Read Free Optical Properties Of Metal Clusters Springer Series In Materials Science

Thank you for downloading **Optical Properties Of Metal Clusters Springer Series In Materials Science**. As you may know, people have search hundreds times for their chosen readings like this Optical Properties Of Metal Clusters Springer Series In Materials Science, but end up in infectious downloads.
Rather than enjoying a good book with a cup of coffee in the afternoon, instead they cope with some harmful bugs inside their desktop computer.

Optical Properties Of Metal Clusters Springer Series In Materials Science is available in our book collection an online access to it is set as public so you can get it instantly.
Our books collection saves in multiple locations, allowing you to get the most less latency time to download any of our books like this one.
Kindly say, the Optical Properties Of Metal Clusters Springer Series In Materials Science is universally compatible with any devices to read

BB0 - MAURICIO ROACH

Atomically Precise Metal Nanoclusters discusses the host of exciting properties that can be better harnessed with a solid understanding of their different structures and subsequent properties at the molecular level. The book delves into the foundational chemistry of numerous key atomically precise clusters and provides guidance on key approaches employed to examine them. Beginning with an introduction to the properties and fundamental nano--chemistry of atomically precise metal nanoclusters, the book then explores key approaches for their synthesis, examination and modification, including chromatography, mass spectrometry, single crystal diffraction, electron microscopy and computational approaches. A final section covers specific nanoclusters and cluster systems. User will find the important knowledge of an experienced team of contributors who provide a detailed guide to understanding, investigating and utilizing these useful structures that is ideal for anyone working in related fields. Presents a comprehensive guide that combines key knowledge, approaches and other types of metal nanocluster Supports an understanding of important interactions and approaches using clear figures Highlights future needs and prospects in the field
Due to the interaction with the contact medium, the properties of clusters may change or even disappear. Thus the physics of cluster-on-surface systems -- the main subject of this book -- is of fundamental importance. The book addresses a wide audience, from the newcomer to the expert. Starting from fundamental concepts of adsorbate-surface interactions, the modification of electronic properties through electron confinement, and concepts of cluster production, it elucidates the distinct properties of the new metallic nanostructures.
Glasses containing metallic nanoparticles exhibit very promising linear and nonlinear optical properties, mainly due to the surface plasmon resonances (SPRs) of the nanoparticles. The spectral position in the visible and near-infrared range and polarization dependence of the SPR are characteristically determined by the nanoparticles' shapes. The focus of Ultra-Short Pulsed Laser Engineered Metal-Glass Nanocomposites is the interaction of intense ultra-short laser pulses with glass containing silver nanoparticles embedded in soda-lime glass, and nanostructural modifications in metal-glass nanocomposites induced by such laser pulses. In order to provide a comprehensive physical picture of the processes leading to laser-induced persistent shape transformation of the nanoparticles, series of experimental results investigating the dependences of laser assisted shape modifications of nanoparticles with laser pulse intensity, excitation wavelength, temperature are considered. In addition, the resulting local optical dichroism allows producing very flexibly polarizing optical (sub-) microstructures with well-specified optical properties. The achieved considerable progress towards technological application of this technique, in particular also for long-term optical data storage, is also discussed.
Metal clusters, an intermediate state between molecules and the extended solid, show peculiar bonding and reactivity patterns. Their significance is critical to many areas, including air pollution, interstellar matter, clay minerals, photography, catalysis, quantum dots, and virus crystals. In Aromaticity and Metal Clusters, dozens of international experts explore not only the basic aspects of aromaticity, but also the structures, properties, reactivity, stability, and other consequences of the aromaticity of a variety of metal clusters. Although the concept of aromaticity has been known for nearly two centuries, there is no way to measure it experimentally and no theoretical formula to calculate it. In order to gain insight into its exact nature, the authors of this volume examine various indirect characteristics such as geometrical, electronic, magnetic, thermodynamic, and reactivity considerations. The book begins by discussing the evolution of aromaticity from benzene to atomic clusters. Next, more specialized chapters focus on areas of significant interest. Topics discussed include: Computational studies on molecules with unusual aromaticity Electronic shells and magnetism in small metal clusters A density functional investigation on the structures, energetics, and properties of sodium clusters through electrostatic guidelines and molecular tailoring The correlation between electron delocalization and ring currents in all metallic aromatic compounds Phenomenological shell model and aromaticity in metal clusters Rationalizing the aromaticity indexes used to describe the aromatic behavior of metal clusters 5f orbital successive aromatic and antiaromatic zones in triangular uranium cluster chemistry This collection of diverse contributions, composed of the work of scientists worldwide, is destined to not only answer puzzling questions about the nature of aromaticity, but also to provoke further inquiry in the minds of researchers.

