

Introduction To Thz Wave Photonics

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Advances in Imaging and Sensing - Shuo Tang 2016-10-26

This introductory, yet in-depth, book explains the physical principles of electronic imaging and sensing and provides the reader with the information necessary to understand the design, operation, and practical applications of contemporary electronic imaging and sensing systems. The text has strong practical focus and contains examples of biomedical applications of optical electronic imaging and sensing. Each chapter draws upon the authors' extensive research, teaching, and industrial experience and provides a useful resource for undergraduate and graduate students, as well as a convenient reference for scientists and engineers working in the field of electronic imaging and sensing.

Terahertz Biomedical Science and Technology - Joo-Hiuk Son 2014-06-13

A number of applications including scientific spectroscopy, security screening, and medical imaging have benefitted from the development and utilization of new and emerging terahertz (THz) generation and detection techniques. Exploring recent discoveries and the advancements of biological behaviors through THz spectroscopy and imaging and the development of THz medical techniques, *Terahertz Biomedical Science and Technology* contains contributions from scientists and researchers in the terahertz biomedical field and is exclusively dedicated to new and emerging terahertz biomedical research and applications. This text offers an assessment of terahertz technology, and provides a compilation of fundamental biological studies conducted using terahertz waves. It introduces THz electromagnetic waves as a new tool for convergent studies, includes laser-based generation techniques and solid-state devices, contains a number of detectors, and discusses high-field generation methods. The material covers recent advancements in terahertz imaging for medical applications—most specifically in cancer diagnosis—reviewing the current status of the THz imaging technique for diagnosing cancers, and exploring the potential medical applications of THz radiation. It also considers the development of future medical applications using terahertz technology. Summarizes the recent progress made in THz waveguides, which are absolutely essential in the development of THz endoscopes. Describes the dynamic imaging of drug absorption in skin, exploiting the sensitivity of THz waves to pharmaceutical materials. Explores the principle and applications of THz molecular imaging techniques using nanoparticle probes. Scientists and engineers involved in biological research and medical applications using optical techniques, as well as graduate students and instructors in optics, physics, electrical engineering, biology, chemistry, and medicine can benefit from this text which highlights new and emerging biomedical studies utilizing novel THz wave techniques.

Isotopes in Nanoparticles - Jordi Llop 2016-03-30

Nanoparticles may be used in industrial processes, incorporated into consumer products, or applied as biomedical agents. Isotopic (radio)labeling is one of the most powerful methods for nanoparticle tracing in experimental studies. This book presents an introduction to some commonly used nanomaterials, describes various methods with which they may be radiolabeled, and provides illustrative examples of applications of the labeled particles. Finally, it discusses the use of nanomaterials in radiotherapy, the stable isotope labeling technique, and operational health and safety aspects related to the manipulation of nanoparticles in controlled areas. The book will appeal to anyone involved in nanotechnology, molecular imaging, radiochemistry, and nanomedicine.

Detectors and Sources for THz and IR - Fedir F. Sizov 2020-05-05

IR and THz technologies are widely used in security screening and surveillance, astronomy, spectroscopy, biomedicine, food and package inspection, detection of concealed weapons, vision through camouflage, etc. There are increasing demands for the fast transmission of large amounts of data. THz radiation penetrates dielectric materials like plastics, ceramics or cardboard allowing contact-free testing. Medical

imaging technologies can provide guidance for surgeons in delimiting the margins of tumors, help clinicians to visualize diseased areas, etc.

Keywords: THz and IR Detectors, THz and IR Sources, Superconducting Photon Detectors, Superconducting THz Detectors, Graphene-based Detectors, THz Sensors with Metamaterials, Photoconductive Antenna Detectors, Imaging, Communication, Spectroscopy, Sensing, Security Screening, Surveillance, Astronomy, Biomedicine, Food Inspection, Package Inspection, Concealed Weapons Detection, Transmission of Large Amounts of Data, Non-destructive Testing, Contact-free Testing, Medical Imaging Technologies.

