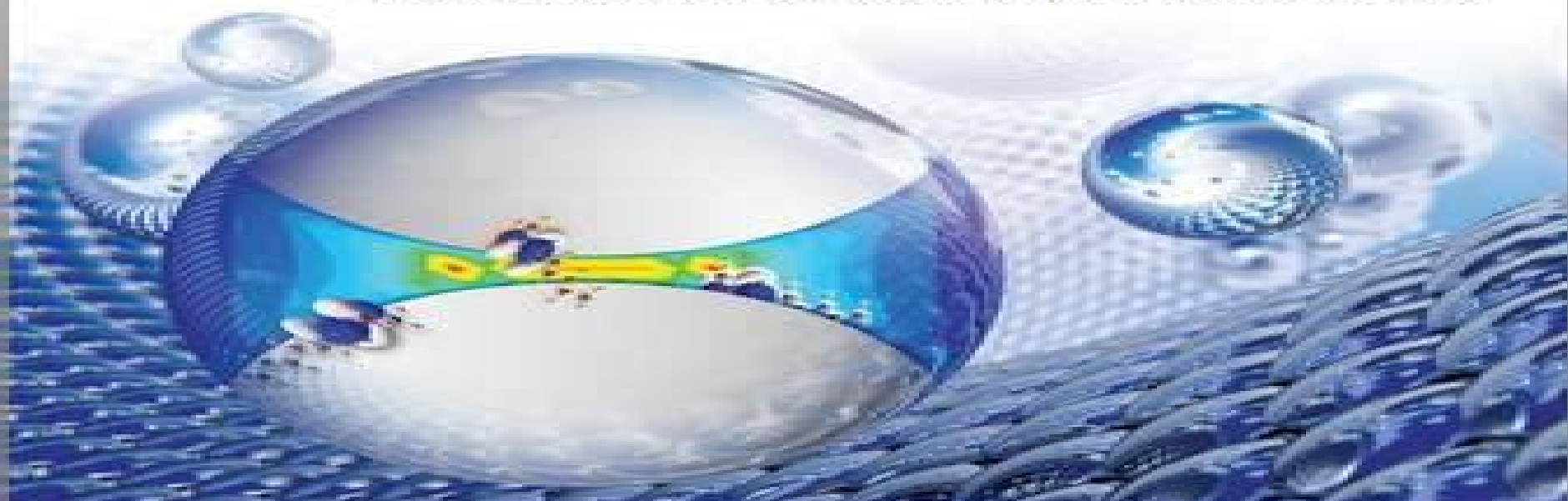


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# FRONTIERS OF SURFACE-ENHANCED RAMAN SCATTERING

SINGLE NANOPARTICLES AND SINGLE CELLS



WILEY

# Frontiers Of Surface Enhanced Raman Scattering Single Nanoparticles And Single Cells

**Michael Hoelscher**



## **Frontiers Of Surface Enhanced Raman Scattering Single Nanoparticles And Single Cells:**

**Frontiers of Surface-Enhanced Raman Scattering** Yukihiro Ozaki, Katrin Kneipp, Ricardo Aroca, 2014-02-19 A comprehensive presentation of Surface Enhanced Raman Scattering SERS theory substrate fabrication applications of SERS to biosystems chemical analysis sensing and fundamental innovation through experimentation Written by internationally recognized editors and contributors Relevant to all those within the scientific community dealing with Raman Spectroscopy i.e. physicists chemists biologists material scientists physicians and biomedical scientists SERS applications are widely expanding and the technology is now used in the field of nanotechnologies applications to biosystems nonosensors nanoimaging and nanoscience

