

The Supercontinuum Laser Source Fundamentals With Updated References

Ultrashort laser pulses with durations in the femtosecond range up to a few picoseconds provide a unique method for precise materials processing or medical applications. Paired with the recent developments in ultrashort pulse lasers, this technology is finding its way into various application fields. The book gives a comprehensive overview of the principles and applications of ultrashort pulse lasers, especially applied to medicine and production technology. Recent advances in laser technology are discussed in detail. This covers the development of reliable and cheap low power laser sources as well as high average power ultrashort pulse lasers for large scale manufacturing. The fundamentals of laser-matter-interaction as well as processing strategies and the required system technology are discussed for these laser sources with respect to precise materials processing. Finally, different applications within medicine, measurement technology or materials processing are highlighted.

This book represents a unique collection of the latest developments in the rapidly developing world of semiconductor laser diode technology and applications. An international group of distinguished contributors have covered particular aspects and the book includes optimization of semiconductor laser diode parameters for fascinating applications. This collection of chapters will be of considerable interest to engineers, scientists, technologists and physicists working in research and development in the field of semiconductor laser diode, as well as to young researchers who are at the beginning of their career.

This new resource provides an insight into the physical principles of the device technology that underpins many laser-based military systems in one form or another. From this knowledge a deeper understanding of the fundamental requirements and the potential performance, as well as limitations of such systems may be assessed, given the appropriate operational parameters. Engineers and students are provided with practical advice on how to evaluate laser devices and systems, operate them safely, and train with them.

Covers modern photonics accessibly and discusses the basic physical principles underlying all the applications and technology of photonics. This volume covers the basic physical principles underlying the technology and all applications of photonics from statistical optics to quantum optics. The topics discussed in this volume are: Photons in perspective; Coherence and Statistical Optics; Complex Light and Singular Optics; Electrodynamics of Dielectric Media; Fast and slow Light; Holography; Multiphoton Processes; Optical Angular Momentum; Optical Forces, Trapping and Manipulation; Polarization States; Quantum Electrodynamics; Quantum Information and Computing; Quantum Optics; Resonance Energy Transfer; Surface Optics; Ultrafast Pulse Phenomena. Comprehensive and accessible coverage of the whole of modern photonics Emphasizes processes and applications that specifically exploit photon attributes of light Deals with the rapidly advancing area of modern optics Chapters are written by top scientists in their field Written for the graduate level student in physical sciences; Industrial and academic researchers in photonics, graduate students in the area; College lecturers, educators, policymakers, consultants, Scientific and technical libraries, government laboratories, NIH.

An introduction to the fundamentals of lasers and pulsed optics, teaching readers the physics behind short and ultrashort laser pulses, and how to manipulate and measure them. Additionally, the text presents experiments and discusses the spectroscopic implications. This well-rounded book provides an up-to-date insight into one of the most exciting fields of laser physics.

In today's world, the range of technologies with the potential to threaten the security of U.S. military forces is extremely broad. These include developments in explosive materials, sensors, control systems, robotics, satellite systems, and computing power, to name just a few. Such technologies have not only enhanced the capabilities of U.S. military forces, but also offer enhanced offensive capabilities to potential adversaries - either directly through the development of more sophisticated weapons, or more indirectly through opportunities for interrupting the function of defensive U.S. military systems. Passive and active electro-optical (EO) sensing technologies are prime examples. Laser Radar considers the potential of active EO technologies to create surprise; i.e., systems that use a source of visible or infrared light to interrogate a target in combination with sensitive detectors and processors to analyze the returned light. The addition of an interrogating light source to the system adds rich new phenomenologies that enable new capabilities to be explored. This report evaluates the fundamental, physical limits to active EO sensor technologies with potential military utility; identifies key technologies that may help overcome the impediments within a 5-10 year timeframe; considers the pros and cons of implementing each existing or emerging technology; and evaluates the potential uses of active EO sensing technologies, including 3D mapping and multi-discriminate laser radar technologies.

