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Modern Luminescence Spectroscopy of Minerals and Materials **Luminescence of Solids Optically Stimulated Luminescence Dosimetry Luminescence** *Laser Techniques in Luminescence Spectroscopy Luminescence and Display Phosphors* **Lanthanide Luminescence** Luminescence Techniques in Chemical and Biochemical Analysis Modern Luminescence Spectroscopy of Minerals and Materials **Luminescence Luminescence Thermometry** *Luminescence Biotechnology* **Luminescence** *An Introduction to Time-Resolved Optically Stimulated Luminescence Luminescence Spectroscopy of Semiconductors* **Soviet Researches on Luminescence** Ultraweak Luminescence Accompanying Biochemical Reactions Methods in Dating and Other Applications using Luminescence **A Course in Luminescence Measurements and Analyses for Radiation Dosimetry Kinetics of Luminescence of Silver Halide Salts** Polarized Luminescence of F-centers in CaF2 *Biological Luminescence - Proceedings Of The First International School* **Luminescence of Lanthanide Ions in Coordination Compounds and Nanomaterials Exciton and Domain Luminescence of Semiconductors** *Circularly Polarized Luminescence of Isolated Small Organic Molecules Chiral Organic Chromophoric Systems in the Enhancement of Circularly Polarized Luminescence* Modern Luminescence from Fundamental Concepts to Materials and Applications Luminescence **Questions and Answers on Thermoluminescence (TL) and Optically Stimulated Luminescence (OSL)** Molecular Luminescence An Introduction to Luminescence of Solids **Luminescence in Solids Containing Manganese** Luminescence in Crystals **Luminescence and Luminescent Materials: Volume 667** International Symposium on Luminescence **Iron Regulation of Luminescence** *Structural and Luminescence Studies of Novel Gold(I) Complexes* **Luminescence Spectroscopy of Europium(III) Analytical Applications of Selectively Excited Lanthanide Ion Luminescence in Various Inorganic Powders A Study of Rare Earth Luminescence and Energy Transfer in Ionic Lanthanide Crystals**

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. Luminescence of Solids gathers together much of the latest work on luminescent inorganic materials and new physical phenomena. The volume includes chapters covering -- the achievements that have led to the establishment of the fundamental laws of luminescence -- light sources, light-dispersing elements, detectors, and other experimental techniques -- models and mechanisms -- materials preparation, and -- future trends. This international collection of cutting-edge luminescence research is complemented by over 170 illustrations that bring to life the text's many vital concepts. Luminescence is presently, and will continue to be, a challenging field of research in materials science, solid-state physics and chemistry. Recent progress in optoelectronic and display technology continues to drive this field in the search for new luminescent materials. Demands on new procedures for synthesis, and understanding underlying luminescence processes in these materials, will create new opportunities for both fundamental and applied research. This book is a compilation of papers, both invited and solicted, from around the world that focus on luminescence and luminescent materials - from theory and modeling, characterization of luminescent materials, and systems with confined structures such as nanocrystallites and quantum wells and dots, to synthesis and device applications. 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. Currently, thermoluminescence (TL) and optically stimulated luminescence (OSL) are the main techniques for studying the luminescence properties of several materials, mainly insulators called phosphors. Frequently, however, students and experts alike need to clarify some concepts related to the effects and defects present in the radiation interaction with solids generated by these phenomena. In this book, a series of questions and corresponding answers give a clearer explanation about the concepts, theory and models related to TL and OSL, including applications in important related areas.Students, researchers and teachers will find this book a good guide for understanding TL and OSL as methods for studying the nature of luminescent solids. It provides a quick way for clearing doubts in the concepts and terminology concerning OSL and TL, as it is intended to answer many questions which can be encountered in practical applications. Optically Stimulated Luminescence (OSL) has become the technique of choice for many areas of radiation dosimetry. The technique is finding widespread application in a variety of radiation dosimetry fields, including personal monitoring, environmental monitoring, retrospective dosimetry (including geological dating and accident dosimetry), space dosimetry, and many more. In this book we have attempted to synthesize the major advances in the field, covering both fundamental understanding and the many applications. The latter serve to demonstrate the success and popularity of OSL as a dosimetry method. The book is designed for researchers and radiation dosimetry practitioners alike. It delves into the detailed theory of the process from the point of view of stimulated relaxation phenomena, describing the energy storage and release processes phenomenologically and developing detailed mathematical descriptions to enable a quantitative understanding of the observed phenomena. The various stimulation modes (continuous wave, pulsed, or linear modulation) are introduced and compared. The properties of the most important synthetic OSL materials beginning with the dominant carbon-doped Al2O3, and moving through discussions of other, less-well studied but nevertheless important, or potentially important, materials. The OSL properties of the two most important natural OSL dosimetry material types, namely quartz and feldspars are discussed in depth. The applications chapters deal with the use of OSL in