**Surface-Enhanced Raman Spectroscopy** Marek Prochazka, 2015-12-12 This book gives an overview of recent developments in RS and SERS for sensing and biosensing considering also limitations possibilities and prospects of this technique Raman scattering RS is a widely used vibrational technique providing highly specific molecular spectral patterns A severe limitation for the application of this spectroscopic technique lies in the low cross section of RS Surface enhanced Raman scattering SERS spectroscopy overcomes this problem by 6-11 orders of magnitude enhancement compared with the standard RS for molecules in the close vicinity of certain rough metal surfaces Thus SERS combines molecular fingerprint specificity with potential single molecule sensitivity Due to the recent development of new SERS active substrates labeling and derivatization chemistry as well as new instrumentations SERS became a very promising tool for many varied applications including bioanalytical studies and sensing Both intrinsic and extrinsic SERS biosensing schemes have been employed to detect and identify small molecules nucleic acids and proteins and also for cellular and in vivo sensing

**Nanopatterned and Nanoparticle-Modified Electrodes** Richard C. Alkire, Philip N. Bartlett, Jacek Lipkowski, 2017-03-13 Volume XVII in the Advances in Electrochemical Science and Engineering series this monograph covers progress in this rapidly developing field with a particular emphasis on important applications including spectroscopy medicinal chemistry and analytical chemistry As such it covers nanopatterned and nanoparticle modified electrodes for analytical detection surface spectroscopy electrocatalysis and a fundamental understanding of the relation between the electrode structure and its function Written by a group of international experts this is a valuable resource for researchers working in such fields as electrochemistry materials science spectroscopy analytical and medicinal chemistry

Frontiers and Advances in Molecular Spectroscopy Jaan Laane, 2017-11-13 Frontiers and Advances in Molecular Spectroscopy once again brings together the most eminent scientists from around the world to describe their work at the cutting edge of molecular spectroscopy Much of what we know about atoms molecules and the nature of matter has been obtained using spectroscopy over the last one hundred years or so Going far beyond the topics discussed in Jaan Laane's earlier book on the subject these chapters describe new methodologies and applications instrumental developments and theory which are taking spectroscopy into still new frontiers The robust range of topics once again demonstrates the wide utility of spectroscopic

techniques New topics include ultrafast spectroscopy of the transition state SERS far uv spectroscopy femtosecond coherent anti Stokes Raman spectroscopy high resolution laser induced fluorescence spectroscopy Raman spectroscopy and biosensors vibrational optical activity ultrafast two dimensional spectroscopy biology with x ray lasers isomerization dynamics and hydrogen bonding single molecule imaging spectra of intermediates matrix isolation spectroscopy and more Covers spectroscopic investigations on the cutting edge of science Written and edited by leading experts in their respective fields Allows researchers to access a broad range of essential modern spectroscopy content from a single source rather than wading through hundreds of scattered journal articles

**Recent Developments In Plasmon-supported Raman Spectroscopy: 45 Years Of Enhanced Raman Signals** Katrin Kneipp,Yukihiro Ozaki,Zhong-qun Tian,2017-12-12 Surface enhanced Raman scattering SERS might be one of the most impressive effects to demonstrate the power of plasmonic approaches in spectroscopy and became one of the triggers for the rapidly emerging field of plasmonics This book provides a review of some recent developments in SERS such as tip enhanced Raman scattering TERS reports new experimental observations sophisticated new SERS active structures and substrates new theoretical insight to explain the effect as well as exciting applications in various fields such as analytical science biomedicine and nanotechnology Written for graduate students and established researchers looking for inspiration for future work its interdisciplinary nature makes the book suitable for readers in the fields of chemistry physics biology medicine nanotechnology and materials science

Revolutionizing Immunological Disease Understanding Through Single Cell Multi-Omics Technologies Jennie R. Lill,Veronica Anania,Ying Zhu,Zora Modrusan,2025-06-17 Single cell technologies encompassing genomics and proteomics are at the forefront of revolutionizing our understanding of biological mechanisms at the cellular level particularly in the context of immunological diseases These technologies have enabled researchers to dissect complex cellular processes with unprecedented detail providing crucial spatial context that was previously unattainable Recent advancements have led to the formulation of new signaling hypotheses and opened novel pathways for therapeutic interventions The integration of multi omics approaches which combine various single cell technologies has further enhanced our ability to explore intracellular signaling and disease pathology Despite these advancements challenges remain in optimizing data interpretation and understanding the full scope of these technologies impact on immunological and cancer immunological disease pathogenesis There is a pressing need for continued exploration and refinement of these methodologies to fully harness their potential in elucidating disease mechanisms