Guided Wave Optics and Photonic Devices introduces readers to a broad cross-section of topics in this area, from the basics of guided wave optics and nonlinear optics to biophotonics. The book is inspired by and expands on lectures delivered by distinguished speakers at a three-week school on guided wave optics and devices organized at the CSIR-Central Glass and Ceramic Research Institute in Kolkata in 2011. An Introduction to Guided Wave Optics and Photonic Devices: Principles, Applications, and Future Directions The book discusses the concept of modes in a guided medium from first principles, emphasizing the importance of dispersion properties in optical fibers. It describes fabrication and characterization techniques of rare-earth-doped optical fibers for amplifiers and lasers, with an eye to future applications. Avoiding complex mathematical formalism, it also presents the basic theory and operational principles of fiber amplifiers and lasers. The book examines techniques for writing fiber Bragg gratings, which are of particular interest for smart sensing applications. A chapter focuses on the fundamental principles of Fourier optics and its implementation in guided wave optics. In addition, the book explains the critical phenomena of soliton dynamics and supercontinuum generation in photonic crystal fiber, including its fabrication process and characteristics. It also looks at plasmonics in guided media and nonlinearity in stratified media—both key areas for future research. The last chapter explores the importance of lasers in biophotonic applications. Written by experts engaged in teaching, research, and development in optics and photonics, this reference brings together fundamentals and recent advances in one volume. It offers a valuable overview of the field for students and researchers alike and identifies directions for future research in guided wave and photonic device technology.

Sebastian Uhlig presents the first experimental investigation of self-organized surface structures (LIPSS) generated by ablation from different (semiconductor and metallic) targets with an ultrafast white-light continuum (WLC) spreading in wavelength from 400-750 nm. The main goal is to study the possibility of LIPSS formation upon irradiation with an incoherent and polychromatic light source (e.g. the WLC) in order to discriminate between the two debated formation scenarios. The generation of a suitable WLC in terms of sufficient white-light pulse energy, broad spectral bandwidth, and low spatial coherence for the LIPSS generation, as well as the characterization of this WLC are additional important objectives of this work.

This textbook provides an introductory presentation of all types of lasers. It contains a general description of the laser, a theoretical treatment and a characterization of its operation as it deals with gas, solid state, free-electron and semiconductor lasers. This expanded and updated second edition of the book presents a description of the dynamics of free-electron laser oscillation using a model introduced in the first edition that allows a reader to understand basic properties of a free-electron laser and makes the difference to "conventional" lasers. The discussions and the treatment of equations are presented in a way that a reader can immediately follow. The book addresses graduate and undergraduate students in science and engineering, featuring problems with solutions and over 400 illustrations.

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.

This book introduces senior-level and postgraduate students to the principles and applications of biophotonics. It also serves as a valuable reference resource or as a short-course textbook for practicing physicians, clinicians, biomedical researchers, healthcare professionals, and biomedical engineers and technicians dealing with the design, development, and application of photonics components and instrumentation to biophotonics issues. The topics include the fundamentals of optics and photonics, the optical properties of biological tissues, light-tissue interactions, microscopy for visualizing tissue components, spectroscopy for optically analyzing the properties of tissue, and optical biomedical imaging. It also describes tools and techniques such as laser and LED optical sources, photodetectors, optical fibers, bioluminescent probes for labeling cells, optical-based biosensors, surface plasmon resonance, and lab-on-a-chip technologies. Among the applications are optical coherence tomography (OCT), optical imaging modalities, photodynamic therapy (PDT), photobiostimulation or low-level light therapy (LLLT), diverse microscopic and spectroscopic techniques, tissue characterization, laser tissue ablation, optical trapping, and optogenetics. Worked examples further explain the material and how it can be applied to practical designs, and the homework problems help test readers' understanding of the text.

Code-division multiple access (CDMA) technology has been widely adopted in cell phones. Its astonishing success has led many to evaluate the promise of this technology for optical networks. This field has come to be known as Optical CDMA (OCDMA). Surveying the field from its infancy to the current state, *Optical Code Division Multiple Access: Fundamentals and Applications* offers the first comprehensive treatment of OCDMA from technology to systems. The book opens with a historical perspective, demonstrating the growth and development of the technologies that would eventually evolve into today's optical networks. Building on this background, the discussion moves to coherent and incoherent optical CDMA coding techniques and performance analysis of these codes in fiber optic transmission systems. Individual chapters provide detailed examinations of fiber Bragg grating (FBG) technology including theory, design, and applications; coherent OCDMA systems; and incoherent OCDMA systems. Turning to implementation, the book includes hybrid multiplexing techniques along with system examples and conversion techniques to connect networks that use different multiplexing platforms, state-of-the-art integration technologies, OCDMA network security issues, and OCDMA network architectures and applications, including a look at possible future directions. Featuring contributions from a team of international experts led by a pioneer in optical technology, *Optical Code Division Multiple Access: Fundamentals and Applications* places the concepts, techniques, and technologies in clear focus for anyone working to build next-generation optical networks.

