

Optically Stimulated Luminescence

FUNDAMENTALS AND APPLICATIONS

EDUARDO G. YUKIHARA | STEPHEN W. S. MCKEEVER

 WILEY

Optically Stimulated Luminescence Fundamentals And Applications

**Eduardo G. Yukihiro, Stephen W. S.
McKeever**



Optically Stimulated Luminescence Fundamentals And Applications:

Optically Stimulated Luminescence Eduardo G. Yukihiro, Stephen W. S. McKeever, 2011-02-16 Optically stimulated luminescence has developed into one of the leading optical techniques for the measurement and detection of ionizing radiation. This text covers in a readable manner advanced modern applications of the technique, how it can play a useful role in different areas of dosimetry, and how to approach the challenges presented when working with optically stimulated luminescence. The six chapters are as follows: Introduction including a short history of OSL and details of successful applications; Theory and Practical Aspects; Personal Dosimetry; Space Dosimetry; Medical Dosimetry; Other Applications and Concepts including retrospective and accident dosimetry, environmental monitoring, and UV dosimetry. Throughout the book, the underlying theory is discussed on an as-needed basis for a complete understanding of the phenomena, but with an emphasis on the practical applications of the technique. The authors also give background information and relevant key references on each method, inviting the reader to explore deeper into the subject independently. Postgraduate researchers and those involved with radiation dosimetry will find this book particularly useful. The material is both relevant and accessible for both specialists and those new to the field; therefore, it is fundamental to any academic interested in modern advances of the subject.

Luminescent Ceramics Morteza Sasani Ghamsari, Hyung-Ho Park, 2024-12-01 Luminescent Ceramics Fundamentals, Properties, Processing, and Applications provides a detailed review of luminescent ceramic materials for lighting, dosimetry, and security. The book's chapters cover oxide, nitride, and fluoride phosphors; garnet transparent ceramics; oxynitride and BeO ceramics; doped $MgAl_2O_4$ ceramics for dosimetry; and novel thermo-luminescent ceramics for light-emitting devices and security applications. The book provides a comprehensive overview of the unique possibilities offered by ceramic materials in the field of light emission and applications. It will be an essential reference resource for all researchers working in the area of luminescent materials. Provides an extensive overview of recent research progress on luminescent ceramic materials and their application in lighting, display, dosimetry, and ceramic lasers. Covers fundamentals, synthesis, characterization, properties, production, processing, and applications. Gives a list of requirements for the materials used for each energy technology. Presents an evaluation and comparison of the choice of materials available, including structure, properties, and performance. Identifies gaps and potential for improvement in the field of luminescent ceramics.

Radiation Dosimetry Phosphors Sanjay J. Dhoble, Vibha Chopra, Vinit Nayar, George Kitis, Dirk Poelman, Hendrik C. Swart, 2022-05-26 Radiation Dosimetry Phosphors provides an overview of the synthesis, properties, and applications of materials used for radiation dosimetry and reviews the most appropriate phosphor materials for each radiation dosimetry technique. The book describes the available phosphors used commercially for their applications in the medical field for dose measurements. Although radiation dosimetry phosphors are commercially available, continuous efforts have been made by the worldwide research community to develop new materials or improve already existing materials used in different areas with low or high

levels of radiation Moreover researchers are still working on developing dosimetric phosphors for OSL ML LL and RPL dosimetry This book provides an overall view of the phosphors available low cost synthesis methods mechanisms involved emerging trends and new challenges for the development of emerging materials for radiation dosimetry It is suitable for those working in academia and R D laboratories in the discipline of materials science and engineering along with practitioners working in radiation and dosimetry Provides the fundamental concepts historical context and review of current phosphors available for radiation dosimetry Reviews low cost material methods to synthesize and characterize rare earth doped inorganic phosphors for different kinds of radiation dosimetry techniques Discusses key barriers and potential solutions for enabling commercial realization phosphors for radiation dosimetry applications

[A Course in Luminescence Measurements and Analyses for Radiation Dosimetry](#) Stephen W. S. McKeever, 2022-05-25 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

Scintillation Dosimetry Sam Beddar, Luc Beaulieu, 2018-09-03 Scintillation Dosimetry delivers a comprehensive introduction to plastic scintillation dosimetry covering everything from basic radiation dosimetry concepts to plastic scintillating fiber optics Comprised of chapters authored by leading experts in the medical physics community the book Discusses a broad range of technical implementations from point source dosimetry scaling to 3D volumetric and 4D scintillation dosimetry Addresses a wide scope of clinical applications from

machine quality assurance to small field and in vivo dosimetry Examines related optical techniques such as optically stimulated luminescence OSL or erenkov luminescence Thus Scintillation Dosimetry provides an authoritative reference for detailed state of the art information on plastic scintillation dosimetry and its use in the field of radiation dosimetry