Second volume of a 40-volume series on nanoscience and nanotechnology, edited by the renowned scientist Challa S.S.R. Kumar. This handbook gives a comprehensive overview about UV-visible and photoluminescence spectroscopy for the characterization of nanomaterials. Modern applications and state-of-the-art techniques are covered and make this volume essential reading for research scientists in academia and industry in the related fields.
This book introduces graduate students in physics, optics, materials science and electrical engineering to surface plasmons, and

applications of surface plasmon physics.
Optical coatings, i.e. multilayer stacks composed from a certain number of thin individual layers, are an essential part of any optical system necessary to tailor the properties of the optical surfaces. Hereby, the performance of any optical coating is defined by a well-balanced interplay between the properties of the individual coating materials and the geometrical parameters (such as film thickness) which define their arrangement. In all scientific books dealing with the performance of optical coatings, the main focus is on optimizing the geometrical coating parameters, particularly the number of individual layers and their thickness. At the same time, much less attention is paid to another degree of freedom in coating design, namely the possibility to tailor optical material properties to an optimum relevant for the required specification. This book, on the contrary, concentrates on the material aside of the problem. After a comprehensive review of the basics of thin film theory, traditional optical coating material properties and their relation to the efficiency of coating design methods, emphasis is placed on novel results concerning the application of material mixtures and nanostructured coatings in optical coating theory and practice, including porous layers, dielectric mixtures as well as metal island films for different applications.
Metallic nanoparticles display fascinating properties that are quite different from those of individual atoms, surfaces or bulk rmaterials. They are a focus of interest for fundamental science and, because of their huge potential in nanotechnology, they are the subject of intense research effort in a range of disciplines. Applications, or potential applications, are diverse and interdisciplinary. They include, for example, use in biochemistry, in catalysis and as chemical and biological sensors, as systems for nanoelectronics and nanostructured magnetism (e.g. data storage devices), where the drive for further miniaturization provides tremendous technological challenges and, in medicine, there is interest in their potential as agents for drug delivery. The book describes the structure of metallic nanoparticles, the experimental and theoretical techniques by which this is determined, and the models employed to facilitate understanding. The various methods for the production of nanoparticles are outlined. It surveys the properties of clusters and the methods of characterisation, such as photoionization, optical spectroscopy, chemical reactivity and magnetic behaviour, and discusses element-specific information that can be extracted by synchrotron-based techniques such as EXAFS, XMCD and XMLD. The properties of clusters can vary depending on whether they are free, deposited on a surface or embedded in a matrix of another material; these issues are explored. Clusters on a surface can be formed by the diffusion and aggregation of atoms; ways of modelling these processes are described. Finally we look at nanotechnology and examine the science behind the potential of metallic nanoparticles in chemical synthesis, catalysis, the magnetic separation of biomolecules, the detection of DNA, the controlled release of molecules and their relevance to data storage. The book addresses a wide audience. There was a huge development of the subject beginning in the mid-1980s where researchers began to study the properties of free nanoparticle and models were developed to describe the observations. The newcomer is introduced to the established models and techniques of the field without the need to refer to other sources to make the material accessible. It then takes the reader through to the latest research and provides a comprehensive list of references for those who wish to pursue particular aspects in more detail. It will also be an invaluable handbook for the expert in a particular aspect of nanoscale research who wishes to acquire knowledge of other areas. The authors are specialists in different aspects of the subject with expertise in physics and chemistry, experimental techniques and computational modelling, and in interdisciplinary research. They have collaborated in research. They have also collaborated in writing this book, with the aim from the outset of making it is a coherent whole rather than a series of independent loosely connected articles. * Appeals to a wide audience * Provides an introduction to established models and techniques in the field * Comprehensive list of references

