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Lanthanide Luminescence Photophysical Studies of Luminescent Supra-molecules and Their Application in Sensing of Anionic Analytes
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Modern Applications of Lanthanide Luminescence
Handbook on the Physics and Chemistry of Rare Earths Laser Induced Luminescence Spectroscopy on Solid Substrates
Laser Techniques in Luminescence Spectroscopy
Highly Luminescent Lanthanide Complexes with Specific Coordination Structures
Triboluminescence
Fluorescence Spectroscopy and Microscopy in Biology Lanthanide-Based Multifunctional Materials
Phosphors, Up Conversion Nano Particles, Quantum Dots and Their Applications
Fluorescence in Industry
Perspectives on Fluorescence
Fluorescence Studies of Polymer Containing Systems
Advanced Fluorescence Reporters in Chemistry and Biology III
Advanced Fluorescence Reporters in Chemistry and Biology I
Advanced Fluorescence Reporters in Chemistry and Biology II

Metallofoldamers Food Analysis Upconverting Nanomaterials Ewing's Analytical Instrumentation Handbook, Fourth Edition High-Performance Polymers for Engineering-Based Composites Nanocomposites, Nanophotonics, Nanobiotechnology, and Applications Handbook on the Physics and Chemistry of Rare Earths Current Trends on Lanthanide Glasses and Materials Hybrid Organic-Inorganic Interfaces Photochemistry 4th International Conference on Nanotechnologies and Biomedical Engineering Upconverting Nanoparticles Titanium Dioxide Fluorescent Proteins I Fluorescent Methods to Study Biological Membranes Advanced Photon Counting Fluorescent Proteins II Advances in Metallacrown Chemistry Fundamentals of Bionanomaterials Photochemistry Highly Efficient OLEDs The Chemistry of Metal-Organic Frameworks, 2 Volume Set

High-Performance Polymers for Engineering-Based Composites presents a selection of investigations and innovative research in polymer chemistry and advanced materials. The book includes case studies in the field of nanocomposites. The volume provides coverage of new research in polymer science and engineering with applications in chemical engineering, materials science, and chemistry. In addition to synthetic polymer chemistry, it also looks at the properties of polymers in various states (solution, melt, solid). The chapters provide a survey of the important categories of polymers including commodity thermoplastics and fibers, elastomers and thermosets, and engineering and specialty polymers. Basic

polymer processing principles are explained as well as in-depth descriptions of the latest polymer applications in different industrial sectors. This new book reviews the field’s current state and emerging advances. With contributions from experts from both the industry and academia, this book presents the latest developments in polymer products and chemical processes. Gregorio Weber is widely acknowledged as the person responsible for the advent of modern fluorescence spectroscopy. Since 2016 is the 100th anniversary of Gregorio Weber’s birth, this special volume has been prepared to honor his life and achievements. It offers contributions from outstanding researchers in the fluorescence field, describing their perspectives on modern fluorescence and its highly diverse applications, ranging from the photophysics of tryptophan and proteins, membrane studies, fluorescence microscopy on live cells, novel software approaches and instrumentation. Many of the authors knew Gregorio Weber personally and have shared their impressions of the man and his contributions. This volume appeals not only to aficionados of fluorescence spectroscopy and its applications in biology, chemistry and physics, but also to those with a general interest in the historical development of an important scientific field. Handbook on the Physics and Chemistry of Rare Earths: Including Actinides, Volume 56, is a continuous series of books covering all aspects of rare earth science, including chemistry, life sciences, materials science and physics. The book's main emphasis is on rare earth elements [Sc, Y, and the lanthanides (La through Lu], but whenever relevant, information is also included on the closely related actinide elements. Individual chapters

in this release include Lanthanide Molecules for Spin-based Quantum Technologies, Modeling Intramolecular Energy Transfer in Lanthanide Chelates: A Critical Review and Recent Advances, and Superconducting Uranium-Based Materials. Presents up-to-date overviews and new developments in the field of rare earths, covering both their physics and chemistry Contains Individual chapters that are comprehensive and broad, along with critical reviews Provides contributions from highly experienced, invited experts This book provides the reader with an updated comprehensive view of the rapidly developing and fascinating field of fluorescence spectroscopy and microscopy. In recent years, fluorescence spectroscopy and microscopy have experienced rapid technological development, which has enabled the detection and monitoring of single molecules with high spatial and temporal resolution. Thanks to these developments, fluorescence has become an even more popular method in physical, biological and related fields. This book guides the reader through both basic and advanced fluorescence spectroscopy and microscopy approaches with a focus on their applications in membrane and protein biophysics. Each of the four parts: A - Fluorescence Spectroscopy, B - Fluorescence Microscopy, C - Applications of Fluorescence Spectroscopy and Microscopy to biological membranes and D - Applications of Fluorescence Spectroscopy to protein studies are written by experts within the field. The book is intended for both complete beginners who want to quickly orient themselves in the large number of existing fluorescent methods, as well as for advanced