In this volume, recent contributions on coherence provide a useful perspective on the diversity of various coherent sources of emission and coherent related phenomena of current interest. These papers provide a preamble for a larger collection of contributions on ultrashort pulse laser generation and ultrashort pulse laser phenomena. Papers on ultrashort pulse phenomena include works on few cycle pulses, high-power generation, propagation in various media, to various applications of current interest. Undoubtedly, *Coherence and Ultrashort Pulse Emission* offers a rich and practical perspective on this rapidly evolving field.

The year 2015 was designated by the United Nations General Assembly as the Year of Light and Light-based Technologies, and also marks the anniversaries of a number of significant historical events related to light. In 1015, Ibn Al-Haytham published his book of optics; in 1815, Fresnel first proposed the notion that light is actually a wave; James Clerk Maxwell then firmly established this concept with his electromagnetic theory of light propagation; and Einstein announced his discovery of the photoelectric effect, demonstrating that light is made of photons in 1905, followed in 1915 by his general theory of relativity, in which light plays a central role. This book presents lectures from the International School of Physics Enrico Fermi summer school: *Frontiers in Modern Optics*, held in Varenna, Italy, in June and July 2014. The school attempted to give a broad and modern overview of the field of optics in a series of lectures addressing ongoing topics of research. Subject areas include: nonlinear optics; light as an investigation tool in modern physics; and detection and imaging. A unique feature of the book is that each chapter has been prepared as a collaborative effort between students at the school and lecturers. This approach has proved very successful and may well provide a model for the future.

Ultrafast photonics has become an interdisciplinary topic of high international research interest because of the spectacular development of compact and efficient lasers producing optical pulses with durations in the femtosecond time domain. Present day long-haul telecommunications systems are almost entirely based on the transmission of short burst

Biophotonics involves understanding how light interacts with biological matter, from molecules and cells, to tissues and even whole organisms. Light can be used to probe biomolecular events, such as gene expression and protein-protein interaction, with impressively high sensitivity and specificity. The spatial and temporal distribution of biochemical constituents can also be visualized with light and, thus, the corresponding physiological dynamics in living cells, tissues, and organisms in real time. Light can also be used to alter the properties and behaviors of biological matter, such as to damage cancerous cells by laser surgery or therapy, and manipulate the neuronal signaling in a brain network. Fueled by the innovations in photonic technologies in the past half century, biophotonics continues to play a ubiquitous role in revolutionizing basic life science studies as well as biomedical diagnostics and therapies. Advancements in biophotonics in the past few decades can be seen not only in biochemistry and cell/molecular biology, but also in numerous preclinical applications. Researchers around the world are searching for ways to bring biophotonic technologies into real clinical practices, particularly cellular and molecular optical imaging. Meanwhile, emerging technologies, such as laser nanosurgery and nanoplasmonics, have created new insights for understanding, monitoring, and even curing diseases on a molecular basis. This book presents the essential basics of optics and biophotonics to newcomers (senior undergraduates or postgraduate researchers) who are interested in this multidisciplinary research field. With stellar contributions from leading experts, the book highlights the major advancements in preclinical diagnostics using optical microscopy and spectroscopy, including multiphoton microscopy, super-resolution microscopy, and endomicroscopy. It also introduces a number of emerging techniques and toolsets for biophotonics applications, such as nanoplasmonics, microresonators for molecular detection, and subcellular optical nanosurgery.