Graphene-Based Materials - Subbiah Alwarappan 2013-10-14

Continuously studied since its discovery, graphene offers truly unique opportunities, because unlike most semiconductor systems, its 2D electronic states are not buried deep under the surface and it can be easily accessed directly by tunneling or by other local probes. An in-depth analysis of recent advances in graphene research, *Graphene-Based Materials: Science and Technology* discusses synthesis, properties, and their important applications in several fields. It examines methods for synthesis of graphene as well as surface characterization, properties, and application in biosensors and energy storage. The book begins with a brief review of the history of graphene and a discussion of its important properties. It then presents the different methods of graphene synthesis available and a brief overview of a few important characterization techniques that distinguishes graphene from its allotropes. The authors detail the applications of graphene in high-speed electronics, field-effect transistors, biosensors, gas-sensors, ultra-capacitors, photonics, optoelectronics, and drug delivery. They conclude with coverage of the toxicity properties of graphene and the future of graphene research. Written by experts with more than a decade of experience in nanotechnology research, the book incorporates the latest literature and findings in the field. Its emphasis on applications, especially biomedical/electrochemical and energy storage applications, sets it apart from other books on this topic. It provides those working in graphene and related materials a resource that helps initiate new thinking.

Terahertz Biomedical and Healthcare Technologies - Amit Banerjee 2020-08-11

Terahertz Biomedical and Healthcare Technologies: Materials to Devices reviews emerging advances in terahertz biomedical and healthcare technologies, including advances in fundamental materials science research, device design and fabrication, applications, and challenges and opportunities for improved performance. In addition, the improvement of materials, optical elements, and measuring techniques are also explored. Other sections cover the design and development of wide bandgap semiconductors for terahertz device applications, including their physics, device modeling, characterization and fabrication concepts. Finally, the book touches on potential defense, medical imaging, internet of things, and the machine learning applications of terahertz technologies. Reviews the latest advances in the fundamental and applied research of terahertz technologies, covering key topics in materials science, biomedical engineering and healthcare informatics. Includes applications of terahertz technologies in medical imaging, diagnosis and treatment. Provides readers with an understanding of the machine learning, pattern recognition, and data analytics research utilized to enhance the effectiveness of terahertz technologies.

Terahertz Technology - Borwen You 2022-08-17

Electromagnetic waves within a terahertz frequency range are becoming critical to investigating molecules, materials, and possible applications that are operated by both visible light and infrared rays. This book discusses sensing, imaging, and optoelectronic technologies of terahertz electromagnetic waves in theory and experiments. Most terahertz technologies can be explained by fundamentals of applied physics that have been demonstrated in other spectral ranges. However, the optoelectronic technology and corresponding configurations of imaging

and sensing techniques are so special for various terahertz material polarization waves, which are excited in solid-state media by high-peak power lasers and waveguide transportation. Thus, this book also specifies terahertz parameters and available technologies.

Modern Techniques of Spectroscopy - Dheeraj Kumar Singh
2021-05-15

The book highlights recent developments in the field of spectroscopy by providing the readers with an updated and high-level of overview. The focus of this book is on the introduction to concepts of modern spectroscopic techniques, recent technological innovations in this field, and current examples of applications to molecules and materials relevant for academia and industry. The book will be beneficial to researchers from various branches of science and technology, and is intended to point them to modern techniques, which might be useful for their specific problems. Spectroscopic techniques, that are discussed include, UV-Visible absorption spectroscopy, XPS, Raman spectroscopy, SERS, TERS, CARS, IR absorption spectroscopy, SFG, LIBS, Quantum cascade laser (QCL) spectroscopy, fluorescence spectroscopy, ellipsometry, cavity-enhanced absorption spectroscopy, such as cavity ring-down spectroscopy (CRDS) and evanescent wave-CRDS both in gas and condensed phases, time-resolved spectroscopy etc. Applications introduced in the different chapters demonstrates the usefulness of the spectroscopic techniques for the characterization of fundamental properties of molecules, e.g. in connection with environmental impact, bio-activity, or usefulness for pharmaceutical drugs, and materials important e.g. for nano-science, nuclear chemistry, or bio-applications. The book presents how spectroscopic techniques can help to better understand substances, which have also great impact on questions of social and economic relevance (environment, alternative energy, etc.).

Field-effect Self-mixing Terahertz Detectors - Jiandong Sun 2016-01-12

A comprehensive device model considering both spatial distributions of the terahertz field and the field-effect self-mixing factor has been constructed for the first time in the thesis. The author has found that it is the strongly localized terahertz field induced in a small fraction of the gated electron channel that plays an important role in the high responsivity. An AlGaIn/GaN-based high-electron-mobility transistor with a 2-micron-sized gate and integrated dipole antennas has been developed and can offer a noise-equivalent power as low as 40 pW/Hz^{1/2} at 900 GHz. By further reducing the gate length down to 0.2 micron, a noise-equivalent power of 6 pW/Hz^{1/2} has been achieved. This thesis provides detailed experimental techniques and device simulation for revealing the self-mixing mechanism including a scanning probe technique for evaluating the effectiveness of terahertz antennas. As such, the thesis could be served as a valuable introduction towards further development of high-sensitivity field-effect terahertz detectors for practical applications.