Atomic Clusters with Unusual Structure, Bonding and Reactivity: Theoretical Approaches, Computational Assessment and Applications reviews the latest computational tools and approaches available for accurately assessing the properties of a cluster, while also highlighting how such clusters can be adapted and utilized for the development of novel materials and applications. Sections provide an introduction to the computational methods used to obtain global minima for clusters and effectively analyze bonds, outline experimental approaches to produce clusters, discuss specific applications, and explore cluster reactivity and usage across a number of fields. Drawing on the knowledge of its expert editors and contributors, this book provides a detailed guide to ascertaining the stability, bonding and properties of atomic clusters. Atomic clusters, which exhibit unusual properties, offer huge potential as building blocks for new materials and novel applications, but understanding their properties, stability and bonding is essential in order to accurately understand, characterize and manipulate them for further use. Searching for the most stable geometry of a given cluster is difficult and becomes even more so for clusters of medium and large sizes, where the number of possible isomers sharply increase, hence this book provides a unique and comprehensive approach to the topic and available techniques and applications. Introduces readers to the vast structural and bonding diversity that clusters show and reflects on their potential for novel application and material development Highlights the latest computational methods and theoretical tools available for identification of the most stable isomers and accurate analysis of bonding in the clusters Focuses on clusters which violate the rules established in traditional chemistry and exhibit unusual structure, bonding and reactivity
Optical Properties of Metal Clusters deals with the electronic structure of metal clusters determined optically. Clusters - as state intermediate between molecules and the extended solid - are important in many areas, e.g. in air pollution, interstellar matter, clay minerals, photography, heterogeneous catalysis, quantum dots, and virus crystals. This book extends the approaches of optical molecular and solid-state methods to clusters, revealing how their optical properties evolve as a function of size. Cluster matter, i.e. extended systems of many clusters - the most frequently occuring form - is also treated. The combination of reviews of experimental techniques, lists of results and detailed descriptions of selected experiments will appeal to experts, newcomers and graduate students in this expanding field.
This book provides an overview of the design, synthesis, and characterization of different photoactive hybrid organic-inorganic materials, based on the combination of mainly organic molecules and inorganic nanostructures, tackling their uses in different scientific fields from photonics to biomedicine. There are many examples extensively describing how the confinement of organic compounds (i.e. chromophores, photochromic molecules or photoreactants), or other photoactive compounds (i.e.metal clusters) into several microporous systems can modulate the photophysical properties and photochemical reactions leading to interesting applications. Among (ordered)-hosts, different systems of diverse nature are widely used, such as the, the 1D- or 3D- channels of zeolitic frameworks, interlayer space of 2D-clays, the organic nanospace of curcubituril and cyclodextrins or the organo-inorganic porous crystalline MOFs systems. This volume highlights the ad-

vances of these photoactive materials and aims to be an inspiration for researchers working in materials science and photochemistry, including chemists, material engineers, physicists, biologists, and medical researchers.

Filling the gap for a description of the optical properties of small particles with sizes less than 1000 nm and to provide a comprehensive overview on the spectral behavior of nanoparticulate matter, this is the most up-to-date reference on the optical physics of nanoparticle systems. The author, an expert in the field with both academic and industrial experience, concentrates on the linear optical properties, elastic light scattering and absorption of single nanoparticles and on reflectance and transmittance of nanoparticle matter.

