



LASER-INDUCED FLUORESCENCE ❖ 2651

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INTRODUCTION

The discovery of the laser and its subsequent development have profoundly affected the course of experimental research in practically every area of science. The laser's unique capacity to deliver large amounts of energy within extraordinarily small ranges of spectral width and directionality has made possible many kinds of measurement that would otherwise have been quite impossible. Wavelength tunability has proved to be an especially important advance that has not only revolutionized spectroscopy but has also brought the full grandeur of spectroscopic detail into many new areas.

Applications of lasers to various aspects of chemistry, physics, and biology have been the subjects of several recent review articles and monographs (1-7). This article concentrates on a single technique, laser-induced fluorescence (LIF), as a tool for the detection of minute amounts of atoms or molecules in specific quantum states. Applications of LIF to purely spectroscopic questions are not covered unless there is some direct bearing on the main subject matter. The literature survey for this review was completed in January 1977.

Although LIF is still in its infancy as a means for studying molecular collisions, interest in this technique is growing rapidly. Dye lasers with spectral widths in the range 1-10 MHz, which have become commercially available, offer an appealing wealth of resolvable detail. Unlike many other high-resolution methods, LIF even affords a favorable efficiency for detection. Fairbank, Hänsch & Schawlow (8) have recently demonstrated the ability for quantitative detection of sodium atoms by LIF at densities as low as 10^2 atoms cm^{-3} . Intensity estimates for more usual conditions show that LIF compares well in detection efficiency with mass spectrometric detection (9). Densities in the range of 10^4 cm^{-3} have successfully been detected (10). As it may be expected that technology will advance in the laser field more rapidly than in competing means of detection, the trend of such comparisons is likely to favor LIF in the future.

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Biomedical Photonics Handbook, 3 Volume Set Tuan Vo-Dinh, 2014-07-29 This handbook presents the most recent technological advances and applications in the areas of biomedical photonics This second edition contains introductory material and covers the state of the art methods and instrumentation for biomedical photonic technologies It integrates interdisciplinary research and development critically needed for scientists engineers manufacturers teachers students and clinical providers to learn about the most recent advances and predicted trends in instrumentation and methods as well as clinical applications in important areas of biomedical photonics Extensive references are provided to enhance further study

Biotechnology Annual Review M. Raafat El-Gewely, 2006-08-08 Biotechnology is a diverse complex and rapidly evolving field Students and experienced researchers alike face the challenges of staying on top of developments in their field of specialty and maintaining a broader overview of the field as a whole Volumes containing competent reviews on a diverse range of topics in the field fulfill the dual role of broadening and updating biotechnologists knowledge The current volume is an excellent example of such a book The topics covered range from classical issues in biotechnology such as recent advances in all protein chromophore technology to topics that are focused on coencapsulation of hepatocytes and bone marrow cell The information presented in this book will therefore will be of great value to both experienced biotechnologists and biotechnologists in training Includes over 80 illustrations and photographs Discusses the recent developments in biodegradable synthetic polymers Offers a detailed discussion on emerging options in protein bioseparation *Annual Review of Nursing Research, Volume 32, 2014* Patricia Watts Kelley, Christine Kasper, PhD, RN, FAAN, 2014-09-23 Print CourseSmart *Macromolecular Characterization of Hydrocarbons for Sustainable Future* Uttam Kumar Bhui, 2021-03-10 This book discusses the macromolecular characterization of hydrocarbon components and their industrial applications for sustainable future development It provides efficient integrated solutions and feasible industrial applications for sustainable cleaner and greener future The book covers recent trends in the use of hydrocarbons such as crude oil coal and shale biomass and other carbon materials Various topics covered in this book include challenges in mature field redevelopment enhanced oil recovery optical characteristics of petroleum crudes surfactants brine solutions challenges and issues in processing hydrocarbons coal for future cleaner fuel and chemicals and biomass for fuels and chemicals The book is useful for the researchers and professionals working in the area of petroleum engineering *Annual Review Of Nano Research, Volume 1* Guozhong Cao, C Jeffrey Brinker, 2006-12-28 The first volume in an exciting new series Annual Review of Nano Research this formidable collection of review articles sees renowned contributors from eight different countries tackle the most recent advances in nanofabrication nanomaterials and nanostructures The broad coverage of topics in nanotechnology and nanoscience also includes a special focus on the hot topic of biomedical applications of nanomaterials The important names contributing to the volume include M R Bockstaller USA L Duclaux France S Forster Germany W Fritzsche Germany L