Laser and Photonic Systems - Shimon Y. Nof 2014-05-12

New, significant scientific discoveries in laser and photonic technologies, systems perspectives, and integrated design approaches can improve even further the impact in critical areas of challenge. Yet this knowledge is dispersed across several disciplines and research arenas. *Laser and Photonic Systems: Design and Integration* brings together a multidisciplinary group of experts to increase understanding of the ways in which systems perspectives may influence laser and photonic innovations and application integration. By bringing together chapters from leading scientists and technologists, industrial and systems engineers, and managers, the book stimulates new thinking that would bring a systems, network, and system-of-systems perspective to bear on laser and photonic systems applications. The chapters challenge you to explore opportunities for revolutionary and broader advancements. The authors emphasize the identification of emerging research and application frontiers where there are promising contributions to lasers, optics, and photonics applications in fields such as manufacturing, healthcare, security, and communications. The book contains insights from leading researchers, inventors, implementers, and innovators. It explains a variety of techniques, models, and technologies proven to work with laser and photonic systems, their development, design, and integration. Such systems are of growing interest to many organizations, given their promise and potential solutions of grand societal challenges. Lastly, the book helps you leverage the knowledge into exciting new frontiers of successful solutions.

Laser-Based Optical Detection of Explosives - Paul M. Pellegrino
2018-09-03

Laser-Based Optical Detection of Explosives offers a comprehensive review of past, present, and emerging laser-based methods for the

detection of a variety of explosives. This book: Considers laser propagation safety and explains standard test material preparation for standoff optical-based detection system evaluation Explores explosives detection using deep ultraviolet native fluorescence, Raman spectroscopy, laser-induced breakdown spectroscopy, reflectometry, and hyperspectral imaging Examines photodissociation followed by laser-induced fluorescence, photothermal methods, cavity-enhanced absorption spectrometry, and short-pulse laser-based techniques Describes the detection and recognition of explosives using terahertz-frequency spectroscopic techniques Each chapter is authored by a leading expert on the respective technology, and is structured to supply historical perspective, address current advantages and challenges, and discuss novel research and applications. Readers are left with an in-depth understanding and appreciation of each technology's capabilities and potential for standoff hazard detection.

Safety and Security Engineering VI - C.A. Brebbia 2015-05-06

This book contains the proceedings of the sixth in a series of interdisciplinary conferences on safety and security engineering. The papers from the biennial conference, first held in 2005, include the work of engineers, scientists, field researchers, managers and other specialists involved in one or more aspects of safety and security. The papers presented cover areas such as: Risk Analysis; Assessment and Management; System Safety Engineering; Incident Management; Information and Communication Security; Natural Disaster Management; Emergency Response; Critical Infrastructure Protection; Public Safety and Security; Human Factors; Transportation Safety and Security; Modelling and Experiments; Security Surveillance Systems.

Electronic Engineering and Information Science - Dongxing Wang
2015-06-11

The International Conference of Electronic Engineering and Information Science 2015 (ICEEIS 2015) was held on January 17-18, 2015, Harbin, China. This proceedings volume assembles papers from various researchers, engineers and educators engaged in the fields of electronic engineering and information science. The papers in this proceedings
Advanced Materials for Future Terahertz Devices, Circuits and Systems - Aritra Acharyya 2021-02-12

This book highlights the properties of advanced materials suitable for realizing THz devices, circuits and systems, and processing and fabrication technologies associated with those. It also discusses some measurement techniques exclusively effective for THz regime, newly explored materials and recently developed solid-state devices for efficient generation and detection of THz waves, potentiality of metamaterials for implementing THz passive circuits and bio-sensors, and finally the future of silicon as the base material of THz devices. The book especially focuses on the recent advancements and several research issues related to THz materials and devices; it also discusses theoretical, experimental, established, and validated empirical works on these topics.

Remote Sensing - Boris Escalante 2012-06-13

This dual conception of remote sensing brought us to the idea of preparing two different books; in addition to the first book which displays recent advances in remote sensing applications, this book is devoted to new techniques for data processing, sensors and platforms. We do not intend this book to cover all aspects of remote sensing techniques and platforms, since it would be an impossible task for a single volume. Instead, we have collected a number of high-quality, original and representative contributions in those areas.