In this age of the photon, information optics and photonics represent the key technologies to sustain our knowledge-based society. New concepts in classical and quantum-entangled light and coherent matter and novel materials and processes have led to remarkable advances in today's information science and technology. This volume contains a collection of 32 chapters from internationally leading scientists and research groups on a variety of topics in information optics and photonics, including the 2003-2006 ICO Prize winners. The chapters are divided into 7 sections: Beam Optics; Laser Photonics and Components; Electromagnetic Coherence; Imaging, Microscopy, Holography, and Materials; Photonics Processing; Quantum Information and Matter; and, Communications and Networks.

This book is a contemporary overview of selected topics in fiber optics. It focuses on the latest research results on light wave manipulation using nonlinear optical fibers, with the aim of capturing some of the most innovative developments on

this topic. The book's scope covers both fundamentals and applications from both theoretical and experimental perspectives, with topics including linear and nonlinear effects, pulse propagation phenomena and pulse shaping, solitons and rogue waves, novel optical fibers, supercontinuum generation, polarisation management, optical signal processing, fiber lasers, optical wave turbulence, light propagation in disordered fiber media and slow and fast light. With contributions from leading-edge scientists in the field of nonlinear photonics and fiber optics, they offer an overview of the latest advances in their own research area. The listing of recent research papers at the end of each chapter is useful for researchers using the book as a reference. As the book addresses fundamental and practical photonics problems, it will also be of interest to, and benefit, broader academic communities, including areas such as nonlinear science, applied mathematics and physics and optical engineering. It offers the reader a wide and critical overview of the state-of-the-art within this practical – as well as fundamentally important and interesting – area of modern science, providing a useful reference which will encourage further research and advances in the field. Offers a study of various phenomena encountered by the manipulation of fundamental properties of light, such as the intensity profile, phase and state of polarisation, in optical fibers, as well as the new applications already made possible by the fiber-optic light wave manipulation technology Describes research results on light wave manipulation with particular emphasis on pulse shaping using nonlinear optics and guided waves, offering the most innovative developments in this area The editors are leading experts in the field and have sourced contributions from leading-edge scientists and their colleagues in the field of nonlinear photonics and fiber optics, providing an overview of the latest advances in their own research area This book gives the readers an introduction to experimental and theoretical knowledge acquired by large-scale laser laboratories that are dealing with extra-high peak power and ultrashort laser pulses for research of terawatt (TW), petawatt (PW), or near-future exawatt (EW) laser interactions, for soft X-ray sources, for acceleration of particles, or for generation of hot dense thermal plasma for the laser fusion. The other part of this book is dealing with the small-scale laser laboratories that are using for its research on commercial sources of laser radiation, nanosecond (ns), picosecond (ps), or femtosecond (fs) laser pulses, either for basic research or for more advanced applications. This book is divided into six main sections dealing with short and ultrashort laser pulses, laser-produced soft X-ray sources, large-scale high-power laser systems, free-electron lasers, fiber-based sources of short optical pulse, and applications of short pulse lasers. In each chapter readers can find fascinating topics related to the high energy and/or short pulse laser technique. Individual chapters should serve the broad spectrum of readers of different expertise, layman, undergraduate and postgraduate students, scientists, and engineers, who may in this book find easily explained fundamentals as well as advanced principles of particular subjects related to these phenomena.

Selected, peer reviewed papers from the 2013 2nd International Conference on Micro Nano Devices, Structure and Computing Systems (MNDSCS 2013), January 23-24, 2013, Shenzhen, China

Over the last century, numerous optical techniques have been developed to characterize materials, giving insight into their optical, electronic, magnetic, and structural properties and elucidating such diverse phenomena as high-temperature superconductivity and protein folding. Optical Techniques for Solid-State Materials Characterization provides detailed descriptions of basic and advanced optical techniques commonly used to study materials, from the simple to the complex. The book explains how to use these techniques to acquire, analyze, and interpret data for gaining insight into material properties. With chapters written by pioneering experts in various optical techniques, the text first provides background on light–matter interactions, semiconductors, and metals before discussing linear, time-integrated optical experiments for measuring basic material properties, such as Fourier transform infrared spectroscopy, photoluminescence, and Raman scattering. The next section begins with a description of ultrashort pulse generation and carrier dynamics in semiconductors and metals. The book then discusses time-resolved optical techniques, such as pump–probe spectroscopy, terahertz spectroscopy, and magneto-optical spectroscopy. The subsequent section describes spatially resolved optical spectroscopy, including conventional optical microscopy and micro-optical and near-field scanning techniques. The book concludes with an overview of more advanced, emerging optical techniques, such as ultrafast x-ray and electron diffraction, ultrafast photoemission spectroscopy, and time-resolved optical microscopy. As optical techniques are among the first applied when studying new systems with novel properties, the information presented in this comprehensive reference will only grow in importance. By supplying clear, detailed explanations of these techniques, the book enables researchers to readily implement them and acquire new insights into the materials they study. CRC Press Authors Speak Rohit P. Prasankumar speaks about his book. Watch the Video