This book discusses current techniques and instrumentation for cluster chemistry. It addresses both the experimental and theoretical aspects of gas-phase metal cluster reactivities, especially those pertaining to pollution removal, energetic reactions and corrosion and anticorrosion. These metal cluster systems have attracted enormous interest as they display a completely new class of physical, chemical, electronic, magnetic and catalytic properties. As these properties change with size and composition, it can thus be understood how their nature evolves from atoms to bulk solids. The book offers readers a basic understanding of the structural chemistry and reactivity of metal clusters in both gas-phase and wet chemistry. Further, the lessons they learn here regarding metal cluster chemistry will prepare researchers for the study of condensed phase dynamics that pertain to wet chemical synthesis, soft-landing deposition and cluster assembly.

This volume contains papers which have been presented at the International Sym posium on Metal Clusters in Heidelberg from April 7-11, 1986. Clusters, and in particular metal clusters, have been the topic of fa~t growing scientific interest. Indeed, clusters constitute a field of interdisciplinary nature where both physical and chemical questions have to be addressed. Clusters are offundamental importance for the deeper understanding of the transition from atoms via molecules and larger aggregates of particles to the properties of solid materials. Moreover, metal clusters and their character istics are of vital significance for such applied topics as catalysis or photography. Experimentally, the field exhibited rapid progress in the last years. Different sources for clusters have been developed. Intense beams made possible the investigation of free neutral clusters and cluster ions as well. Even though a number of issues concerning metal clusters is still discussed controversially, the present volume tries to give an overview of current work in this field and to illustrate the large variety of experiments as well as the advances made possible by modern theoretical methods. Looking at the many interesting questions still to be addressed it is fair to propose a rapid further growth of this field.

While ion-beam techniques have been used to create thin films in the semiconductor industry for several decades, these methods have been too costly for other surface treatment applications. However, as manufacturing devices become increasingly smaller, the use of a directed-energy ion beam is finding novel industrial applications that require the custom tailoring of new materials and devices, including magnetic storage devices, photonics, opto--electronics, and molecular transport. Engineering Thin Films and Nanostructures with Ion Beams offers a thorough narrative of the recent advances that make this technology relevant to current and future applications. Featuring internationally recognized researchers, the book compiles their expertise in a multidimensional source that: Highlights the mechanisms and visual evidence of the effects of single-ion impacts on metallic surfaces Considers how ion-beam techniques can help achieve higher disk-drive densities Introduces gas-cluster ion-beam technology and reviews its precedents Explains how ion beams are used to aggregate metals and semiconductors into nanoclusters with nonlinear optical properties Addresses current challenges in building equipment needed to produce nanostructures in an industrial setting Examines the combination of ion-beam techniques, particularly with physical vapor deposition Delineates the fabrication of nanopillars, nanoflowers, and interconnected nanochannels in three dimensions by using atomic shadowing techniques Illustrates the production of nanopores of varying dimensions in polymer films, alloys, and superconductors using ion-beam irradiation Shows how fingerprints can be made more reliable as forensic evidence by recoil-mixing them into the substrate using ion beams From the basics of the ion-beam modification of materials to state-of-the-art applications, Engineering Th

With the central importance of electric polarizability and hyperpolarizability for a wide spectrum of activities, this book charts the trends in the accurate theoretical determination of these properties in specialized fields. The contributions include reviews and original papers that extend from methodology to applications in specific areas of primary importance such as cluster science and organic synthesis of molecules with specific properties.

Many bottom-up and top-down techniques for nanomaterial and nanostructure generation have enabled the development of applications in nanoelectronics and nanophotonics. Handbook of Nanophysics: Nanoelectronics and Nanophotonics explores important recent applications of nanophysics in the areas of electronics and photonics. Each peer-reviewed chapter contains a broad-based introduction and enhances understanding of the state-of-the-art scientific content through fundamental equations and illustrations, some in color. This volume discusses how different nanomaterials, such as quantum dots and nanotubes, are used in quantum computing, capacitors, and transistors. Leading international experts review the potential of the novel patterning techniques in molecular electronics as well as nanolithography approaches for producing semiconductor circuits. They also describe optical properties of nanostructures, nanowires, nanorods, and clusters, including cathodoluminescence, photoluminescence, and polarization-sensitivity. In addition, the book covers nanophotonic devices and nanolasers. Nanophysics brings together multiple disciplines to determine the structural, electronic, optical, and thermal behavior of nanomaterials; electrical and thermal conductivity; the forces between nanoscale objects; and the transition between classical and quantum behavior. Facilitating communication across many disciplines, this landmark publication encourages scientists with disparate interests to collaborate on interdisciplinary projects and incorporate the theory and methodology of other areas into their work.