readers who are interested in particular methods and their proper use. This book introduces readers to fundamental information on phosphor and quantum dots. It comprehensively reviews the latest research advances in and applications of fluoride phosphors, oxide phosphors, nitridosilicate phosphors and various quantum dot materials. Phosphors and phosphor-based quantum dot materials have recently gained considerable scientific interest due to their wide range of applications in lighting, displays, medical and telecommunication technologies. This work will be of great interest to researchers and graduate students in materials sciences and chemistry who wish to learn more about the principles, synthesis and analysis of phosphors and quantum dot materials. With advances in techniques and technology coupled with the growing need to deal withthe problems associated with quality assurance, product development, and food safety,the science of food analysis has developed rapidly in recent years. Food Analysis: Principlesand Techniques provides an unparalleled source of information for all aspects of thisfield, filling your needs for up-to-date, detailed treatment of the methods of food analysis.Volume 2 of this important 8-volume treatise focuses on essential physicochemical techniques,ranging from the measurement of physical parameters, such as temperature, solubility,and viscosity, to the determination of food components at the supramolecular andatomic levels. Incorporating the latest developments in instrumentation that facilitate rapid,quantitative analysis, Physicochemical Techniques assures you comprehensive,

accuratecoverage that you can turn to time and time again.Consolidating the expertise of renowned international authorities, Food Analysis: Principlesand Techniques serves as the complete, state-of-the-art reference and the basis forcontinuing development. For all food analysts in industry, government, and academiaincludingfood scientists, chemists, biochemists, nutritionists, environmental chemists,and microbiologists-this major resource will be the standard by which other works arecompared . Also, graduate students in food science and nutrition will find each volume ofthis work indispensable in their studies. This book gathers 12 outstanding contributions that reflect state-of-the-art industrial applications of fluorescence, ranging from the pharmaceutical and cosmetics industries to explosives detection, aeronautics, instrumentation development, lighting, photovoltaics, water treatment and much more. In the field of fluorescence, the translation of research into important applications has expanded significantly over the past few decades. The 18th volume in the Springer Series on Fluorescence fills an important gap by focusing on selected industrial applications of fluorescence, described in contributions by both industry-based researchers and academics engaged in collaborations with industrial partners. Fluorescent proteins are intimately connected to research in the life sciences. Tagging of gene products with fluorescent proteins has revolutionized all areas of biosciences, ranging from fundamental biochemistry to clinical oncology, to environmental research. The discovery of the

Green Fluorescent Protein, its first, seminal application and the ingenious development of a broad palette of fluorescence proteins of other colours, was consequently recognised with the Nobel Prize for Chemistry in 2008. Fluorescent Proteins II highlights the physicochemical and biophysical aspects of fluorescent protein technology beyond imaging. It is tailored to meet the needs of physicists, chemists and biologists who are interested in the fundamental properties of fluorescent proteins, while also focussing on specific applications. The implementations described are cutting-edge studies and exemplify how the physical and chemical properties of fluorescent proteins can stimulate novel findings in life sciences. Lanthanide-Based Multifunctional Materials: From OLEDs to SIMs serves as a comprehensive and state-of the art review on these promising compounds, delivering a panorama of their extensive and rapidly growing applications. After an introductory chapter on the theoretical description of the optical and magnetic behaviour of lanthanides and on the prediction of their properties by ab-initio methods, four chapters are devoted to lanthanide-based OLEDs, including the latest trends in visible emitters, the emerging field of near infrared emitters and the first achievements attained in the field of chiral OLEDs. The use of lanthanide complexes as molecular magnets spreads over another two chapters, which explain the evolution of 4f-elements-based SIMs and the most recent advances in heterometallic 3d–4f SMMs. Other very active research areas are covered in the remaining five chapters, dedicated