X-Ray Lasers 2004 comprises invited, contributed, and poster papers presented at the 9th International Conference on X-Ray Lasers (ICXRL2004) held in Beijing in May 2004. Some 120 participants from 13 countries and regions met in Beijing to compare results and exchange views on future developments in x-ray lasers and related fields. The book covers the following topics: overviews of x-ray lasers research, collisionally pumped x-ray lasers, capillary discharge-pumped x-ray lasers, OFI and photo-pumped x-ray lasers, high-order harmonics XUV radiation, grazing incidence pumping x-ray lasers, theory and simulations of x-ray lasers and plasma media, free-electron lasers and accelerator-based x-ray sources, alternative pumping schemes for x-ray lasers, applications of x-ray lasers and other bright x-ray sources, x-ray optics and instrumentation, investigations of x-ray laser media, and developments of x-ray laser drivers. X-Ray Lasers 2004 provides not only an overview and an up-to-date progress report on this fast moving field, but also important reference material on which future work can be built.

The present book focuses on recent advances methods and applications in photovoltaic (PV) systems. The book is divided into two parts: the first part deals with some theoretical, simulation and experiments on solar cells, including efficiency improvement, new materials and behavior performances. While the second part of the book devoted mainly on the application of advanced methods in PV systems, including advanced control, FPGA implementation, output power

forecasting based artificial intelligence technique (AI), high PV penetration, reconfigurable PV architectures and fault detection and diagnosis based AI. The authors of the book trying to show to readers more details about some theoretical methods and applications in solar cells and PV systems (eg. advanced algorithms for control, optimization, power forecasting, monitoring and fault diagnosis methods). The applications are mainly carried out in different laboratories and location around the world as projects (Algeria, KSA, Turkey, Morocco, Italy and France). The book will be addressed to scientists, academics, researchers and PhD students working in this topic. The book will help readers to understand some applications including control, forecasting, monitoring, fault diagnosis of photovoltaic plants, as well as in solar cells such as behavior performances and efficiency improvement. It could be also be used as a reference and help industry sectors interested by prototype development.

Presenting a blend of applied and fundamental research in highly interdisciplinary subjects of rapidly developing areas, this book contains contributions on the frontiers and hot topics of laser physics, laser technology and laser engineering, and covers a wide range of laser topics, from all-optical signal processing and chaotic optical communication to production of superwicking surfaces, correction of extremely high-power beams, and generation of ultrabroadband spectra. It presents both review-type contributions and well researched and documented case studies, and is intended for graduate students, young scientist, and emeritus scientist working/studying in laser physics, optoelectronics, optics, photonics, and adjacent areas. The book contains both experimental and theoretical studies, as well as combinations of these two, which is known to be a most useful and interesting form of reporting scientific results, allowing students to really learn from each contribution. The book contains over 130 illustrations.

This book provides a comprehensive overview of laser sources and their applications in various fields of science, industry, and technology. After an introduction to the basics of laser physics, different laser types and materials for lasers are summarized in the context of a historical survey, outlining the evolution of the laser over the past five decades. This includes, amongst other aspects, gas lasers, excimer lasers, the wide range of solid-state and semiconductor lasers, and femtosecond and other pulsed lasers where particular attention is paid to high-power sources. Subsequent chapters address related topics such as laser modulation and nonlinear frequency conversion. In closing, the enormous importance of the laser is demonstrated by highlighting its current applications in everyday life and its potential for future developments. Typical applications in advanced material processing, medicine and biophotonics as well as plasma and X-ray generation for nanoscale lithography are discussed. The book provides broad and topical coverage of laser photonics and opto-electronics, focusing on significant findings and recent advances rather than in-depth theoretical studies. Thus, it is intended not only for university students and engineers, but also for scientists and professionals applying lasers in biomedicine, material processing and everyday consumer products. Further, it represents essential reading for engineers using or developing high-power lasers for scientific or industrial applications.