Introduction to THz Wave Photonics - Xi-Cheng Zhang 2009-12-01

Terahertz (THz) radiation, which is electromagnetic radiation in a frequency interval from 0.3 to 10 THz (1 mm–30 μm wavelength), is the next frontier in science and technology. This band occupies a large portion of the electromagnetic spectrum between the infrared and microwave bands. Basic research, new initiatives, and developments in advanced sensing and imaging technology with regard to the THz band remain unexplored compared to the relatively well-developed science and technology in the microwave and optical frequencies. Historically, THz technologies were used mainly within the astronomy community for studying the background of cosmic far-infrared radiation, and by the laser-fusion community for the diagnostics of plasmas. Since the first demonstration of THz wave time-domain spectroscopy in the late 1980s, there has been a series of significant advances (particularly in recent years) as more intense THz sources and higher sensitivity detectors provide new opportunities for understanding the basic science in the THz frequency range.

Terahertz Spectroscopy - Jamal Uddin 2017-03-13

The terahertz regime of the electromagnetic spectrum was largely unexplored due to the lack of technology needed to generate and detect the radiation. However, in the last couple of decades, there has been a dramatic increase in tools needed to harness the radiation. This remarkable progress made in the development of terahertz sources, components, and detectors has resulted in an ever-increasing inquisitiveness of the applications of terahertz technology in a wide range of fields including medicine, pharmaceuticals, security, sensing, and quality assurance. This book, *Terahertz Spectroscopy - A Cutting Edge Technology*, presents an overview of the recent advances in terahertz technology and their application in a vast array of fields. The scientists and students are encouraged to read and share the content of this volume. The book also provides a good starting point for researchers who are new to the terahertz regime. The various chapters of the book have been written by renowned scientists in different parts of the world who are at the forefront of terahertz research fields. It is our (InTech publisher, editor, and authors) hope that this book will enhance knowledge and stimulate more interest and future research in terahertz technology.

Terahertz Antenna Technology for Imaging and Sensing Applications - Isha Malhotra 2021-05-11

This book covers terahertz antenna technology for imaging and sensing, along with its various applications. The authors discuss the use of terahertz frequency and photoconductive antenna technology for imaging applications, such as biological and bio-medical applications, non-destructive inspection of fabrics and plastics, analysis of hydration levels or detecting the presence of metallic components in samples, and detecting a variety of materials with unique spectral fingerprints in the terahertz frequency range, such as different types of explosives or several compounds used in the fabrication of medicines. Provides a comprehensive review of terahertz source and detector for imaging and sensing; Discusses photoconductive antenna technology for imaging and sensing; Presents modalities for improving the photoconductive dipole antenna performance for imaging and sensing; Explores applications in tomographic imaging, art conservation and the pharmaceutical and aerospace industries.

Terahertz Physics - R. A. Lewis 2012

Designed for independent learning, this is the first book for advanced undergraduate and graduate students in this exciting field.

Carbon - Tapan Gupta 2017-10-25

All living things contain carbon in some form, as it is the primary component of macromolecules including proteins, lipids, nucleic acids (RNA and DNA), and carbohydrates. As a matter of fact, it is the backbone of all organic (chemistry) compounds forming different kinds of bonds. Carbon: The Black, the Gray and the Transparent is not a complete scientific history of the material, but a book that describes key discoveries about this old faithful element while encouraging broader perspectives and approaches to its research due to its vast applications. All allotropes of carbon are described in this book, along with their properties, uses, and methods of procurement or manufacturing. Black carbon is represented by coal, gray carbon is represented by graphite, and transparent carbon is represented by diamond.

Characterization of Terahertz Emission from High Resistivity Fe-doped Bulk Ga_{0.69}In_{0.31}As Based Photoconducting Antennas - Suranjana Sengupta 2011-06-07

Terahertz science and technology is attracting great interest due to its application in a wide array of fields made possible by the development of new and improved terahertz radiation sources and detectors. This book focuses on the development and characterization of one such source - namely the semi-large aperture photoconducting (PC) antenna fabricated on Fe-doped bulk Ga_{0.69}In_{0.31}As substrate. The high ultrafast carrier mobility, high resistivity, and subpicosecond carrier lifetime along with low bandgap make Ga_{0.69}In_{0.31}As an excellent candidate for PC antenna based THz emitter that can be photoexcited by compact Yb-based multiwatt laser systems for high power THz emission. The research is aimed at evaluating the impact of physical properties of a semi-large aperture Ga_{0.69}In_{0.31}As PC antenna upon its THz generation efficiency, and is motivated by the ultimate goal of developing a high-power terahertz radiation source for time-domain terahertz spectroscopy and imaging systems.