*Frontiers of Molecular Spectroscopy* Jaan Laane,2011-08-11 Much of what we know about atoms molecules and the nature of matter has been obtained using spectroscopy over the last one hundred years or so In this book we have collected together twenty chapters by eminent scientists from around the world to describe their work at the cutting edge of molecular spectroscopy These chapters describe new methodology and applications instrumental developments and theory which is taking spectroscopy into new frontiers The range of topics is broad Lasers are utilized in

much of the research but their applications range from sub femtosecond spectroscopy to the study of viruses and also to the investigation of art and archeological artifacts Three chapters discuss work on biological systems and three others represent laser physics The recent advances in cavity ringdown spectroscopy CRDS surface enhanced Raman spectroscopy SERS two dimensional correlation spectroscopy 2D COS and microwave techniques are all covered Chapters on electronic excited states molecular dynamics symmetry applications and neutron scattering are also included and demonstrate the wide utility of spectroscopic techniques Provides comprehensive coverage of present spectroscopic investigations Features 20 chapters written by leading researchers in the field Covers the important role of molecular spectroscopy in research concerned with chemistry physics and biology

Nanotechnology in Environmental Science Chaudhery Mustansar Hussain,Ajay Kumar Mishra,2018-02-05 Ein berblick ber den aktuellen Stand von Ger ten die auf Nanotechnologie basieren und in den Umweltwissenschaften zum Einsatz kommen Der Fokus liegt dabei auf Nanomaterialien und Polymer Nanokompositen Das Handbuch besch ftigt sich insbesondere mit den auf Nanotechnologie basierenden Ans tzen die einfachere schnellere und kosteng nstigere Prozesse bei der Umwelt berwachung und Umweltsanierung versprechen Dar ber hinaus bietet es aktuelle und detaillierte Informationen zu konomie Toxizit t und Vorschriften in Verbindung mit der Nanotechnologie Das Buch schlie t mit einem Blick auf die Rolle der Nanotechnologie f r eine gr ne und nachhaltige Zukunft F r Forscher und Entwickler im akademischen Bereich und aus der Industrie ist dieses Handbuch das vorhandene und demn chst verf gbare Ger te beschreibt unabdingbar

**Enzyme or Whole Cell Immobilization for Efficient Biocatalysis: Focusing on Novel Supporting Platforms and Immobilization Techniques** Wen-Yong Lou,Jun Ge,Changzhu Wu,Jesús Fernández Lucas,2021-04-21

**Fundamentals of Nanomedicine** James F. Leary,2022-03-31 The first introductory book on the subject this book will provide a complete grounding to this pioneering field for students and professionals across biomedical engineering biology and medicine It features a comprehensive overview of original work in this revolutionary field Topics discussed include drug delivery cell material interaction and gene therapy accompanied by real world examples and over 100 illustrations The book teaches readers how to design and test their own nanomedical systems for real world applications in biomedical engineering medicine and pharmacy Presenting a thorough discussion of the science and engineering of nanomedicine it discusses vital environmental social and ethical impacts of this revolutionary technology Including over 200 thought provoking study questions allowing the reader to self assess their understanding this book is a rich source of information that will be of interest and importance in nanomedicine

**Studies on the Plasmon-Induced Photoexcitation Processes of Molecules on Metal Surfaces** Fumika Nagasawa,2017-08-10

This thesis proposes a novel way to catch light energy using an ultrasmall nanostructure The author has developed photon materials systems to open the way for novel photoexcitation processes based on the findings obtained from in situ observation of the systems in which localized surface plasmon LSP and molecules interact strongly The highly ordered metal nanostructure provided the

opportunity for anisotropic photoexcitation of materials in an eccentric way The optimization of the systems via nanostructuring and electrochemical potential control resulted in the novel excitation process using LSP to realize the additional transition for photoexcitation Furthermore excited electronic states formed the strong coupling between LSP and excitons of molecules This thesis will provide readers with an idea for achieving very effective processes for photon absorption scattering and emission beyond the present limits of photodevices