This book presents the underlying physical picture and an overview of the state of the art of femtosecond supercontinuum generation in various transparent solid-state media, ranging from wide-bandgap dielectrics to semiconductor materials, and across various parts of the optical spectrum, from the ultraviolet to the mid-infrared. A particular emphasis is placed on the most recent experimental developments: multi-octave supercontinuum generation with pumping in the mid-infrared spectral range, spectral control, power and energy scaling of broadband radiation and the development of simple, flexible and robust pulse compression techniques, which deliver few optical cycle pulses and which could be readily implemented in a variety of modern ultrafast laser systems. The expected audience includes graduate students, professionals and scientists working in the field of laser-matter interactions and ultrafast nonlinear optics.

The field of ultrafast nonlinear optics is broad and multidisciplinary, and encompasses areas concerned with both the generation and measurement of ultrashort pulses of light, as well as those concerned with the applications of such pulses. Ultrashort pulses are extreme events – both in terms of their durations, and also the high peak powers which their short durations can facilitate. These extreme properties make them powerful experiment tools. On one hand, their ultrashort durations facilitate the probing and manipulation of matter on incredibly short timescales. On the other, their ultrashort durations can facilitate high peak powers which can drive highly nonlinear light-matter interaction processes. Ultrafast Nonlinear Optics covers a complete range of topics, both applied and fundamental in nature, within the area of ultrafast nonlinear optics. Chapters 1 to 4 are concerned with the generation and measurement of ultrashort pulses. Chapters 5 to 7 are concerned with fundamental applications of ultrashort pulses in metrology and quantum control. Chapters 8 and 9 are concerned with ultrafast nonlinear optics in optical fibres. Chapters 10 to 13 are concerned with the applications of ultrashort pulses in areas such as particle acceleration, microscopy, and micromachining. The chapters are aimed at graduate-student level and are intended to provide the student with an accessible, self-contained and comprehensive gateway into each subject.

Self-focusing has been an area of active scientific investigation for nearly 50 years. This book presents a comprehensive treatment of this topic and reviews both theoretical and experimental investigations of self-focusing. This book should be of interest to scientists and engineers working with lasers and their applications. From a practical point of view, self-focusing effects impose a limit on the power that can be transmitted through a material medium. Self-focusing also can reduce the threshold for the occurrence of other nonlinear optical processes. Self-focusing often leads to damage in optical materials and is a limiting factor in the design of high-power laser systems. But it can be harnessed for the design of useful devices such as optical power limiters and switches. At a formal level, the equations for self-focusing are equivalent to those describing Bose-Einstein condensates and certain aspects of plasma physics and hydrodynamics. There is thus a unifying theme between nonlinear optics and these other disciplines. One of the goals of this book is to connect the extensive early literature on self-focusing, filament-ation, self-trapping, and collapse with more recent studies aimed at issues such as self-focusing of fs pulses, white light generation, and the generation of filaments in air with lengths of more than 10 km. It also describes some modern advances in self-focusing theory including the influence of beam nonparaxiality on self-focusing collapse. This book consists of 24 chapters. Among them are three reprinted key landmark articles published earlier. It also contains the first publication of the 1964 paper that describes the first laboratory observation of self-focusing phenomena with photographic evidence.

The optical fiber based supercontinuum source has recently become a significant scientific and commercial success, with applications ranging from frequency comb production to advanced medical imaging. This one-of-a-kind book explains the theory of

fiber supercontinuum broadening, describes the diverse operational regimes and indicates principal areas of applications, making it a very important guide for researchers and graduate students. With contributions from major figures and groups who have pioneered research in this field, the book describes the historical development of the subject, provides a background to the associated nonlinear optical processes, treats the generation mechanisms from continuous wave to femtosecond pulse pump regimes and highlights the diverse applications. A full discussion of numerical methods and comprehensive computer code are also provided, enabling readers to confidently predict and model supercontinuum generation characteristics under realistic conditions.