Springer Handbook of Electronic and Photonic Materials - Safa Kasap 2017-10-04

The second, updated edition of this essential reference book provides a wealth of detail on a wide range of electronic and photonic materials, starting from fundamentals and building up to advanced topics and

applications. Its extensive coverage, with clear illustrations and applications, carefully selected chapter sequencing and logical flow, makes it very different from other electronic materials handbooks. It has been written by professionals in the field and instructors who teach the subject at a university or in corporate laboratories. The Springer Handbook of Electronic and Photonic Materials, second edition, includes practical applications used as examples, details of experimental techniques, useful tables that summarize equations, and, most importantly, properties of various materials, as well as an extensive glossary. Along with significant updates to the content and the references, the second edition includes a number of new chapters such as those covering novel materials and selected applications. This handbook is a valuable resource for graduate students, researchers and practicing professionals working in the area of electronic, optoelectronic and photonic materials.

Encyclopedia of Modern Optics - Bob D. Guenther 2018-02-14

The Encyclopedia of Modern Optics, Second Edition, provides a wide-ranging overview of the field, comprising authoritative reference articles for undergraduate and postgraduate students and those researching outside their area of expertise. Topics covered include classical and quantum optics, lasers, optical fibers and optical fiber systems, optical materials and light-emitting diodes (LEDs). Articles cover all subfields of optical physics and engineering, such as electro-optical design of modulators and detectors. This update contains contributions from international experts who discuss topics such as nano-photonics and plasmonics, optical interconnects, photonic crystals and 2D materials, such as graphene or hollow fibers. Other topics of note include solar energy, high efficiency LED's and their use in illumination, orbital angular momentum, quantum optics and information, metamaterials and transformation optics, high power fiber and UV fiber lasers, random lasers and bio-imaging. Addresses recent developments in the field and integrates concepts from fundamental physics with applications for manufacturing and engineering/design Provides a broad and interdisciplinary coverage of specialist areas Ensures that the material is appropriate for new researchers and those working in a new sub-field, as well as those in industry Thematically arranged and alphabetically indexed, with cross-references added to facilitate ease-of-use

Handbook of Terahertz Technologies - Ho-Jin Song 2015-04-15

Terahertz waves, which lie in the frequency range of 0.1–10 THz, have long been investigated in a few limited fields, such as astronomy, because of a lack of devices for their generation and detection. Several technical breakthroughs made over the last couple of decades now allow us to radiate and detect terahertz waves more easily, which has triggered the search for new uses of terahertz waves in many fields, such as bioscience, security, and information and communications technology. The book covers some of the technical breakthroughs in terms of device technologies. It discusses not only the theoretical details and typical features of the technology described, but also some issues and challenges related to it. In addition, it is shown what can actually be done with the terahertz-wave technologies by introducing several successful demonstrations, such as wireless communications, industrial uses, remote sensing, chemical analysis, and 2D/3D imaging.

Deep Imaging in Tissue and Biomedical Materials - Lingyan Shi 2017-03-16

The use of light for probing and imaging biomedical media is promising for the development of safe, noninvasive, and inexpensive clinical imaging modalities with diagnostic ability. The advent of ultrafast lasers has enabled applications of nonlinear optical processes, which allow deeper imaging in biological tissues with higher spatial resolution. This book provides an overview of emerging novel optical imaging techniques, Gaussian beam optics, light scattering, nonlinear optics, and nonlinear optical tomography of tissues and cells. It consists of pioneering works that employ different linear and nonlinear optical imaging techniques for deep tissue imaging, including the new applications of single- and multiphoton excitation fluorescence, Raman scattering, resonance Raman spectroscopy, second harmonic generation, stimulated Raman scattering gain and loss, coherent anti-Stokes Raman spectroscopy, and near-infrared and mid-infrared supercontinuum spectroscopy. The book is a comprehensive reference of emerging deep tissue imaging techniques for researchers and students working in various disciplines. *Frontiers In Electronics: Selected Papers From The Workshop On Frontiers In Electronics 2013 (Wofe-2013)* - Sorin Cristoloveanu 2014-12-15

This book brings together 11 invited papers from the Workshop on Frontiers in Electronics (WOFE) 2013 that took place at San Juan, Puerto

Rico, in December 2013. These articles present the ground-breaking works by world leading experts from CMOS and SOI, to wide-bandgap semiconductor technology, terahertz technology, and bioelectronics. WOFE is a bi-annual gathering of leading researchers from around the world, across multiple disciplines, to share their results and discuss key issues in the future development of microelectronics, photonics, and nanoelectronics. The focus of this volume includes topics ranging from advanced transistors: TFT, FinFET, TFET, HEMT to Nitride devices, as well as emerging technologies, devices and materials. This book will be a useful reference for scientists, engineers, researchers, and inventors looking for the future research and development direction of microelectronics, and the trends and technology underpinning these developments.

