

Development in science depends on several factors. Among these, the role of individual scientists is perhaps not the most important one. Science is typically a body of collective knowledge and any increase in the amount of this knowledge is certainly due to strong interaction among scientists. Even in the past, it happened quite rarely that a single person, without any aid of others, d- covered something fundamental or opened a new chapter in science. Great figures of science history have, in most cases, had rather a summarizing and s- thesizing role. This is especially valid over the last few decades. On one hand, the amount of information necessary to achieve new discoveries, has increased tremendously. On the other hand, improvement of technical facilities has increased the speed of information exchange. These factors resulted in a degree of specialization in science that had never seen before. Most of us are experts and specialists rather than scientists in the classical sense. My personal feeling is that, even nowadays, there is a strong need for professionals with a broad knowledge and c- prehensive mind, although they may not be competitive in the number of their publications or the sizes of their grants. Every time I have met such a person (I can count these cases on my fingers) I have become deeply influenced by his or her strong intellect.

Macromolecules in the body form noncovalent associations, such as DNA-protein or protein-protein complexes, that control and regulate numerous cellular functions. Understanding how changes in the concentration and conformation of these macromolecules can trigger physiological responses is essential for researchers developing drug therapies to treat diseases affected by these imbalances. Introduction to Macromolecular Binding Equilibria gives students in medicinal chemistry, pharmaceuticals, and bioengineering the necessary background in biophysical chemistry for research applications in drug discovery and development. Building upon a fundamental knowledge of calculus and physical chemistry, this compact, graduate-level text prepares students for advanced work in solution thermodynamics and binding phenomena and applying methods in this book to their own research. This book describes the underlying theory of binding phenomena and explains how to apply the binding polynomial approach for building models and interpreting data. It also covers practical considerations for setting up binding experiments and describes how to obtain true thermodynamic isotherms unbiased by model assumption via model-free analysis of binding data.

In the 1800s mathematicians introduced a formal theory of symmetry: group theory. Now a branch of abstract algebra, this subject first arose in the theory of equations. Symmetry is an immensely important concept in mathematics and throughout the sciences, and its applications range across the entire subject. Symmetry governs the structure of crystals, innumerable types of pattern formation, how systems change their state as parameters vary; and fundamental physics is governed by symmetries in the laws of nature. It is highly visual, with applications that include animal markings, locomotion, evolutionary biology, elastic buckling, waves, the shape of the Earth, and the form of galaxies. In this Very Short Introduction, Ian Stewart demonstrates its deep implications, and shows how it plays a major role in the current search to unify relativity and quantum theory. ABOUT THE SERIES: The Very Short Introductions series from Oxford University Press contains hundreds of titles in almost every subject area. These pocket-sized books are the perfect way to get ahead in a new subject quickly. Our expert authors combine facts, analysis, perspective, new ideas, and enthusiasm to make interesting and challenging topics highly readable.

Shape in Chemistry

Choice

Correlations, Coherence, and Order

Introduction to Molecular Vaccinology

An Introduction to Ultrathin Organic Films

A Handbook for Philosophy of Nature and Science

Spectroscopy of the Earth's Atmosphere and Interstellar Medium focuses on the characteristics of the electromagnetic spectrum of the Earth's atmosphere in the far-infrared and microwave regions. It discusses the modes of observation in field measurements and reviews the two techniques used in the spectral region. Organized into six chapters, this volume begins with an overview of the effect of water-vapor absorption, followed by a discussion on the two frequently used method for deriving atmospheric parameters from high-resolution infrared atmospheric spectra, namely, the equivalent width (EW) technique and the nonlinear least-square fitting (NLSF). Other chapters consider the mechanisms by which interstellar clouds are formed. In addition, the book explores the composition of interstellar clouds, ion-molecule reactions, and the formation of stars. This book will be useful to anyone involved in, or interested in learning more about the field of atmospheric spectroscopy, including scientists, aeronomers, astronomers, astrophysicists, and students.

Complex liquids constitute a basic element in modern materials science; their significant features include self-assembly, mesoscale structures, complex dynamics, unusual phases and enormous sensitivity to perturbations. Understanding their nature and properties are a great challenge to modern materials science that demands novel approaches. This book focuses on nonlinear dielectric phenomena, particularly on nonlinear dielectric spectroscopy (NDS), which may be considered a possible successor to broadband dielectric spectroscopy (BDS). NDS phenomena directly coupled to mesoscale heterogeneity fluctuations, so information obtained in this way is basically complementary to BDS tests. The book also discusses the application of NDS in a set of complex liquid systems: glassy liquids, liquid crystals, liquids with critical point phenomena, and bio-relevant liquids. The complementary application of NDS and BDS may allow the discovery of universal patterns for the whole category of complex liquids. Written by specialists in the field of nonlinear dielectric studies, theoreticians and experimentalists, ranging from solid state physics to biophysics, the book is organized so that it can serve as a basic textbook for a non-experienced reader.