Advances In Physics And Applications Of Optically And Thermally Stimulated Luminescence Reuven Chen,Vasilis Pagonis,2019-03-06 In this volume international leading experts in the study of thermally and optically stimulated luminescence give an up to date comprehensive coverage of the theoretical and experimental aspects of these subjects as well as their applications The theory of thermoluminescence TL and optically stimulated luminescence OSL are discussed in detail including mainly solid state models of localized and delocalized transitions These models cover the effects occurring during the excitation by irradiation and the read out by heating or by exposure to light The methods described consist of analytical mathematical considerations as well as numerical simulations The main application of these effects namely radiation dosimetry includes personal and environmental dosimetry as well as retrospective dosimetry and the dosimetry of cosmic radiation and space missions Also discussed in detail are archaeological and geological dating the use of luminescence dosimetry in medical physics as well as general applications in geosciences other model subjects such as time resolved luminescence and thermally assisted OSL and the sister subject of thermoluminescence in photosynthetic materials

ICOM2015 Book of Abstracts Мирослав Драмићанин,Bruno Viana,Rachid Mahiou,2016-03-24 **An Introduction to Time-Resolved Optically Stimulated Luminescence** Makaiko L Chithambo,2018-12-18 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 Al_2O_3 C BeO and YAlO_3 Mn^{2+} 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 Al_2O_3 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

Radiation Therapy Dosimetry Arash Darafsheh, 2021-03-09 This comprehensive book covers the everyday use and underlying principles of radiation dosimeters used in radiation oncology clinics It provides an up to date reference spanning the full range of current modalities with emphasis on practical know how The main audience is medical physicists radiation oncology physics residents and medical physics graduate students The reader gains the necessary tools for determining which detector is best for a given application Dosimetry of cutting edge techniques from radiosurgery to MRI guided systems to small fields and proton therapy are all addressed Main topics include fundamentals of radiation dosimeters brachytherapy and external beam radiation therapy dosimetry and dosimetry of imaging modalities Comprised of 30 chapters authored by leading experts in the medical physics community the book Covers the basic principles and practical use of radiation dosimeters in radiation oncology clinics across the full range of current modalities Focuses on providing practical guidance for those using these detectors in the clinic Explains which detector is more suitable for a particular application Discusses the state of the art in radiotherapy approaches from radiosurgery and MR guided systems to advanced range verification techniques in proton therapy Gives critical comparisons of dosimeters for photon electron and proton therapies

Luminescence Dating in Archaeology, Anthropology, and Geoarchaeology Ioannis Liritzis, Ashok Kumar Singhvi, James K. Feathers, Gunther A. Wagner, Annette Kaderleit, Nikolaos Zacharias, Sheng-Hua Li, 2013-07-05 The field of Luminescence Dating has reached a level of maturity Both research and applications from all fields of archaeological science from archaeological materials to anthropology and geoarchaeology now routinely employ luminescence dating The advent of optically stimulated luminescence OSL techniques and the potential for exploring a spectrum of grain aliquots enhanced the applicability accuracy and the precision of luminescence dating The present contribution reviews the physical basis mechanisms and methodological aspects of luminescence dating discusses advances in instrumentations and facilities improvements in analytical procedures and statistical treatment of data along with some examples of applications across continents covering all periods Middle Palaeolithic to Medieval and both Old and New World archaeology They also include interdisciplinary applications that contribute to palaeo landscape reconstruction

Luminescent Metal Oxides S.V. Moharil, N.S. Bajaj, P.K. Tawalare, 2023-11-16 The focus of the book is to explore metal oxides exhibiting a high optical transmittance as applicable in the field of light emitting diodes LEDs photo catalysts and so forth It provides exposure to structural and chemical parameters of optically active metal oxides as a phosphor innovative and currently demanded synthesis methods and their proper characterization It further covers applications such as optical thermometry scintillation anti counterfeit solid state lighting and spectral modifier for solar cells VUV application and long persistent light emission phenomenon Features Reviews selection of structurally and functionally active materials for effective synthesis of metal

oxides Exclusively covers large number of areas of applications of the luminescent metal oxides Cover various aspects of metal oxide research including synthesis and applications Includes chapters on synthesis related predictions using machine learning Discusses radiation dosimetry and bio imaging aspects This book is aimed at researchers and graduate students in materials science and phosphor technology *Luminescence* Jagannathan Thirumalai, 2016-11-10 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