Jiang China C Lopez Spain W J Parak Germany B Samori Italy U S Schubert The Netherlands S Shinkai Japan A Stein USA S M Hou China and Y N Xia USA The volume serves both as a handy reference for experts active in the field and as an excellent introduction to scientists whose expertise lies elsewhere but who are interested in learning about this cutting edge research area **Handbook of Visual Optics, Volume Two** Pablo Artal,2017-02-24 Handbook of Visual Optics offers an

authoritative overview of encyclopedic knowledge in the field of physiological optics It builds from fundamental concepts to the science and technology of instruments and practical procedures of vision correction integrating expert knowledge from physics medicine biology psychology and engineering The chapters comprehensively cover all aspects of modern study and practice from optical principles and optics of the eye and retina to novel ophthalmic tools for imaging and visual testing devices and techniques for visual correction and the relationship between ocular optics and visual perception

Understanding Tuberculosis Pere-Joan Cardona,2012-02-15 Mycobacterium tuberculosis is a disease that is transmitted through aerosol This is the reason why it is estimated that a third of humankind is already infected by Mycobacterium tuberculosis The vast majority of the infected do not know about their status Mycobacterium tuberculosis is a silent pathogen causing no symptomatology at all during the infection In addition infected people cannot cause further infections Unfortunately an estimated 10 per cent of the infected population has the probability to develop the disease making it very difficult to eradicate Once in this stage the bacilli can be transmitted to other persons and the development of clinical symptoms is very progressive Therefore the diagnosis especially the discrimination between infection and disease is a real challenge In this book we present the experience of worldwide specialists on the diagnosis along with its lights and shadows

Interpol's Forensic Science Review Niamh Nic Daeid,2017-08-09 Every three years worldwide forensics experts gather at the Interpol Forensic Science Symposium to exchange ideas and discuss scientific advances in the field of forensic science and criminal justice Drawn from contributions made at the latest gathering in Lyon France Interpol s Forensic Science Review is a one source reference providing a comp

Annual Review Of Cold Atoms And Molecules - Volume 2 Kirk W Madison,Lincoln D Carr,Hui Zhai,Kai Bongs,Ana Maria Rey,2014-04-01 The aim of this book is to present review articles describing the latest theoretical and experimental developments in the field of cold atoms and molecules Our hope is that this series will promote research by both highlighting recent breakthroughs and by outlining some of the most promising research directions in the field *Annual Review Of Nano Research, Volume 2* Guozhong Cao,C Jeffrey Brinker,2008-03-19

The second volume of the Annual Review of Nano Research focuses mainly on nanofabrication nanomaterials and nanostructures and energy application of nanomaterials All of the review chapters are contributed by well published scientists and bring the most recent advancements in selected topics to the readers This review volume will perfectly serve dual purposes either as an excellent introduction to scientists whose expertise lies in different fields but who are interested in learning about nanotechnology or as a quick reference for experts active in the field of nanotechnology and nanoscience

Comprehensive Biomedical Physics ,2014-07-25 Comprehensive Biomedical Physics Ten Volume Set is a new reference work that provides the first point of entry to the literature for all scientists interested in biomedical physics It is of particular use for graduate and postgraduate students in the areas of medical biophysics This Work is indispensable to all serious readers in this interdisciplinary area where physics is applied in medicine and biology Written by leading scientists who have evaluated and summarized the most important methods principles technologies and data within the field Comprehensive Biomedical Physics is a vital addition to the reference libraries of those working within the areas of medical imaging radiation sources detectors biology safety and therapy physiology and pharmacology as well as in the treatment of different clinical conditions and bioinformatics This Work will be valuable to students working in all aspect of medical biophysics including medical imaging and biomedical radiation science and therapy physiology pharmacology and treatment of clinical conditions and bioinformatics The most comprehensive work on biomedical physics ever published Covers one of the fastest growing areas in the physical sciences including interdisciplinary areas ranging from advanced nuclear physics and quantum mechanics through mathematics to molecular biology and medicine Contains 1800 illustrations all in full color