personal, environmental, medical and UV dosimetry, geological dating and retrospective dosimetry (accident dosimetry and dating). Finally the developments in instrumentation that have occurred over the past decade or more are described. The book will find use in those laboratories within academia, national institutes and the private sector where research and applications in radiation dosimetry using luminescence are being conducted. Potential readers include personnel involved in radiation protection practice and research, hospitals, nuclear power stations, radiation clean-up and remediation, food irradiation and materials processing, security monitoring, geological and archaeological dating, luminescence studies of minerals, etc. Luminescence Thermometry: Methods, Materials, and Applications presents the state-of-the art applications of luminescence thermometry, giving a detailed explanation of luminescence spectroscopic schemes for the read-out of temperature, while also describing the diverse materials that are capable of sensing temperature via luminescence. Chapters cover the fundamentals of temperature, traditional thermometers and their figures of merit, a concise description of optical thermometry methods, luminescence and instrumentation, and an explanation of the ways in which increases in temperature quench luminescence. Additional sections focus on materials utilized for luminescence thermometry and the broad range of applications for luminescence thermometry, including temperature measurement at the nanoscale and the application of multifunctional luminescent materials. Provides an overview of luminescence thermometry applications, including high-temperature, biomedical, nanoscale and multifunctional Delves into luminescence thermometry by materials group, including Rare-earth and transition Metal Ion Doped, Semiconductors, Quantum Dots and Organic materials Gives a concise introduction of the latest methods of temperature measurement, including luminescence spectroscopic schemes and methods of analysis These proceedings review and report on recent research on biological luminescence, covering both the basic and applied aspects in different disciplines of science. In this, the only up-to-date book on this key technology, the number-one expert in the field perfectly blends academic knowledge and industrial applications. Adopting a didactical approach, Professor Ronda discusses all the underlying principles, such that both researchers as well as beginners in the field will profit from this book. The focus is on the inorganic side and the phenomena of luminescence behind the manifold applications illustrated here, including displays, LEDs, lamps, and medical applications. Valuable reading for chemists and electrochemists, as well as materials scientists, those working in the optical and chemical industry, plus lamp and lighting manufacturers. Provides information on modern luminescence techniques, beginning with a general introduction to luminescence spectroscopy. Divided into two basic sections, the first dealing with fluorescence and the latter part on chemiluminescence. Topics include immunoassays, the use of chemiluminescence in flow A Course in Luminescence Measurements and Analyses for Radiation Dosimetry A complete approach to the three key techniques in luminescence dosimetry In A Course in Luminescence Measurements and Analyses for Radiation Dosimetry, expert researcher Stephen McKeever delivers a holistic and comprehensive exploration of the three main luminescence techniques used in radiation dosimetry: thermoluminescence, optically stimulated luminescence, and radiophotoluminescence. The author demonstrates how the three techniques are related to one another and how they compare to each other. Throughout, the author’s focus is on pedagogy, including state-of-the-art research only where it is relevant to demonstrate a key principle or where it reveals a critical insight into physical mechanisms. The primary purpose of the book is to teach beginning researchers about the three aforementioned techniques, their similarities and distinctions, and their applications. A Course in Luminescence Measurements and Analyses for Radiation Dosimetry offers access to a companion website that includes original data sets and problems to be solved by the reader. The book also includes: A thorough introduction to the field of luminescence applications in radiation dosimetry, including a history of the subject. Comprehensive explorations of introductory models and kinetics, including the concepts of thermoluminescence, optically stimulated luminescence, and radiophotoluminescence. Practical discussions of luminescence curve shapes, including the determination of trapping parameters from experimental thermoluminescence and optically stimulated luminescence data. In-depth examinations of dose-response functions, superlinearity, supralinearity, and sublinearity, as well as the causes of non-linearity. Detailed examples with well-known materials. A Course in Luminescence Measurements and Analyses for Radiation Dosimetry is an invaluable guide for undergraduate and graduate students in the field of radiation dosimetry, as well as faculty and professionals in the field. This book reviews up-to-date ideas of how the luminescence radiation in semiconductors originates and how to analyze it experimentally. The book fills a gap between general textbooks on optical properties of solids and specialized monographs on luminescence. It is unique in its coherent treatment of the phenomenon of luminescence from the very introductory definitions, from light emission in bulk crystalline and amorphous materials to the advanced chapters that deal with semiconductor nano objects, including spectroscopy of individual nanocrystals. The theory of radiative recombination channels in semiconductors is considered on a level of intuitive physical understanding rather than rigorous quantum mechanical treatment. The book is based on teaching and written in the style of a