Optical MEMS, Nanophotonics, and Their Applications - Guangya Zhou 2017-12-14

This book covers device design fundamentals and system applications in optical MEMS and nanophotonics. Expert authors showcase examples of how fusion of nanoelectromechanical (NEMS) with nanophotonic elements is creating powerful new photonic devices and systems including MEMS micromirrors, MEMS tunable filters, MEMS-based adjustable lenses and apertures, NEMS-driven variable silicon nanowire waveguide couplers, and NEMS tunable photonic crystal nanocavities. The book also addresses system applications in laser scanning displays, endoscopic systems, space telescopes, optical telecommunication systems, and biomedical implantable systems. Presents efforts to scale down mechanical and photonic elements into the nano regime for enhanced performance, faster operational speed, greater bandwidth, and higher level of integration. Showcases the integration of MEMS and optical/photonic devices into real commercial products. Addresses applications in optical telecommunication, sensing, imaging, and biomedical systems. Prof. Vincent C. Lee is Associate Professor in the Department of Electrical and Computer Engineering, National University of Singapore. Prof. Guangya Zhou is Associate Professor in the Department of Mechanical Engineering at National University of Singapore.

Encyclopedia of Analytical Science - 2019-04-02

The third edition of the Encyclopedia of Analytical Science is a definitive collection of articles covering the latest technologies in application areas such as medicine, environmental science, food science and geology. Meticulously organized, clearly written and fully interdisciplinary, the Encyclopedia of Analytical Science provides foundational knowledge across the scope of modern analytical chemistry, linking fundamental topics with the latest methodologies. Articles will cover three broad areas: analytical techniques (e.g., mass spectrometry, liquid chromatography, atomic spectrometry); areas of application (e.g., forensic, environmental and clinical); and analytes (e.g., arsenic, nucleic acids and polycyclic aromatic hydrocarbons), providing a one-stop resource for analytical scientists. Offers readers a one-stop resource with access to information across the entire scope of modern analytical science. Presents articles split into three broad areas: analytical techniques, areas of application and analytes, creating an ideal resource for students, researchers and professionals. Provides concise and accessible information that is ideal for non-specialists and readers from undergraduate levels and higher.

Molecular and Laser Spectroscopy - V.P. Gupta 2020-07-10

Molecular and Laser Spectroscopy, Advances and Applications: Volume 2 gives students and researchers an up-to-date understanding of the fast-developing area of molecular and laser spectroscopy. This book covers basic principles and advances in several conventional as well as new and upcoming areas of molecular and laser spectroscopy, such as a wide range of applications in medical science, material science, standoff detection, defence and security, chemicals and pharmaceuticals, and environmental science. It covers the latest advancements, both in terms of techniques and applications, and highlights future projections. Editors V.P. Gupta and Yukihiro Ozaki have brought together eminent scientists in different areas of spectroscopy to develop specialized topics in conventional molecular spectroscopy (Cavity ringdown, Matrix Isolation, Intense THz, Far- and Deep- UV, Optogalvanic), linear and nonlinear laser spectroscopy (Rayleigh & Raman Scattering), Ultrafast Time-resolved spectroscopy, and medical applications of molecular spectroscopy. and advanced material found in research articles. This new volume expands upon the topics covered in the first volume for scientists to learn the latest techniques and put them to practical use in their work. Covers several areas of spectroscopy research and expands upon topics covered in the first volume. Includes exhaustive lists of research articles,

reviews, and books at the end of each chapter to further learning objectives. Uses illustrative examples of the varied applications to provide a practical guide to those interested in using molecular and laser spectroscopy tools in their research.

Handbook of Humidity Measurement, Volume 1 - Ghenadii Korotcenkov 2018-03-15

The first volume of The Handbook of Humidity Measurement focuses on the review of devices based on optical principles of measurement such as optical UV, fluorescence hygrometers, optical and fiber-optic sensors of various types. Numerous methods for monitoring the atmosphere have been developed in recent years, based on measuring the absorption of electromagnetic field in different spectral ranges. These methods, covering the optical (FTIR and Lidar techniques), as well as a microwave and THz ranges are discussed in detail in this volume. The role of humidity-sensitive materials in optical and fiber-optic sensors is also detailed. This volume describes the reasons for controlling the humidity, features of water and water vapors, and units used for humidity measurement.