Lipid Domains ,2015-06-08 Current Topics in Membranes is targeted toward scientists and researchers in biochemistry and molecular and cellular biology providing the necessary membrane research to assist them in discovering the current state of a particular field and in learning where that field is heading This volume offers an up to date presentation of current knowledge in the field of Lipid Domains Written by leading experts Contains original material both textual and illustrative that should become a very relevant reference material The material is presented in a very comprehensive manner Both researchers in the field and general readers should find relevant and up to date information *Encyclopedia of Cell Biology*

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Handbook of Aggregation-Induced Emission, Volume 3 Youhong Tang,Ben Zhong Tang,2022-04-04 The third volume of the ultimate reference on the science and applications of aggregation induced emission The Handbook of Aggregation Induced Emission explores foundational and advanced topics in aggregation induced emission as well as cutting edge developments in the field celebrating twenty years of progress and achievement in this important and interdisciplinary field The three volumes combine to offer readers a comprehensive and insightful interpretation accessible to both new and experienced researchers working on aggregation induced emission In Volume 3 Emerging Applications the editors address the applications of AIEgens in several fields including bio imaging fluorescent molecular switches electrochromic materials regenerative medicine detection of organic volatile contaminants hydrogels and organogels Topics covered include AIE active emitters and their applications in OLEDs and circularly polarized luminescence of aggregation induced emission materials AIE polymer films for optical sensing and energy harvesting aggregation induced electrochemiluminescence and mechanoluminescence materials with aggregation induced emission Dynamic super resolution fluorescence imaging based on photoswitchable fluorescent spiropyran Visualization of polymer microstructures Self assembly of micelle and vesicles New strategies for biosensing and cell imaging Perfect for academic researchers working on aggregation induced emission this set of volumes is also ideal for professionals and students in the fields of photophysics photochemistry materials science optoelectronic materials synthetic organic chemistry macromolecular chemistry polymer science and biological sciences

Molecular Imaging of Small Animals Habib Zaidi,2014-05-27 This book examines the fundamental concepts of multimodality small animal molecular imaging technologies and their numerous applications in biomedical research Driven primarily by the widespread availability of various small animal models of human diseases replicating accurately biological and biochemical processes in vivo this is a relatively new yet rapidly expanding field that has excellent potential to become a

powerful tool in biomedical research and drug development In addition to being a powerful clinical tool a number of imaging modalities including but not limited to CT MRI SPECT and PET are also used in small laboratory animal research to visualize and track certain molecular processes associated with diseases such as cancer heart disease and neurological disorders in living small animal models of disease In vivo small animal imaging is playing a pivotal role in the scientific research paradigm enabling to understand human molecular biology and pathophysiology using for instance genetically engineered mice with spontaneous diseases that closely mimic human diseases

New Methods and Sensors for Membrane and Cell Volume Research ,2021-12-01 New Methods and Sensors for Membrane and Cell Volume Research Volume 88 provides an overview of novel experimental approaches to study both the cell membrane and the under membrane space the cytosol which have lately began drawing renewed attention The book s overall emphasis is on fluorescent and FRET based sensors however other optical such as variants of transmission microscopy and non optical methods neutron scattering and mass spectrometry also have dedicated chapters This volume provides a rare review of experimental approaches to study intracellular phase transitions as well as anion channels membrane tension and dynamics and other topics of intense current interest Describes novel FRET based membrane sensors Reviews selected non optical approaches to membrane structure and dynamics Describes traditional and modern aspects of cell volume research such as phase transitions and macromolecular crowding

TRP Channels Michael X. Zhu,2016-04-19 The rapid expansion of the TRP field has generated a large amount of excellent original work across many different research fields However investigators are not necessarily familiar with the pros and cons of the variety of methods used to study TRP channels Because of functional and genetic diversity as well as the different physiological roles

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