The PUILS series delivers up-to-date reviews of progress in Ultrafast Intense Laser Science, a newly emerging interdisciplinary research field spanning atomic and molecular physics, molecular science, and optical science, which has been stimulated by the recent developments in ultrafast laser technologies. Each volume compiles peer-reviewed articles authored by researchers at the forefront of each their own subfields of UILS. Every chapter opens with an overview of the topics to be discussed, so that researchers unfamiliar to the subfield, as well as graduate students, can grasp the importance and attractions of the research topic at hand; these are followed by reports of cutting-edge discoveries. This tenth volume covers a broad range of topics from this interdisciplinary research field, focusing on electron scattering by atoms in intense laser fields, atoms and molecules in ultrashort pulsed EUV and X-ray light fields, filamentation induced by intense laser fields, and physics in super-intense laser fields. This new edition of a classic in the field has been expanded and enriched with new content and updated references. The book covers the fundamental principles and surveys research of current thinkers and experts in the field with updated references of the key breakthroughs over the past decade and a half.

This book is the first to provide a comprehensive introduction to the synthesis, optical properties, and photonics applications of tellurite glasses. The book begins with an overview of tellurite glasses, followed by expert chapters on synthesis, properties, and state-of-the-art applications ranging from laser glass, optical fibers, and optical communications through color tuning, plasmonics, supercontinuum generation, and other photonic devices. The book provides in-depth information on the the structural, linear, and non-linear optical properties of tellurite glasses and their implications for device development. Real-world examples give the reader valuable insight into the applications of tellurite glass. A detailed discussion of glass production methods, including raw materials and melting and refining oxide- and fluoro-tellurite glasses, is also included. The book features an extensive reference list for further reading. This highly readable and didactic text draws on chemical composition, glass science, quantum mechanics, and electrostatics. It is suitable for both advanced undergraduate and graduate students as well as practicing researchers.

Fundamentals of Light Microscopy and Electronic Imaging, Second Edition provides a coherent introduction to the principles and applications of the integrated optical microscope system, covering both theoretical and practical considerations. It expands and updates discussions of multi-spectral imaging, intensified digital cameras, signal colocalization, and uses of objectives, and offers guidance in the selection of microscopes and electronic cameras, as well as appropriate auxiliary optical systems and fluorescent tags. The book is divided into three sections covering optical principles in diffraction and image formation, basic modes of light microscopy, and components of modern electronic imaging systems and image processing operations. Each chapter introduces relevant theory, followed by descriptions of instrument alignment and image interpretation. This revision includes new chapters on live cell imaging, measurement of protein dynamics, deconvolution microscopy, and interference microscopy. PowerPoint slides of the figures as well as other supplementary materials for instructors are available at a companion website:

www.wiley.com/go/murphy/lightmicroscopy

Nonlinear optics is one of the most important fields of science and engineering, covering the generation, transmission, and control of the whole spectrum of laser pulses in solids, liquids, gases, and fibers. In turn, one of the most important ultrafast nonlinear optical processes is the supercontinuum generation - the production of intense ultrafast broadband "white light" pulses. This book is intended to fill the need of both scientists and graduate students for a single source book containing the most necessary and relevant material on supercontinuum technology. It reviews the basic principles, surveys research results, and presents the current thinking of experts in the supercontinuum field.

The wide range of topics covered make this book of interest to a diverse range of scientific communities.

Essential principles and practice of assay development The first comprehensive, integrated treatment of the subject, *Assay Development: Fundamentals and Practices* covers the essentials and techniques involved in carrying out an assay project in either a biotechnology/drug discovery setting or a platform setting. Rather than attempting comprehensive coverage of all assay development technologies, the book introduces the most widely used assay development technologies and illustrates the art of assay development through a few commonly encountered biological targets in assay development (e.g., proteases, kinases, ion channels, and G protein-coupled receptors). Just enough biological background for these biological targets is provided so that the reader can follow the logics of assay development. Chapters discuss: The basics of assay development, including foundational concepts and applications Commonly used instrumental methods for both biochemical assays and cell-based assays Assay strategies for protein binding and enzymatic activity Cell-based assays High-throughput screening An in-depth study of the now popular Caliper's off-chip kinase assay provides an instructive, real-world example of the assay development process.

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