graduate text with plenty of tutorial material, illustrations, and problem sets at chapter ends. It is designed predominantly for students in physics, optics, optoelectronics and materials science. The aim of this book is to give readers a broad review of topical worldwide advancements in theoretical and experimental facts, instrumentation and practical applications erudite by luminescent materials and their prospects in dealing with different types of luminescence like photoluminescence, electroluminescence, thermo-luminescence, triboluminescence, bioluminescence design and applications. The additional part of this book deals with the dynamics, rare-earth ions, photon down-/up-converting materials, luminescence dating, lifetime, bioluminescence microscopical perspectives and prospects towards the basic research or for more advanced applications. This book is divided into four main sections: luminescent materials and their associated phenomena; photo-physical properties and their emerging applications; thermoluminescence dating: from theory to applications, and bioluminescence perspectives and prospects. Individual chapters should serve the broad spectrum of common readers of diverse expertise, layman, students and researchers, who may in this book find easily elucidated fundamentals as well as progressive principles of specific subjects associated with these phenomena. This book was created by 14 contributions from experts in different fields of luminescence and technology from over 20 research institutes worldwide. Time-resolved optical stimulation of luminescence has become established as an important method for measurement of optically stimulated luminescence. Its enduring appeal is easy to see with the number of materials studied growing from the initial focus on natural minerals such as quartz and feldspar to synthetic dosimeters such as ?-Al2O3:C, BeO and YAlO3:Mn2+. The aim of time-resolved optical stimulation is to separate in time the stimulation and emission of luminescence. The luminescence is stimulated from a sample using a brief light pulse. The ensuing luminescence can be monitored either during stimulation in the presence of scattered stimulating light or after the light-pulse. The time-resolved luminescence spectrum measured in this way can be resolved into components each with a distinct lifetime. The lifetimes are linked to physical processes of luminescence and thus provide a means to study dynamics involving charge transfer between point-defects in materials. This book is devoted to time-resolved optically stimulated luminescence and is suitable for researchers with an interest in the study of point-defects using luminescence methods. The book first sets the method within the context of luminescence field at large and then provides an overview of the instrumentation used. There is much attention on models for time-resolved optically stimulated luminescence, two of which are analytical and the third of which is based on computational simulation of experimental results. To bring relevance to the discussion, the book draws on examples from studies on quartz and a-Al2O3:C, two materials widely investigated using this method. The book shows how kinetic analysis for various thermal effects such as thermal quenching and thermal assistance can be investigated using time-resolved luminescence. Although use of light sums is an obvious choice for this, contemporary work is discussed to show the versatility of using other alternative methods such the dynamic throughput. This volume, which comprises a collection of papers by leading Soviet researchers, is devoted to topics in the luminescence of semiconductors. An experimental check is made on a series of predictions of the theory of ionization domains. A new low-voltage luminescence of zinc sulfide is described and investigated and is found to be due to a high-frequency electrical instability. A detailed study of the electrical properties of the instability and of the characteristics of the emission testifies to the pre-breakdown character of the electroluminescence and to the acousto electrical nature of the instability. The luminescence excitation spectra of AIN crystals excited in the region of the fundamental absorption contain lines belonging to excitons and their phonon replicas. The symmetry of the electronic and vibrational transitions corresponding to parts of these lines is interpreted. The results of a study of the scattering of light by electron - hole drops in germanium are cited. The results are discussed on the basis of a theory of exciton condensation in which allowance is made for the diffusion of excitons toward the surface of the drops and for the surface tens ion of the electron - hole liquid. This volume will be of interest to a wide range of scientific workers, particularly those engaged in the study of luminescence and physics of semiconductors. Modern Luminescence: From Fundamental Concepts to Materials and Applications, Volume One, Concepts and Luminescence is a multivolume work that reviews the fundamental principles, properties and applications of luminescent materials. Topics addressed include key concepts of luminescence, with a focus on important characterization techniques to understand a wide category of luminescent materials. The most relevant luminescent materials, such as transition metals, rare-earth materials, actinide-based materials, and organic materials are discussed, along with emerging applications of luminescent materials in biomedicine, solid state devices, and the development of hybrid materials. This book is an important introduction to the underlying scientific concepts needed to understand luminescence,