Nanopowders of Metal Oxides and Fluorides Sergey Sokovnin, Vladislav Ilves, 2022-12-27 One of the directions of nanotechnology is the production of nanopowders NPs Nanopowders according to the currently widely used classification of nanomaterials belong to zero dimensional systems in which the limitation of wave functions occurs in all three directions Biological methods are considered the most environmentally friendly way to synthesize NPs but the possibility of biological contamination with mutated microorganisms cannot be ruled out This book presents a new method for producing simple and complex metal oxide and fluoride NPs based on the evaporation condensation process using pulsed electron beam evaporation It presents the results of more than 10 years of study of the characteristics of NPs produced using the aforementioned method This eco friendly method ensures the production of clean NPs which are mesoporous and suitable for use in various applications such as medicine spintronics optoelectronics dosimeters photocatalysis semiconductors and ultraviolet and blue lasers Importantly these NPs have the potential to be used as a drug delivery system and in the creation of new nanostructures that do not contain noble metals The book will be useful for the researchers in macromolecular science nanotechnology chemistry biology and medicine especially those with an interest in drug delivery or cancer therapy

Luminescent Nanomaterials Odireleng Martin Ntwaeaborwa, 2022-05-18 In recent decades luminescent nanomaterials have generated great interest in the scientific community due to their unique properties which are different from those of their bulk counterparts and their use in a wide variety of applications Today luminescent nanomaterials are used in a number

of applications such as displays solid state lighting solar cells long afterglow dosimetry theft prevention medical imaging phototherapy and quantum and gas sensing This book presents cutting edge research from experts in the field of synthesis and characterization of luminescent nanomaterials and their potential applications It covers interesting topics in semiconductor physics photochemistry physical chemistry materials science and luminescence and will be useful for beginners and advanced researchers interested in this field

Borate Phosphors S. K. Omanwar, R. P. Sonekar, N. S. Bajaj, 2022-05-11 Borate based phosphors have attracted much attention due to their high optical stability low cost synthesis via conventional and non conventional methods and resulting technology to be environmentally friendly This book discusses the structural and chemical parameters of borates as a phosphor including suitable synthesis methods and proper characterization of materials Further it includes applications of borate materials such as photoluminescence UV application UVU application photo therapy application and radiological applications Features Provides information on borate phosphors and their structure Aids selection of proper structural and functional borates used in applications based on phosphor technology Discloses the modification in properties of borate functional group upon mixing or substitution with other metallic functional groups Discusses biological applications such as photo thermal heating based therapy temperature sensors imaging and diagnosis Includes current trends and innovations limitations and challenges prospects and scope in each chapter This book is aimed at researchers and graduate students in inorganic materials luminescent optical materials materials science engineering and physics

Solid-State Sensors Ambarish Paul, Mitradip Bhattacharjee, Ravinder Dahiya, 2023-10-06 Solid State Sensors A thorough and up to date introduction to solid state sensors materials fabrication processes and applications Solid State Sensors provides a comprehensive introduction to the field covering fundamental principles underlying theories sensor materials fabrication technologies current and possible future applications and more Presented in a clear and accessible format this reader friendly textbook describes the fundamentals and classification of all major types of solid state sensors including piezoresistive capacitive thermometric optical bio chemical magnetic and acoustic based sensors Throughout the text the authors offer insight into how different solid state methods complement each other as well as their respective advantages and disadvantages in relation to specific devices and a variety of state of the art applications Detailed yet concise chapters include numerous visual illustrations and comparative tables of different subtypes of sensors for a given application With in depth discussion of recent developments current research and key challenges in the field of solid state sensors this volume Describes solid state sensing parameters and their importance in sensor characterization Explores possible future applications and breakthroughs in associated fields of research Covers the fundamental principles and relevant equations of sensing phenomena Discusses promising smart materials that have the potential for sensing applications Includes an overview of the history classification and terminology of sensors With well balanced coverage of the fundamentals of sensor design current and emerging applications and the most recent research