to lanthanide-doped germanate and tellurite glasses, luminescent materials for up-conversion, luminescent thermosensors, multimodal imaging and therapeutic agents, and chemosensors. The book is aimed at academic and industrial researchers, undergraduates and postgraduates alike, and is of particular interest for the Materials Science, Applied Physics and Applied Chemistry communities. Includes the latest progress on lanthanide-based materials and their applications (in OLEDs, SIMs, doped matrices, up-conversion, thermosensors, theragnostics and chemosensors) Presents basic and applied aspects of the Physics and Chemistry of lanthanide compounds, as well as future lines of action Covers successful examples of devices and proofs-of-concept and provides guidelines for the rational design of new materials The essential resource that offers a comprehensive understanding of OLED optimizations Highly Efficient OLEDs. Materials Based on Thermally Activated Delayed Fluorescence (TADF) offers substantial information on the working principle of OLEDs and on new types of emitting materials (organic and inorganic). As the authors explain, OLEDs that use the Singlet-Harvesting mechanism based on the molecular property of TADF work according to a new exciton harvesting principle. Thus, low-cost emitter materials, such as Cu(I) or Ag(I) complexes as well as metal-free organic molecules, have the potential to replace high-cost rare metal complexes being currently applied in OLED technology. With contributions from an international panel of experts on the topic, the text shows how the application of new TADF materials allow for the development of efficient OLED

displays and lighting systems. This new mechanism is the gateway to the third-generation of luminescent materials. This important resource: Offers a state-of-the-art compilation of the latest results in the dynamically developing field of OLED materials Is edited by a pioneer in the field of OLED material technology Contains a detailed application-oriented guide to new low-cost materials for displays and lighting Puts the focus on the emerging fields of OLED technology Written for materials scientists, solid state chemists, solid state physicists, and electronics engineers, Highly Efficient OLEDs. Materials Based on Thermally Activated Delayed Fluorescence offers a comprehensive resource to the latest advances of OLEDs based on new TADF materials. Upconverting Nanomaterials: Perspectives, Synthesis, and Applications serves as a powerful instrument that explores cutting-edge research knowledge on the topic of upconverting nanosystems, while simultaneously providing the necessary fundamental background for nonspecialist readers. The various aspects of upconverting materials are approached both from a theoretical point of view, particularly upconverting phenomenon, and a practical one. By presenting synthetic strategies, functionalization, production of core shell structures and nanocomposites, this book supplies PhD students, researchers, and scientists with a wealth of ideas they can apply to different fields of research. Thirty-five renowned scientists from around the world have collaborated to produce 11 chapters that help to "make a voyage" through the most important aspects of UPNPs, including syntheses, mechanism,

functionalization, and applications. This volume builds upon the successful book Lanthanide Luminescence published in the Springer Series on Fluorescence in 2011. Since its publication, the field of lanthanide spectroscopy and the areas in which the light emission properties of the f-elements are used have experienced substantial advances. The luminescence properties of lanthanide ions make them unique candidates for a myriad of optical applications. This book highlights and reviews the latest research in areas ranging from luminescence thermometry to imaging, sensing and photonic applications of these fascinating elements. Each chapter provides a comprehensive introduction to a specific area of application of lanthanide luminescence and extensively reviews seminal papers and current research literature. Given its interdisciplinary scope, the book appeals to scientists and advanced students in physics, chemistry and materials science interested in compounds and materials with optical properties. This volume describes the application of fluorescence spectroscopy in polymer research. The first chapters outline the basic principles of the conformational and dynamic behavior of polymers and review the problems of polymer self-assembly. Subsequent chapters introduce the theoretical principles of advanced fluorescence methods and typical examples of their application in polymer science. The book closes with several reviews of various fluorescence applications for studying specific aspects of polymer-solution behavior. It is a useful resource for polymer scientists and experts in fluorescence spectroscopy alike, facilitating their communication and