such as atomic and molecular physics and chemistry. Other topics explored cover the latest advances in materials characterization methods, such as Raman spectroscopy, ultrafast spectroscopy, nonlinear spectroscopy, and more. Finally, there is a focus on the materials physics of nanophotonics. Includes an overview of the underlying scientific concepts of luminescence, such as quantum theory, physics and historical context Provides the most important materials characterization methods, including Raman spectroscopy, nonlinear spectroscopy, and more for a wide range of luminescent materials Introduces nanophotonics dynamics that are important to keep in mind when designing materials and devices This book collects all the latest advances in the leading research of the circularly polarized luminescence (CPL) of small organic molecules. Compared with that of lanthanide-based fluorophores, the research into the CPL of small organic molecules is still at the developmental stage for their relatively smaller dissymmetric factors, but has been a source of widespread attention recently. The book includes the state of the art of the discoveries in CPL organic molecules, such as helicenes, biaryls, cyclophanes, boron dipyrromethene dyes, and other chiral molecules, mostly in their isolated states, covering all possible chiral substances for future applications. This book also highlights the recent development of CPL instruments as well as time-resolved circular dichroism spectroscopy, to facilitate the further development and future design of CPL molecules. This new book highlights the link between the luminescence phenomena of phosphors used in different displays. Both fluorescence (used in display phosphors) and phosphorescence (used in after glow phosphors and storage phosphors) mechanisms and the efforts made in phosphor synthesis to reduce the interference of one on another are dealt with in detail. Luminescence Spectroscopy of Minerals and Materials presents an overview of the general concepts in luminescence spectroscopy as well as experimental methods and their interpretation. Special emphasis is laid on the fluorescence lifetime and the determination of time-resolved spectra. This method enables the exposure of new luminescence in minerals previously hidden by more intensive centers. Specialists in the fields of solid state physics, chemistry and spectroscopy will find a wealth of new information in this unique book. The dangers and drawbacks inherent in radioactivity-based methods along with a demonstrated and dramatic increase in sensitivity have precipitated a major shift towards luminescence measurements and visualization techniques. Their use has now spread even to traditional clinical environments, and their applications have grown from clinical assays to DNA sequencing, antioxidant detection, and high-throughput screening. Luminescence Biotechnology: Instruments and Applications furnishes a thorough w review of the principles and applications of luminescence. With a consistent focus on practical considerations, contributions from a team of internationally acclaimed authors take you from the fundamentals of the different luminescence-based assay systems, calculation methods, and instruments through the spectrum of applications and latest research advances. Topics include gene and protein assays, oxidative stress and tissue aging, applications of luminescent microspheres, and proton image analysis. This book clearly identifies the advantages of luminescence over other assay techniques, discusses its potential pitfalls, and illustrates the broad range of its utility. Whether you are a newcomer to the field or a seasoned professional, this book provides a wealth of information that will bring you quickly up to date on the technology, recent research developments, and cutting-edge applications. Luminescence Spectroscopy of Minerals and Materials presents an overview of the general concepts in luminescence spectroscopy as well as experimental methods and their interpretation. Special emphasis is laid on the fluorescence lifetime and the determination of time-resolved spectra. This method enables the exposure of new luminescence in minerals previously hidden by more intensive centers. Specialists in the fields of solid state physics, chemistry and spectroscopy will find a wealth of new information in this unique book. It is well known that luminescence is the term used to describe the excess radiation from a body over and above the thermal radiation and persisting for a time which greatly exceeds the period of a light vibration. The first half of this definition, proposed by Wiedemann, distinguishes luminescence from equilibrium thermal radi ation; the second half, introduced by Vavilov, distinguishes luminescence from various forms of scattering and from induced radiation, such as Vavilov-Cherenkov radiation, etc. Distinctions are made between photo-, cathodo-, x-ray-, and other forms ofluminescence, depending on how energy is introduced into the luminescent body. Electroluminescence is the name given to that form of fluorescence in which the radiating body receives energy directly from an electric field. It should be noted that luminescence under the influence of cathode rays is not called electroluminescence, because in this case the necessary energy is not supplied directly from the electric field to the radiating body but by means of extraneous electrons. Electroluminescence of gaseous bodies (radiation from a gas discharge) has been known for a long time and is widely used in luminescent lamps and gas discharge tubes. In 1923 Losev [1J observed radiation from silicon carbide crystals when a voltage was applied to them di rectly. Trapped charge dating is a commonly used chronological tool in Earth Sciences and Archaeology. The two principle methods are luminescence dating and electron spin resonance. Both are based on stored energy produced by the absorption of natural radioactivity in common minerals such as quartz and feldspars, and in some biological materials such as tooth enamel. Methodological developments in the last 20 years have substantially increased the accuracy and precision of these methods. This compilation offers a taste of the recent research into both method and applications.

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