This textbook introduces the reader to the elementary chemistry on which materials science depends by discussing the different classes of materials and their applications. It shows the reader how different types of materials are produced, why they possess specific properties, and how they are used in technology. Each chapter contains study questions to enable discussions and consolidation of the acquired knowledge. The new edition of this textbook is completely revised and updated to reflect the significant expansion of the field of materials chemistry over the last years, covering now also topics such as graphene, nanotubes, light emitting diodes, extreme photolithography, biomedical materials, and metal organic frameworks. From the reviews of the first edition: "This book is not only informative and comprehensive for a novice reader, but also a valuable resource for a scientist and/or an industrialist for new and novel challenges." (Materials and Manufacturing Process, June 2009) "Allcock provides a clear path by first describing basic chemical principles, then distinguishing between the various major materials groups, and finally enriching the student by offering a variety of special examples." (CHOICE, April 2009) "Proceeding logically from the basics to materials in advanced technology, it covers the fundamentals of materials chemistry, including principles of materials synthesis and materials characterization methods." (Internationale Fachzeitschrift Metall, January 2009)

This volume contains a selection of scientific papers related to the structure and dynamics of non-rigid molecules. This frontline topic was born a few decades ago, when Longuet-Higgins proposed his famous theory of Molecular Symmetry Groups (Mol. Phys. 6, (1962) 457). Unfortunately, since this early paper, very few publications have been devoted to the study of non-rigid molecules. Let us mention some books which dedicate some chapters to them: Induced Representations in Crystals and Molecules, by S. L. Altmann, Academic Publishers, 1977; Molecular Symmetry and Spectroscopy, by P. R. Bunker, Academic Publishers, 1979; and finally Large Amplitude Motion in Molecules, Vols. I and II, by several authors, Springer Verlag, 1979. More recently an International Symposium on Non-Rigid Molecules was held in Paris, France, from 1-7 July 1982, the proceedings of which were published in the volume entitled Symmetries and Properties of Non-Rigid Molecules. A Comprehensive Survey, edited by J. Maruani et al., Elsevier, 1983. Finally, we should mention the very specialized work The Permutational Approach to Dynamic Stereochemistry, by J. Brocas et al., McGraw-Hill, 1983. The purpose of this book is to fill in this information on the structure and dynamics of non-rigid systems. To this aim, we have gathered a collection of recent papers written by the most qualified specialists in the world, covering a large field from van der Waals molecules to inorganic complexes and organic polyrotor molecules, as well as considering statistical and dynamic aspects.

Accurate Structure Determination of Free Molecules

Introduction to Polymer Chemistry, Fourth Edition

Molecular Similarity in Drug Design

An Introduction

Introduction to Materials Chemistry

Scattering and inverse scattering in Pure and Applied Science

In calling this series Molecular Plant Virology, I had in mind aspects of plant virology of interest to biochemists, molecular geneticists, biophysicists, genetic engineers, or, collectively,molecular biologists. At the same time, the intention was to provide up-to-date reviews, by expert contributors, on current research topics in plant virology of interest and referential use to virologists and plant biologists. The selected topics are pitched mainly at a research level, but with sufficient introduction and cross-referencing to enable graduate students to enter this fascinating field and, hopefully, not get lost.

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

The functionalization of surfaces on the nanoscale is one of the most fascinating and at the same time challenging topics in science. It is the key to tailoring catalysts, sensors, or devices for solar energy conversion, whose functional principle is based on the interaction of an active solid surface with another (liquid or gaseous) phase. As an example, planar transition metal complexes adsorbed on solid supports are promising candidates for novel heterogeneous catalysts. An important feature of these catalysts, compared to supported metal clusters, is the fact that the active sites, i. e. , the coordinated metal centers with their vacant axial coordination sites, are well de?ned and uniform. Metalloporphyrinoids are particularly suitable in this respect because they combine a structure forming element—the rigid molecular frame, which often induces long range order—with an active site, the coordinated metal ion. Its planar coordination environment leaves two axial coordination sites available for additional ligands. If adsorbed on a surface, one of these axial sites is occupied by the underlying substrate. The resulting electronic interaction with the surface can be used to tailor the electronic structure and thereby the reactivity of the metal center. The remaining site is free for the attachment of molecules (sensor functionality) and/or operates as a reaction center (single-site catalysis). Prototype examples are omnipresent in nature, where in particular metallo-tetrapyrrols play a decisive role in important biological processes, with the most prominent examples being iron porphyrins in heme, magnesium porphyrins in chlorophyll, and cobalt corrin in vitamin B12.

Introduction to Polymer Chemistry provides undergraduate students with a much-needed, well-rounded presentation of the principles and applications of natural, synthetic, inorganic, and organic polymers. With an emphasis on the environment and green chemistry and materials, this fourth edition continues to provide detailed coverage of natural and synthetic giant molecules, inorganic and organic polymers, elastomers, adhesives, coatings, fibers, plastics, blends, caulks, composites, and ceramics. Building on undergraduate work in foundational courses, the text fulfills the American Chemical Society Committee on Professional Training (ACS CPT) in-depth course requirement

Vibration-Rotational Spectroscopy and Molecular Dynamics

The Hierarchic Theory of Liquids and Solids

Advances in Atomic, Molecular, and Optical Physics

Volume I: Virus Structure and Assembly and Nucleic Acid-Protein Interactions

Symmetry: A Very Short Introduction