cooperation. The key element of any fluorescence sensing or imaging technology is the fluorescence reporter, which transforms the information on molecular interactions and dynamics into measurable signals of fluorescence emission. This book, written by a team of frontline researchers, demonstrates the broad field of applications of fluorescence reporters, starting from nanoscopic properties of materials, such as self-assembled thin films, polymers and ionic liquids, through biological macromolecules and further to living cell, tissue and body imaging. Basic information on obtaining and interpreting experimental data is presented and recent progress in these practically important areas is highlighted. The book is addressed to a broad interdisciplinary audience. Handbook on the Physics and Chemistry of Rare Earths: Including Actinides is a continuous series of books covering all aspects of rare earth science, including chemistry, life sciences, materials science, and physics. The book's main emphasis is on rare earth elements [Sc, Y, and the lanthanides (La through Lu], but whenever relevant, information is also included on the closely related actinide elements. Individual chapters are comprehensive, broad, up-to-date, critical reviews written by highly experienced, invited experts. The series, which was started in 1978 by Professor Karl A. Gschneidner Jr., combines, and integrates, both the fundamentals and applications of these elements with two published volumes each year. Presents up-to-date overviews and new developments in the field of rare earths, covering both their physics and chemistry Contains Individual chapters that are comprehensive and broad, with critical reviews Provides contributions from

highly experienced, invited experts Titanium dioxide is mainly used as a pigment and photocatalyst. It is possible to find it in food, cosmetics, building materials, electric devices, and others. This book contains chapters about characteristics of anatase and rutile crystallographic structure of titanium dioxide and the use of theoretical calculation for photoactivity determination. With contributions by numerous experts Fluorescent proteins are intimately connected to research in the life sciences. Tagging of gene products with fluorescent proteins has revolutionized all areas of biosciences, ranging from fundamental biochemistry to clinical oncology, to environmental research. The discovery of the Green Fluorescent Protein, its first, seminal application and the ingenious development of a broad palette of fluorescence proteins of other colours, was consequently recognised with the Nobel Prize for Chemistry in 2008. Fluorescent Proteins I is devoted to the basic photophysical and photochemical aspects of fluorescent protein technology. Experienced experts highlight colour tuning, the exploration of switching phenomena and respective methods for their investigation. The book provides a thorough understanding of primary molecular processes allowing the design of fluorescent proteins for specific applications. This comprehensive book presents the theoretical principles, current applications and latest research developments in the field of luminescent lanthanide complexes; a rapidly developing area of research which is attracting increasing interest amongst the scientific community. Luminescence of Lanthanide Ions in

Coordination Compounds and Nanomaterials begins with an introduction to the basic theoretical and practical aspects of lanthanide ion luminescence, and the spectroscopic techniques used to evaluate the efficiency of luminescence. Subsequent chapters introduce a variety of different applications including: • Circularly polarized luminescence • Luminescence bioimaging with lanthanide complexes • Two-photon absorption of lanthanide complexes • Chemosensors • Upconversion luminescence • Excitation spectroscopy • Heterometallic complexes containing lanthanides Each chapter presents a detailed introduction to the application, followed by a description of experimental techniques specific to the area and an extensive review of recent literature. This book is a valuable introduction to the literature for scientists new to the field, as well as providing the more experienced researcher with a comprehensive resource covering the most relevant information in the field; a ‘one stop shop’ for all key references. Metallofoldamers are oligomers that fold into three-dimensional structures in a controlled manner upon coordination with metal ions. Molecules in this class have shown an impressive ability to form single-handed helical structures and other three-dimensional architectures. Several metallofoldamers have been applied as sensors due to their selective folding when binding to a specific metal ion, while others show promise for applications as responsive materials on the basis of their ability to fold and unfold upon changes in the oxidation state of the coordinated metal ion, and as

novel catalysts. Metallofoldamers: From Helicates to Biomimetic Architectures describes the variety of interactions between oligomers and metal species, with a focus on non-natural synthetic molecules. Topics covered include: the major classes of foldamers and their folding driving force metalloproteins and metalloenzymes helicates: self-assembly, structure and applications abiotic metallo-DNA metallo-PNA and iDNA metallopeptides interactions of biomimetic oligomers with metal ions applications of metallofoldamers Modern learning resource providing broad coverage of the rapidly-advancing field of upconverting nanoparticles This modern reference explains photon upconversion technology using nanoparticles from first principles to novel and future applications in imaging, sensing, catalysis, energy technology, biomedicine, and many other areas. Expert authors discuss both established and novel materials and applications, going far beyond the coverage of previously published books on the subject. Key topics covered in the book include: Synthesis, characterization, and basic properties of nanoparticles with photon-upconverting properties New types of upconverting nanoparticles, including transition metal- and rare earth-doped materials, metal-organic frameworks, core/shell particles, and surface-modified particles Current and emerging application areas for upconverting nanoparticles, including heating, lighting, sensing, and detection Biomedical uses of nanoparticles, including photodynamic therapy Photon upconversion using nanoparticles has opened the door to a new universe of