The contributors to the book are world best experts in the optics of random media; they provide a state-of-the-art review of recent developments in the field including nonlinear optical and magneto-optical properties, Raman and hyper-Raman scattering, laser action, plasmon excitation and localized giant fields, imaging and spectroscopy of random media

Recent advances in experimental techniques now enable researchers to produce in a laboratory clusters of atoms of desired composition from any of the elements of the periodic table. This has created a new area of research into novel materials since clusters cannot be regarded either as a "large" molecule or as a fragment of the bulk. Both experimental and theoretical studies are revealing unusual properties that are not ob served in solid state environments. The structures of micro-clusters are found to be significantly distorted from the most symmetric arrangement, some even exhibiting pentagonal symmetry commonly found in

icosahedric structures. The unusual stability of certain clusters, now described as "magic number species", shows striking similarities with the nuclear shell structure. The relative stabilities of clusters depend not only on the composition of the clusters but also on their charged states. The studies on spontaneous fragmentation of mUltiply charged clusters, commonly referred to as Coulomb explosion, illustrate the role of electronic bonding mechanisms on stability of clusters. The effect of foreign atoms on geometry and stability of clusters and the interaction of gas atoms with clusters are showing promise for an indepth understanding of chemisorption and catalysis. The magnetic and optical properties are dependent not only on cluster size but also on its geometry. These findings have the potential for aiding industry in the area of micro-electronics and catalysis.

Here is a brilliant book that covers the major aspects of nanomaterials production. It integrates the many and varied chemical, material and thermo-dynamical facets of production, offering readers a new and unique approach to the subject. The mechanical, optical, and magnetic characteristics of nanomaterials are also presented in detail. Nanomaterials are a fast developing field of research and this book serves as both a reference work for researchers and a textbook for graduate students.

Nanostructures refer to materials that have relevant dimensions on the nanometer length scales and reside in the mesoscopic regime between isolated atoms and molecules in bulk matter. These materials have unique physical properties that are distinctly different from bulk materials. Self-Assembled Nanostructures provides systematic coverage of basic nanomaterials science including materials assembly and synthesis, characterization, and application. Suitable for both beginners and experts, it balances the chemistry aspects of nanomaterials with physical principles. It also highlights nanomaterial-based architectures including assembled or self-assembled systems. Filled with in-depth discussion of important applications of nano-architectures as well as potential applications ranging from physical to chemical and biological systems, Self-Assembled Nanostructures is the essential reference or text for scientists involved with nanostructures.

This practically-oriented overview of nanotechnologies and nanosciences is designed to provide students and researchers with essential information on both the tools of manufacture and specific features of the nanometric scale. Specific applications and techniques covered include nanolithography, STM and AFM, nanowires and supramolecules, molecular electronics, pptronics, and simulation. Each section devotes space to industrial applications and prospective developments. The book provides the only pedagogical review on major nanosciences topics at this level.