**New Frontiers of Nanoparticles and Nanocomposite Materials** Andreas Öchsner, Ali Shokuhfar, 2014-07-08 The development of nanomaterials opens the possibility for new materials with outstanding properties compared to classical engineering materials These materials can find applications in different fields such as medical treatment or structural mechanics This monograph focuses on two major groups of nanomaterials i e nanoparticles and nanocomposites Nanoparticles for example in the form of hollow particles allow for new possibilities in drug delivery Different aspects of nanoparticles ranging from manufacturing to modeling and simulation are covered Nanocomposite materials are formed by mixing two or more dissimilar materials at the nanoscale in order to control and develop new and improved structures and properties The properties of nanocomposites depend not only on the individual components used but also on the morphology and the interfacial characteristics Nanocomposite coatings and materials are one of the most exciting and fastest growing areas of research and novel properties being continuously developed which are previously unknown in the constituent materials Thus the second part of this monograph gives an overview on the latest developments in the area of composites and coatings based on nanomaterials

Surface Enhanced Raman Scattering: New Theoretical Approaches, Materials and Strategies Ivano Alessandri, John Lombardi, 2020-03-25

**New Frontiers in Ultrasensitive Bioanalysis** Xiao-Hong Nancy Xu, 2007-04-09 An overview of current research and developments in ultrasensitive bioanalysis New platforms of ultrasensitive analysis of biomolecules and single living cells using multiplexing single nanoparticle sensing nano fluidics and single molecule detection are advancing every scientific discipline at an unprecedented pace With chapters written by a diverse group of scientists working in the forefront of ultrasensitive bioanalysis this book provides an overview of the current status and an in depth understanding of the objectives and future research directions of ultrasensitive bioanalysis Spanning a wide spectrum of new research approaches this book Introduces new theories ideas methodologies technologies and applications of ultrasensitive bioanalysis in a wide variety of research fields Includes background fundamentals and descriptions of instrumentation and techniques behind every experimental design and approach to help readers explore the promising applications of new tools Covers single molecule detection SMD single living cell analysis multi functional nanoparticle probes miniaturization multiplexing quantitative and qualitative analysis of metal ions and small molecules and more Discusses techniques such as single molecule microscope and spectroscopy single nanoparticle optics single nanoparticle sensors micro and nano fluidics microarray detection ultramicroelectrodes electrochemiluminescence mass spectrometry and more This book will be a useful

resource and an inspiration for scientists and graduate and undergraduate students in a wide variety of research fields including chemistry biology biomedical science and engineering and materials science and engineering Plasmonics in Chemistry and Biology Marc Lamy de la Chapelle, Nordin Felidj, 2019-05-13 Over the past decade plasmonic nanoparticles have been the subject of extensive research owing to their remarkable optical properties These properties arise from a collective oscillation of the conductive electrons at the nanoparticle surface under light irradiation known as localized surface plasmon LSP LSP is characterized by i a strong absorption and scattering of the light depending on the geometrical parameters of the nanoparticles and ii a strong amplification of the local field in the vicinity of the nanoparticles Quite recently it was shown that the activation and the initiation of chemical reactions or physical processes can be facilitated using LSP excitation Such exploitation presents two main advantages an enhanced yield and a fine control of chemical reactions at the nanoscale These topics have become very active and are in line with molecular plasmonics This book explores this new field and provides a broad view on the exploitation of plasmonics in chemical and biological fields

*Raman Spectroscopy for Nanomaterials Characterization* Challa S.S.R. Kumar, 2012-03-30 First volume of a 40 volume series on nanoscience and nanotechnology edited by the renowned scientist Challa S S R Kumar This handbook gives a comprehensive overview about Raman spectroscopy for the characterization of nanomaterials Modern applications and state of the art techniques are covered and make this volume essential reading for research scientists in academia and industry