light-powered technology. This book is a key resource for scientists, physicists, and chemists across a wide range of disciplines who wish to master the theory, methods and applications of this powerful new technology. The breadth of scientific and technological interests in the general topic of photochemistry is truly enormous and includes, for example, such diverse areas as microelectronics, atmospheric chemistry, organic synthesis, non-conventional photoimaging, photosynthesis, solar energy conversion, polymer technologies, and spectroscopy. This Specialist Periodical Report on Photochemistry aims to provide an annual review of photo-induced processes that have relevance to the above wide-ranging academic and commercial disciplines, and interests in chemistry, physics, biology and technology. In order to provide easy access to this vast and varied literature, each volume of Photochemistry comprises sections concerned with photophysical processes in condensed phases, organic aspects which are sub-divided by chromophore type, polymer photochemistry, and photochemical aspects of solar energy conversion. Volume 34 covers literature published from July 2001 to June 2002. Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research. Compiled by teams of leading authorities in the relevant subject areas, the series creates a unique service for the active research chemist, with regular, in-depth accounts of progress in particular fields of chemistry. Subject coverage within different volumes of a given title is similar and publication is on an annual or biennial basis. This book gathers the

proceedings of the 4th International Conference on Nanotechnologies and Biomedical Engineering, held on September 18-21, 2019, in Chisinau, Republic of Moldova. It continues the tradition of the previous conference proceedings, thus reporting on both fundamental and applied research at the interface between nanotechnologies and biomedical engineering. Topics include: developments in bio-micro/nanotechnologies and devices; biomedical signal processing; biomedical imaging; biomaterials for biomedical applications; biomimetics; bioinformatics and e-health, and advances in a number of related areas. The book offers a timely snapshot of cutting-edge, multidisciplinary research and developments in the field of biomedical and nano-engineering. Hybrid organic-inorganic materials and the rational design of their interfaces open up the access to a wide spectrum of functionalities not achievable with traditional concepts of materials science. This innovative class of materials has a major impact in many application domains such as optics, electronics, mechanics, energy storage and conversion, protective coatings, catalysis, sensing and nanomedicine. The properties of these materials do not only depend on the chemical structure, and the mutual interaction between their nano-scale building blocks, but are also strongly influenced by the interfaces they share. This handbook focuses on the most recent investigations concerning the design, control, and dynamics of hybrid organic-inorganic interfaces, covering: (i) characterization methods of interfaces, (ii) innovative computational approaches and simulation of interaction processes, (iii) in-situ studies of

dynamic aspects controlling the formation of these interfaces, and (iv) the role of the interface for process optimization, devices, and applications in such areas as optics, electronics, energy and medicine. Providing vital knowledge on the design and synthesis of specific metal-organic framework (MOF) classes as well as their properties, this ready reference summarizes the state of the art in chemistry. Divided into four parts, the first begins with a basic introduction to typical cluster units or coordination geometries and provides examples of recent and advanced MOF structures and applications typical for the respective class. Part II covers recent progress in linker chemistries, while special MOF classes and morphology design are described in Part III. The fourth part deals with advanced characterization techniques, such as NMR, in situ studies, and modelling. A final unique feature is the inclusion of data sheets of commercially available MOFs in the appendix, enabling experts and newcomers to the field to select the appropriate MOF for a desired application. A must-have reference for chemists, materials scientists, and engineers in academia and industry working in the field of catalysis, gas and water purification, energy storage, separation, and sensors. Fluorescence reporter is the key element of any sensing or imaging technology. Its optimal choice and implementation is very important for increasing the sensitivity, precision, multiplexing power, and also the spectral, temporal, and spatial reso- tion in different methods of research and practical analysis. Therefore, design of ?uorescence reporters with advanced properties is one of the most important