Encyclopedia of Interfacial Chemistry: Surface Science and Electrochemistry summarizes current, fundamental knowledge of interfacial chemistry, bringing readers the latest developments in the field. As the chemical and physical properties and processes at solid and liquid interfaces are the scientific basis of so many technologies which enhance our lives and create new opportunities, its important to highlight how these technologies enable the design and optimization of functional materials for heterogeneous and electro-catalysts in food production, pollution control, energy conversion and storage, medical applications requiring biocompatibility, drug delivery, and more. This book provides an interdisciplinary view that lies at the intersection of these fields. Presents fundamental knowledge of interfacial chemistry, surface science and electrochemistry and provides cutting-edge research from academics and practitioners across various fields and global regions

Luminescent Metal Nanoclusters: Synthesis, Characterization, and Applications provides a comprehensive accounting of various protocols used for the synthesis of metal nanoclusters, their characterization techniques, toxicity evaluation and various applications and future prospects. The book provides detailed experimental routes, along with mechanisms on the formation of benign metallic clusters using biomaterials and a comprehensive review regarding the preparation, properties and prospective applications of these nano clusters in various fields, including therapeutic applications. Various methods to protect nanocluster materials to increase their stability are emphasized, including the incorporation of ligands (protein, small molecule, DNA, thiols). This book addresses a gap in the current literature by bringing together the preparation, characterization and applications of all the possible types of reported metal nanoclusters and their hybrids. It is suitable for materials scientists and engineers in academia and those working in research and development in industry. It may also be of interest to those working in the interdisciplinary nanotechnology community, such as physical chemists. Covers the most relevant material categories of luminescent nanoclusters such as metal nanoclusters, nano composites and alloy nanoclusters Provides a comprehensive overview of the various available methods used for the protection of nanoclusters Discusses the latest advances and future opportunities in addressing challenges in producing benign nanomaterials such as toxicity and stability

Atomic clusters are aggregates of atoms containing a few to several thousand atoms. Due to the small size of these pieces of matter, the properties of atomic clusters in general are different from those of the corresponding material in the macroscopic bulk phase. This monograph presents the main developments of atomic clusters and the current status of the field. The book treats different types of clusters with very different properties: clusters in which the atoms or molecules are tied by weak van der Waals interactions, metallic clusters, clusters of ionic materials, and network clusters made of typical covalent elements. It includes methods of experimental cluster synthesis as well as the structural, electronic, thermodynamic and magnetic properties of clusters, covering both experiments and the theoretical work that has led to our present understanding of the different properties of clusters. The question of assembling nanoclusters to form solids with new properties is also considered. Having an adequate knowledge of the properties of clusters can be of great help to any scientist working with objects of nanometric size. On the other hand, nanoclusters are themselves potentially important in fields like catalysis and nanomedicine.

A state-of-the-art reference, Metal Nanoparticles offers the latest research on the synthesis, characterization, and applications of nanoparticles. Following an introduction of structural, optical, electronic, and electrochemical properties of nanoparticles, the book elaborates on nanoclusters, hyper-Raleigh scattering, nanoarrays, and several applications including single electron devices, chemical sensors, biomolecule sensors, and DNA detection. The text emphasizes how size, shape, and surface chemistry affect particle performance throughout. Topics include synthesis and formation of nanoclusters, nanosphere lithography, modeling of nanoparticle optical properties, and biomolecule sensors.

Metal nanoclusters, which bridge metal atoms and nanocrystals, are gaining attention due to their unique chemical and physical properties which differ greatly from their corresponding large nanoparticles and molecular compounds. Their electronic and optical properties are of particular interest for their use in sensing, optoelectronics, photovoltaics and catalysis. The book highlights recent progress and challenges in size-controlled synthesis, size-dependent properties, characterization and applications of metal nanoclusters. Specific topics include organochalcogenolate-stabilized metal nanoparticles, water-soluble fluorescent silver nanoclusters, thiolate-protected Au and Ag nanoclusters, DNA-templat-

ed metal nanoclusters, fluorescent platinum nanoclusters and janus nanoparticles by interfacial engineering. Edited by active researchers in the area, the book provides a valuable reference for researchers in the area of functional nanomaterials. It also provides a guide for graduate students, academic and industrial researchers interested in the fundamentals of the materials or their applications.

Heat transfer laws for conduction, radiation and convection change when the dimensions of the systems in question shrink. The altered behaviours can be used efficiently in energy conversion, respectively bio- and high-performance materials to control microelectronic devices. To understand and model those thermal mechanisms, specific metrologies have to be established. This book provides an overview of actual devices and materials involving micro-nanoscale heat transfer mechanisms. These are clearly explained and exemplified by a large spectrum of relevant physical models, while the most advanced nanoscale thermal metrologies are presented.