Optical and Electrochemical Biosensing Junjie Zhu, Renyun Zhang, Tingting Zheng, Cheng Ma, 2022-09-27 The transduction of unreadable chemical biological components to readable optical or electrochemical signals utilizing different biosensing technologies is one of the important pathways of understanding the principles of nature To achieve this ambitious goal many biosensors have been developed to obtain useful information from complex systems e g cells tissues and humans ever since the first glucose biosensor was invented in 1967 Nowadays biosensors are spread all over every branch of frontier science ranging from fundamental measurement science to advanced artificial intelligence technology Although many transduction technologies are available so far optical and electronic signals are still two of the most commonly used techniques as the detectable outputs for biosensors Taking advantage of the development of additive manufacturing techniques such as 3D printing and the improved understanding of the biomolecules optical and electrochemical biosensing technologies have also been developed on their sensitivity selectivity and speed In view of the fast development in the area we propose a Research Topic focused on the recent development of optical and electrochemical biosensing The topics of the Research Topic cover various optical and electrochemical biosensors which potentially promote the revolution of modern measurement techniques Notably this issue will not only cover the topics in individually used optical or electrochemical biosensors but also receive interconnection techniques between optical and electrochemical signals We welcome submissions in the following themes but not limited to Fundamental studies of the optical and electrochemical biosensing Optical

biosensing techniques Electrochemical biosensing techniques Combined optical and electrochemical biosensors  
Commercializing of the optical and electrochemical biosensors In vivo and in vitro optical and electrochemical biosensing

**Cancer Theranostics** Xiaoyuan Chen, Stephen Wong, 2014-03-20 Aiding researchers seeking to eliminate multi step procedures reduce delays in treatment and ease patient care Cancer Theranostics reviews assesses and makes pertinent clinical recommendations on the integration of comprehensive in vitro diagnostics in vivo molecular imaging and individualized treatments towards the personalization of cancer treatment Cancer Theranostics describes the identification of novel biomarkers to advance molecular diagnostics of cancer The book encompasses new molecular imaging probes and techniques for early detection of cancer and describes molecular imaging guided cancer therapy Discussion also includes nanoplatforms incorporating both cancer imaging and therapeutic components as well as clinical translation and future perspectives Supports elimination of multi step approaches and reduces delays in treatments through combinatorial diagnosis and therapy Fully assesses cancer theranostics across the emergent field with discussion of biomarkers molecular imaging imaging guided therapy nanotechnology and personalized medicine Content bridges laboratory clinic and biotechnology industries to advance biomedical science and improve patient management *Encyclopedia of Interfacial Chemistry*, 2018-03-29 Encyclopedia of Interfacial Chemistry Surface Science and Electrochemistry Seven Volume Set summarizes current fundamental knowledge of interfacial chemistry bringing readers the latest developments in the field As the chemical and physical properties and processes at solid and liquid interfaces are the scientific basis of so many technologies which enhance our lives and create new opportunities its important to highlight how these technologies enable the design and optimization of functional materials for heterogeneous and electro catalysts in food production pollution control energy conversion and storage medical applications requiring biocompatibility drug delivery and more This book provides an interdisciplinary view that lies at the intersection of these fields Presents fundamental knowledge of interfacial chemistry surface science and electrochemistry and provides cutting edge research from academics and practitioners across various fields and global regions *Quorum Network (Sensing/Quenching) in Multidrug-Resistant Pathogens* Rodolfo Garcia-Conteras, Thomas K. Wood, Maria Tomás, 2019-06-28 The findings of the contributed studies from this Research Topic reflect important aspects hot topics of Quorum network Sensing Quenching in multidrug resistant pathogens which including i novel mechanisms of QS and detection techniques ii QS QQ in clinical multidrug resistant strains iii the relationship between QS QQ as well as multidrug resistance and iv the application of new QQ therapies



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