problems. In this volume, top experts in this ?eld provide advanced knowledge on the design and properties of ?uorescent dyes. Organic dyes were the ?rst ?uorescent materials used for analytical purposes, and we observe that they retain their leading positions against strong competition of new materials – conjugated polymers, semiconductor nanocrystals, and metal chelating complexes. Recently, molecular and cellular biology got a valuable tool of organic ?uorophores synt-sized by cell machinery and incorporated into green ?uorescent protein and its analogs. Demands of various ?uorescence techniques operating in spectral, anisotropy, and time domains require focused design of ?uorescence reporters well adapted to these techniques. Near-IR spectral range becomes more and more attractive for various applications, and new dyes emitting in this range are strongly requested. Two-photonic ?uorescence has become one of the major tools in bioimaging, and ?uorescence reporters well adapted to this technique are in urgent need. These problems cannot be solved without the knowledge of fundamental principles of dye design and of physical phenomena behind their ?uorescence response. This book expounds on progress made over the last 35 years in the theory, synthesis, and application of triboluminescence for creating smart structures. It presents in detail the research into utilization of the triboluminescent properties of certain crystals as new sensor systems for smart engineering structures, as well as triboluminescence-based sensor systems that have the potential to enable wireless, in-situ, real time and

distributed (WIRD) structural health monitoring of composite structures. The sensor component of any structural health monitoring (SHM) technology — measures the effects of the external load/event and provides the necessary inputs for appropriate preventive/corrective action to be taken in a smart structure — sits at the heart of such a system. This volume explores advances in materials properties and structural behavior underlying creation of smart composite structures and sensor systems for structural health monitoring of critical engineering structures, such as bridges, aircrafts, and wind blades. Analytical chemistry together with photophysical studies is a powerful tool for the detection and quantification of crucial chemical species involved in the environment and biological processes. Among analytical techniques, luminescent chemosensors are widely used in the development of new solutions to long-standing problems. Here, the main focus of this research is the recognition and quantification of important biological and organic/inorganic anions utilizing luminescent molecular sensors. The first part of this work is focused on the recognition of ATP due to its pivotal role in many biological processes. Bisantrene, a molecule comprising imidazolium hydrazone receptor moieties and anthracene as a central fluorophore, was employed as a new sensor for ATP in water at neutral pH by displaying amplified fluorescence. This process was selective to ATP while other nucleotide phosphates such as AMP, GTP, UTP, and CTP did not elicit sensor response. Also, this sensor was used to sense other small anions such as FCl-, AcO-, H2PO4- and HP2O73- in an organic solvent,

where the sensor shows fluorescence quenching. The second project is focused on the recognition and sensing of various phosphates and carboxylates in water using a metal-sensor coordination system. The sensors are based on fluorescent carboxamidequinoline chemosensors derivatized by phenol and benzothiazole. These sensors form non-fluorescent complexes with Eu3+ where the fluorescence is recovered when the phosphate anion sequesters the Eu3+ from the complex. The present sensors show selectivity for biological phosphates such as ATP, ADP, and AMP. Arsenate (HAsO42-) is a highly toxic analyte to living organisms, and efforts toward sensing arsenate are an important area of research. The third project is aimed at the detection of arsenate (HAsO42-) in water by luminescence spectroscopy using a lanthanide/transition metal dyad. We have synthesized a cryptand molecule which binds Eu3+and displays a ligand-sensitized luminescence. This intense luminescence is quenched upon addition of Zn2+, only to be restored in the presence of arsenate. This lanthanide/transition metal dyad was used for the detection of arsenate in water utilizing an Off-to-On intensity switching of Eu3+ luminescence. Biological membranes play a central role in cell structure, shape and functions. However, investigating the membrane bilayer has proved to be difficult due to its highly dynamic and anisotropic structure, which generates steep gradients at the nanometer scale. Due to the decisive impact of recently developed fluorescence-based techniques, tremendous advances have been made in the last few years in our understanding of membrane

characteristics and functions. In this context, the present book illustrates some of these major advances by collecting review articles written by highly respected experts. The book is organized in three parts, the first of which deals with membrane probes and model membranes. The second part describes the use of advanced quantitative and high-resolution techniques to explore the properties of biological membranes, illustrating the key progress made regarding membrane organization, dynamics and interactions. The third part is focused on the investigation of membrane proteins using the same techniques, and notably on the membrane receptors that play a central role in signaling pathways and therapeutic strategies. All chapters provide comprehensive information on membranes and their exploration for beginners in the field and advanced researchers alike. This volume focuses on Time-Correlated Single Photon Counting (TCSPC), a powerful tool allowing luminescence lifetime measurements to be made with high temporal resolution, even on single molecules. Combining spectrum and lifetime provides a “fingerprint” for identifying such molecules in the presence of a background. Used together with confocal detection, this permits single-molecule spectroscopy and microscopy in addition to ensemble measurements, opening up an enormous range of hot life science applications such as fluorescence lifetime imaging (FLIM) and measurement of Förster Resonant Energy Transfer (FRET) for the investigation of protein folding and interaction. Several technology-related chapters present both the basics and current state-of-the-art, in particular of