Intracellular Delivery - Aleš Prokop 2011-05-26

This book features a special subsection of Nanomedicine, an application of nanotechnology to achieve breakthroughs in healthcare. It exploits the improved and often novel physical, chemical and biological properties of materials only existent at the nanometer scale. As a consequence of small scale, nanosystems in most cases are efficiently uptaken by cells and appear to act at the intracellular level. Nanotechnology has the potential to improve diagnosis, treatment and follow-up of diseases, and includes targeted drug delivery and regenerative medicine; it creates new tools and methods that impact significantly upon existing conservative practices. This volume is a collection of authoritative reviews. In the introductory section we define the field (intracellular delivery). Then, the fundamental routes of nanodelivery devices, cellular uptake, types of delivery devices, particularly in terms of localized cellular delivery, both for small drug molecules, macromolecular drugs and genes; at the academic and applied levels, are covered. The following section is dedicated to enhancing delivery via special targeting motifs followed by the introduction of different types of intracellular nanodelivery devices (e.g. a brief description of their chemistry) and ways of producing these different devices. Finally, we put special emphasis on particular disease states and on other biomedical applications, whilst diagnostic and sensing issues are also included. Intracellular delivery / therapy is a highly topical which will stir great interest. Intracellular delivery enables much more efficient drug delivery since the impact (on different organelles and sites) is intracellular as the drug is not supplied externally within the blood stream. There is great potential for targeted delivery with improved localized delivery and efficacy.

Methodologies and Applications for Analytical and Physical Chemistry - A. K. Haghi 2018-07-17

This volume presents an up-to-date review of modern materials and concepts, issues, and recent advances in analytical and physical chemistry. Distinguished scientists and engineers from key institutions worldwide have contributed chapters that provide a deep analysis of their particular subjects. The chapters discuss the composition and properties of complex materials as well as mixtures, processes, and the need for new and improved analytical technology.

Emerging Trends in Terahertz Solid-State Physics and Devices - Arindam Biswas 2020-03-20

This book highlights recent advances and applications in terahertz (THz) technology, addressing advanced topics such as THz biomedical imaging, pattern recognition and tomographic reconstruction for THz biomedical imaging by machine learning and artificial intelligence, THz imaging radars for autonomous vehicle applications, and THz imaging systems for security and surveillance. It also discusses theoretical, experimental, established and validated empirical work on these topics.

Principles of Terahertz Time-Domain Spectroscopy - Jean-Louis Coutaz 2018-12-07

Terahertz time-domain spectroscopy (THz-TDS) is a unique technique for characterizing the response of materials and devices in the far-infrared region of the electromagnetic spectrum. Based on the measurement of transmitted or reflected ultra-short electromagnetic pulses and on a Fourier-transform of the recorded waveforms, THz-TDS permits fast and precise determination of the permittivity or permeability of materials over a wide bandwidth. This book is devoted to the determination of this spectral response of samples from the recorded waveforms.

Advances in Sensors: Reviews, Vol. 6 - Sergey Yurish 2018-07-30

The Vol. 6 of this Book Series contains 21 chapters written by 94 contributors-experts from universities and research centres, from 21 countries: Argentina, Austria, Brazil, China, Czech Republic, Denmark, Finland, France, Germany, India, Italy, Japan, Mexico, Poland, Romania, Russia, Slovenia, Switzerland, Thailand, UK and USA. This volume is devoted to various chemical sensors (sensors for various gases, nucleic acids, organic compounds, nanosensors, etc.) and biosensors. This book ensures that our readers will stay at the cutting edge of the field and get the right and effective start point and road map for the further researches and developments. By this way, they will be able to save more time for productive research activity and eliminate routine work. With the unique combination of information in this volume, the 'Advances in Sensors: Reviews' Book Series will be of value for scientists and engineers in industry and at universities, to sensors developers, distributors, and end users.

Intelligent Electronics and Circuits - Mingbo Niu 2022-09-28

Intelligent electronics could shape future smart cities and promote initiatives on exploring brand-new integrated circuits, high-effective intelligent reconfigurable surfaces, nondestructive evaluation, terahertz (THz), ITS, 6G, medical and safety imaging, and signal filtering. This book presents mainstream principles, circuitry architectures, and a development roadmap for intelligent electronic systems. Its content ranges from theoretical basis to materials characteristics, and from featured advances to practical applications.