developments in the field Solid State Sensors is an excellent textbook for advanced students and professionals in disciplines such as Electrical and Electronics Engineering Physics Chemistry and Biomedical Engineering *Cultural Heritage* Hani Hayajneh ,2023 Human heritage is an endless mine of knowledge skills ethos and accomplishments which visualize and examine the power of human creativity and innovation throughout the history The contributions cast an insight into the human psyche to perceive its Weltanschauung and its way of thinking and making artefacts associated with knowledge existence and identity in the context of other existing systems in the world They demonstrate the diversity of topics as well as the state of the art of interdisciplinary approaches that participants of the Humboldt Kolleg use in their research on cultural heritage and confirm once again that the strengths of the Alexander von Humboldt Network should be celebrated and honoured The present volume invites us to seek more novel research approaches that aim towards an understanding of the complex nature of human inheritance **Spectroscopy for Materials Characterization** Simonpietro Agnello,2021-09-08 SPECTROSCOPY FOR MATERIALS CHARACTERIZATION Learn foundational and advanced spectroscopy techniques from leading researchers in physics chemistry surface science and nanoscience In Spectroscopy for Materials Characterization accomplished researcher Simonpietro Agnello delivers a practical and accessible compilation of various spectroscopy techniques taught and used to today The book offers a wide ranging approach taught by leading researchers working in physics chemistry surface science and nanoscience It is ideal for both new students and advanced researchers studying and working with spectroscopy Topics such as confocal and two photon spectroscopy as well as infrared absorption and Raman and micro Raman spectroscopy are discussed as are thermally stimulated luminescence and spectroscopic studies of radiation effects on optical materials Each chapter includes a basic introduction to the theory necessary to understand a specific technique details about the characteristic instrumental features and apparatuses used including tips for the appropriate arrangement of a typical experiment and a reproducible case study that shows the discussed techniques used in a real laboratory Readers will benefit from the inclusion of Complete and practical case studies at the conclusion of each chapter to highlight the concepts and techniques discussed in the material Citations of additional resources ideal for further study A thorough introduction to the basic aspects of radiation matter interaction in the visible ultraviolet range and the fundamentals of absorption and emission A rigorous exploration of time resolved spectroscopy at the nanosecond and femtosecond intervals Perfect for Master and Ph D students and researchers in physics chemistry engineering and biology Spectroscopy for Materials Characterization will also earn a place in the libraries of materials science researchers and students seeking a one stop reference to basic and advanced spectroscopy techniques *Phosphors for Radiation Detectors* Takayuki Yanagida,Masanori Koshimizu,2022-02-02 Phosphors for Radiation Detector Phosphors for Radiation Detectors Discover a comprehensive overview of luminescence phosphors for radiation detection In Phosphors for Radiation Detection accomplished researchers Takayuki Yanagida and Masanori Koshimizu deliver a state of the art exploration of the use of

phosphors in radiation detection The internationally recognized contributors discuss the fundamental physics and detector functions associated with the technology with a focus on real world applications The book discusses all forms of luminescence phosphors for radiation detection used in a variety of fields including medicine security resource exploration environmental monitoring and high energy physics Readers will discover discussions of dosimeter materials including thermally stimulated luminescent materials optically stimulated luminescent materials and radiophotoluminescence materials The book also covers transparent ceramics and glasses and a broad range of devices used in this area Phosphors for Radiation Detection also includes Thorough introductions to ionizing radiation induced luminescence organic scintillators and inorganic oxide scintillators Comprehensive explorations of luminescent materials including discussions of materials synthesis and their use in gamma ray neutron and charged particle detection Practical discussions of semiconductor scintillators including treatments of organic inorganic layered perovskite materials for scintillation detectors In depth examinations of thermally stimulated luminescent materials including discussions of the dosimetric properties for photons charged particles and neutrons Relevant for research physicists materials scientists and electrical engineers Phosphors for Radiation Detection is an also an indispensable resource for postgraduate and senior undergraduate students working in detection physics

Unraveling Thermoluminescence C M Sunta, 2014-07-15 The book is essentially about the theoretical aspects of thermoluminescence TL It is structured and written in a manner which will specially be of interest to the fresh undergraduate students and young researchers planning to take up work in the field of thermoluminescence It is arranged into seven chapters starting with the historical growth of the subject of TL and an overview of the luminescence phenomena A Physical model involving thermally disconnected deep traps is specially described Using this model expressions are derived for the TL intensity growth curve the supralinearity factor and the pre dose sensitization factor A new factor called the sensitization factor is introduced which co relates the supralinearity and the pre dose sensitization factors Dealing with the theoretical models of TL limitations of the general order GO kinetics and the mixed order kinetics models are specially brought out Due to the lacunae of GO model the determination of activation energy becomes subject to error when GO model is applied to the experimental TL glow curves Satisfying the quasi equilibrium QE condition is essential for the validity of analytical models of TL A new method is given to ascertain if QE condition is satisfied in an experimental glow curve The book assumes a basic knowledge of physics and mathematics at an undergraduate level and takes the reader to the results at the cutting edge of understanding of the subject in an easy to understand manner

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