TCSPC electronics, photon detectors and lasers. The remaining chapters cover a broad range of applications and methodologies for experiments and data analysis, including the life sciences, defect centers in diamonds, super-resolution microscopy, and optical tomography. The chapters detailing new options arising from the combination of classic TCSPC and fluorescence lifetime with methods based on intensity fluctuation represent a particularly unique highlight. Lanthanides have fascinated scientists for more than two centuries now, and since efficient separation techniques were established roughly 50 years ago, they have increasingly found their way into industrial exploitation and our everyday lives. Numerous applications are based on their unique luminescent properties, which are highlighted in this volume. It presents established knowledge about the photophysical basics, relevant lanthanide probes or materials, and describes instrumentation-related aspects including chemical and physical sensors. The uses of lanthanides in bioanalysis and medicine are outlined, such as assays for in vitro diagnostics and research. All chapters were compiled by renowned scientists with a broad audience in mind, providing both beginners in the field and advanced researchers with comprehensive information on on the given subject. The breadth of scientific and technological interests in the general topic of photochemistry is truly enormous and includes, for example, such diverse areas as microelectronics, atmospheric chemistry, organic synthesis, non-conventional photoimaging, photosynthesis, solar energy conversion, polymer technologies, and spectroscopy. This

Specialist Periodical Report on Photochemistry aims to provide an annual review of photo-induced processes that have relevance to the above wide-ranging academic and commercial disciplines, and interests in chemistry, physics, biology and technology. In order to provide easy access to this vast and varied literature, each volume of Photochemistry comprises sections concerned with photophysical processes in condensed phases, organic aspects which are sub-divided by chromophore type, polymer photochemistry, and photochemical aspects of solar energy conversion. Volume 34 covers literature published from July 2001 to June 2002. Specialist Periodical Reports provide systematic and detailed review coverage in major areas of chemical research. Compiled by teams of leading authorities in the relevant subject areas, the series creates a unique service for the active research chemist, with regular, in-depth accounts of progress in particular fields of chemistry. Subject coverage within different volumes of a given title is similar and publication is on an annual or biennial basis. This monograph covers the latest developments in lanthanide doped glasses and phosphor materials. The book aims to explain the basic functioning mechanisms of phosphor materials, and the luminescence behaviour of glasses doped with certain lanthanide ions. It also describes how to plot colors in a CIE chromaticity diagram. The book will be of use for senior researchers, materials scientists, chemists, physicists, engineers, as well as research students to gain knowledge on current developments of these materials. This book presents some of the latest

achievements in nanotechnology and nanomaterials from leading researchers in Ukraine, Europe, and beyond. It features contributions from participants in the 2nd International Summer School “Nanotechnology: From Fundamental Research to Innovations” and International Research and Practice Conference “Nanotechnology and Nanomaterials”, NANO-2013, which were held in Bukovel, Ukraine on August 25-September 1, 2013. These events took place within the framework of the European Commission FP7 project Nanotwinning, and were organized jointly by the Institute of Physics of the National Academy of Sciences of Ukraine, University of Tartu (Estonia), University of Turin (Italy), and Pierre and Marie Curie University (France). Internationally recognized experts from a wide range of universities and research institutions share their knowledge and key results on topics ranging from nanooptics, nanoplasmonics, and interface studies to energy storage and biomedical applications. This paper provides an overview of the photophysical processes and analytical applications of high-resolution luminescence spectroscopy using solid samples. Experimental results are discussed within the framework of a theoretical model involving isolated guest molecules weakly interacting with the host solid substrate. Examples are given to illustrate the spectral structure of luminescence spectra exhibiting zero-phonon lines and phonon wings. Effects of experimental parameters such as temperature are discussed. Analytical considerations on the various laser-based techniques in fluorescence and phosphorescence analysis are reviewed and