Terahertz Wireless Communication Components and System Technologies - Mohammed El Ghzaoui 2022-05-07

This book presents scientific and technological innovations and advancements already developed or under development in academia, industry, and research communities. It includes fundamental ideas and advancement in terahertz technology covering high intensity terahertz wave generation, THz detection, different modes of THz wave generation, THz modulation system, and terahertz propagation channel modeling. It highlights methodologies for the design of terahertz components and system technologies including emerging applications. The chapter contents are based on theoretical, methodological, well-established, and validated empirical work dealing with different topics in the terahertz domain. The book covers a very broad audience ranging from basic sciences to experts and learners in engineering and technology. It would be a good reference for advanced ideas and concepts in THz technology which will best suit microwave, biomedical, and electrical and communication engineers working towards next-generation technology.

Biomedical Photonics for Diabetes Research - Andrey Dunaev 2022-10-26

In 2021, over 537 million people worldwide were diagnosed with diabetes, according to the International Diabetes Federation and so the diagnosis, care and treatment of patients with diabetes mellitus have become one of the highest healthcare priorities. Biomedical photonics methods have been found to significantly improve and assist in the diagnosis of various disorders and complications arising from diabetes. These methods have also been widely used in various studies in the field of diabetes, including in the assessment of biochemical characteristics, metabolic processes, and microcirculation that are impaired in this disease. This book provides an introduction to methods of biomedical photonics. The chapters, written by world-leading experts, cover a wide range of issues, including the theoretical basis of different biophotonics methods and practical issues concerning the conduction of experimental

studies to diagnose disorders associated with diabetes. It provides a comprehensive summary of the recent advances in biomedical optics and photonics in the study of diabetes and related complications. This book will be of interest to biomedical physicists and researchers, in addition to practicing doctors and endocrinologists looking to explore new instrumental methods for monitoring the effectiveness of patient treatment. Features • The first collective book combining accumulated knowledge and experience in the field of diabetes research using biophotonics. • Contributions from leading experts in the field. • Combines the theoretical base of the described methods and approaches, as well as providing valuable practical guidance and the latest research from experimental studies.

Semiconductor Nanotechnology - Stephen M. Goodnick 2018-07-26

This book presents research dedicated to solving scientific and technological problems in many areas of electronics, photonics and renewable energy. Energy and information are interconnected and are essential elements for the development of human society. Transmission, processing and storage of information requires energy consumption, while the efficient use and access to new energy sources requires new information (ideas and expertise) and the design of novel systems such as photovoltaic devices, fuel cells and batteries. Semiconductor physics creates the knowledge base for the development of information (computers, cell phones, etc.) and energy (photovoltaic) technologies. The exchange of ideas and expertise between these two technologies is critical and expands beyond semiconductors. Continued progress in information and renewable energy technologies requires miniaturization of devices and reduction of costs, energy and material consumption. The latest generation of electronic devices is now approaching nanometer scale dimensions, new materials are being introduced into electronics manufacturing at an unprecedented rate, and alternative technologies to mainstream CMOS are evolving. Nanotechnology is widely accepted as a source of potential solutions in securing future progress for information and energy technologies. Semiconductor Nanotechnology features chapters that cover the following areas: atomic scale materials design, bio- and molecular electronics, high frequency electronics, fabrication of nanodevices, magnetic materials and spintronics, materials and processes for integrated and subwave optoelectronics, nanoCMOS, new materials for FETs and other devices, nanoelectronics system architecture, nano optics and lasers, non-silicon materials and devices, chemical and biosensors, quantum effects in devices, nano science and technology applications in the development of novel solar energy devices, and fuel cells and batteries.

THz for CBRN and Explosives Detection and Diagnosis - Mauro F. Pereira 2017-08-02

This work is intended to jointly address the development, realization and applications of emitters and detectors of terahertz (THz-0.3 THz up to 10 THz) and their application to diagnostics of CBRN effects and detection of explosives and CBRN. Hazardous substances typically exhibit rotational and vibrational transitions in this region, hence giving access to spectroscopic analysis of a large variety of molecules which play a key role in security as well as various other areas, e.g. air pollution, climate research, industrial process control, agriculture, food industry, workplace safety and medical diagnostics can be monitored by sensing and identifying them via THz (0.3 to 10 THz) and mid infrared (MIR-10 THz to 100 THz) absorption "finger prints". Most plastics, textiles and paper are nearly transparent for THz radiation.