Springer Handbook of Condensed Matter and Materials Data provides a concise compilation of data and functional relationships from the fields of solid-state physics and materials in this 1200 page volume. The data, encapsulated in 914 tables and 1025 illustrations, have been selected and extracted primarily from the extensive high-quality data collection Landolt-Börnstein and also from other systematic data sources and recent publications of physical and technical property data. Many chapters are authored by Landolt-Börnstein editors, including the prominent Springer Handbook editors, W. Martienssen and H. Warlimont themselves. The Handbook is designed to be useful as a desktop reference for fast and easy retrieval of essential and reliable data in the lab or office. References to more extensive data sources are also provided in the book and by interlinking to the relevant sources on the enclosed CD-ROM. Physicists, chemists and engineers engaged in fields of solid-state sciences and materials technologies in research, development and application will appreciate the ready access to the key information coherently organized within this wide-ranging Handbook. From the reviews: "...this is the most complete compilation I have ever seen... When I received the book, I immediately searched for data I never found elsewhere..., and I found them rapidly... No doubt that this book will soon be in every library and on the desk of most solid state scientists and engineers. It will never be at rest." -Physicalia Magazine

The book bridges the gap between fundamental physics courses (such as optics, electrodynamics, quantum mechanics and solid state physics) and highly specialized literature on the spectroscopy, design, and application of optical thin film coatings. Basic knowledge from the above-mentioned courses is therefore presumed. Starting from fundamental physics, the book enables the reader derive the theory of optical coatings and to apply it to practically important spectroscopic problems. Both classical and semiclassical approaches are included. Examples describe the full range of classical optical coatings in various spectral regions as well as highly specialized new topics such as rugate filters and resonant grating waveguide structures. The second edition has been updated and extended with respect to probing matter in different spectral regions, homogenous and inhomogeneous line broadening mechanisms and the Fresnel formula for the effect of planar interfaces.

Protected Metal Clusters: From Fundamentals to Applications surveys the fundamental concepts and potential applications of atomically precise metal clusters protected by organic ligands. As this class of materials is now emerging as a result of breakthroughs in synthesis and characterization that have taken place over the last few years, the book provides the first reference with a focus on these exciting novel nanomaterials, explaining their formation, and how, and why, they play an important role in the future of molecular electronics, catalysis, sensing, biological imaging, and medical diagnosis and therapy. Surveys the fundamental concepts and potential applications of atomically precise metal clusters protected by organic ligands. Provides well-organized, tutorial style chapters that are ideal for teaching and self-study In-depth descriptions by top scientists in the field Presents the state-of-the art of protected metal clusters and their future prospects

This book offers a comprehensive overview of the rapidly developing field of cluster science. In an interdisciplinary approach, basic concepts as well as recent developments in research and practical applications are authoritatively discussed by leading authors. Topics covered include 'naked' metal clusters, clusters stabilized by ligands, clusters in solids, and colloids. The reader will find answers to questions like: * How many metal atoms must a particle have to exhibit metallic properties? * How can the large specific surface of clusters and colloids be employed in catalysts? * How can metal clusters be introduced into solid hosts? * Which effects are responsible for the transition from isolated to condensed clusters? The editor has succeeded in bringing the contributions of various authors together into a homogeneous, readable book, which will be useful for the academic and industrial reader alike.

Metallic nanoparticles hold promise for their potential applications in a wide array of disciplines ranging from materials science to medicine. This book brings the power of theoretical methods to an audience of experimentalists, and explicates the simulation of metallic clusters and nanoparticles. It begins with a summary of the current state of research on metallic nanoparticles, then moves on to the current state of the art in theory of metallic nanoparticldes, and then explains why and how these tools help experimentalists. Contributions are provided by renowned experts in the field from across the world.