discussed in detail. Bionanomaterials are identified as a perfect replacement, in the quest for the search of an alternative to toxic conventional nanomaterials for biomedical applications. Bionanomaterials are the nanomaterials, that are fabricated via biomolecules or encapsulate or immobilize a conventional nanomaterial with a biomolecule. The biomolecules extracted from the microbes, plants, agricultural wastes, insects, marine organisms and certain animals are used for the formation of bionanomaterials. These bionanomaterials exhibited low or negligible toxicity towards humans, other organisms and the environment with enhanced biocompatibility, bioavailability and bioreactivity. Thus, the aim of this book is to provide an overview of various bionanomaterials, their synthesis, characterization and their application-oriented properties. The book is divided into two parts – Part 1 discusses about the bionanomaterials of exclusive natural origin, self-assembled bionanomaterials and their environmental application and Part 2 focuses on applications of distinct bionanomaterials in biomedical sciences. The 'Chapter 1 – Bionanomaterials: Definitions, sources, types, properties, market, toxicity and regulations' aims to provide an extensive overview of bionanomaterials, their definitions, sources, types and their properties. In addition, the toxicity of bionanomaterials and their regulations implied in recent times were also discussed. 'Chapter 2 – Nature inspired bionanomaterials' highlights different types of nature-inspired biosynthesized nanomaterials and their green synthesis methods, as well as some of their emerging

applications, especially in the fields of nanomedicine, cosmetics, drug delivery, molecular imaging, and catalytic precursors. Further, the chapter also covers different types of bionanomaterials (e.g., viruses, protein cages, and phages) and highlights their unique properties and potential applications. 'Chapter 3 – Culinary spices mediated biogenesis of nanoparticles for cancer and diabetes treatment' deals with bionanomaterials synthesized by using extracts of culinary spices and its vital role in the treatment of distinct types of cancer and diabetes. In 'Chapter 4 – Environment friendly superhydrophobic bioactive nanocoatings', the authors have discussed the basics of exceptional water repellence behaviour and recent developments in the area of bioactive-SHC for various applications. In addition, the current and projected requirements for bioactive-SHC were also addressed. The authors of 'Chapter 5 – Self-assembly of nanobionics: from theory to application' reviewed, discussed, addressed and highlighted the recent advancements in bionics as an interdisciplinary field to understand the bionic materials and particles, that are mainly fabricated via self-assembly approach. This volume focuses on recent developments in metallacrown chemistry. While the field was established in 1989 by Professor Vincent Pecoraro and numerous applications had been proposed, there has been a recent surge in the practical applications for this class of molecules. Written by leaders in the metallacrown chemistry field this book addresses recent developments. The

single-molecule magnet properties of metallacrowns are presented along with discussions on their ability to bind DNA, as well as their potency to serve as building blocks for supramolecular structures. The volume is not only intended for those who work directly in the field of metallacrowns but it also appeals to those working in the aligned fields of metallamacrocyclic chemistry, self-assembly chemistry, and supramolecular chemistry. This dedicated volume serves as an encyclopedic reference for those wishing to gain insight into the field. This thesis deals with strongly luminescent lanthanide complexes having novel coordination structures. Luminescent lanthanide complexes are promising candidates as active materials for EL devices, lasers, and bio-sensing applications. The organic ligands in lanthanide complexes control geometrical and vibrational frequency structures that are closely related to the luminescent properties. In most of the previous work, however, lanthanide complexes have high-vibrational frequency C–H units close to the metal center for radiationless transition. In this thesis, the luminescent properties of lanthanide complexes with low-vibrational frequency C–F and P=O units are elucidated in terms of geometrical, vibrational, and chemical structures. The author also describes lanthanide coordination polymers with both high thermal stability (decomposition point > 300°C) and strong-luminescent properties (emission quantum yield > 80%). The author believes that novel studies on the characteristic structures and photophysical properties of lanthanide complexes may

open up a frontier field in photophysical, coordination and material chemistry. This handbook is a guide for workers in analytical chemistry who need a starting place for information about a specific instrumental technique. It gives a basic introduction to the techniques and provides leading references on the theory and methodology for an instrumental technique. This edition thoroughly expands and updates the chapters to include concepts, applications, and key references from recent literature. It also contains a new chapter on process analytical technology.