Chemical Sensors and Biosensors for Medical and Biological Applications

Key features include: Self-assessment questions and exercises Chapters start with essential principles, then go on to address more advanced topics More than 1300 references to direct the reader to key literature and further reading Highly illustrated with 450 figures, including chemical structures and reactions, functioning principles, constructive details and response characteristics Chemical sensors are self-contained analytical devices that provide real-time information on chemical composition. A chemical sensor integrates two distinct functions: recognition and transduction. Such devices are widely used for a variety of applications, including clinical analysis, environment monitoring and monitoring of industrial processes. This text provides an up-to-date survey of chemical sensor science and technology, with a good balance between classical aspects and contemporary trends. Topics covered include: Structure and properties of recognition materials and reagents, including synthetic, biological and biomimetic materials, microorganisms and whole-cells Physicochemical basis of various transduction methods (electrical, thermal, electrochemical, optical, mechanical and acoustic wave-based) Auxiliary materials used e.g. synthetic and natural polymers, inorganic materials, semiconductors, carbon and metallic materials properties and applications of advanced materials (particularly nanomaterials) in the production of chemical sensors and biosensors Advanced manufacturing methods Sensors obtained by combining particular transduction and recognition methods Mathematical modeling of chemical sensor processes Suitable as a textbook for graduate and final year undergraduates, and also for researchers in chemistry, biology, physics, physiology, pharmacology and electronic engineering, this book is valuable to anyone interested in the field of chemical sensors and biosensors.

Application of Nanomaterials in Chemical Sensors and Biosensors

Sensors for measuring and detecting chemical and biological substances are comprehensively used and are, for the most part, unobtrusive. They can help monitor our health through alerting us to chemical or biological changes in our bodies, our environment through checking air quality or pollution levels and they can contribute towards a more sustainable future. Polymer-based sensors are the subject of much attention due to their ability to collect molecules on their flexible sensory
surfaces. However, most petroleum-based polymers are not renewable, leading to problems of waste-disposal. By using renewable materials, such as paper, cotton or starch, these problems can be overcome. This book reviews the current state-of-play in renewable-material-based chemical sensors and biosensors, and suggests applications in industry, environment and biomedicine. Contents: Introduction (Jaehwan Kim) Renewable Materials (Bong Sup Shim) Sensing Principles (Joo-Hyung Kim) Chemical Sensors (Bong Sup Shim) Biosensors (Joo-Hyung Kim) Summary and Suggestions (Jaehwan Kim) Readership: Graduate students and researchers of nanomaterials, nanoscience, and those interested in their applications in nanomedicine, biotechnology and the environment. Keywords: Biosensors; Chemical Sensors; Polymer-Based Sensors; Renewable Sensors; Waste-Management; Biomedicine; Biotechnology; Nanomedicine

Environmental Analysis by Electrochemical Sensors and Biosensors

Biosensor Technology

Chemical Sensors and Biosensors

Biosensors are analytical devices that combine a biologically sensitive element with a physical or chemical transducer to selectively and quantitatively detect the presence of specific compounds. Balancing basics, principles, and case studies, Biosensors: Microelectrochemical Devices covers the theory and applications of one class of biosensor-microelectrochemical devices. The book clearly explains microelectronic techniques used to produce these cheap, fast reacting, and disposable sensors with the aid of helpful diagrams and tables. Researchers and postgraduates active in the field of chemical sensors, analytical chemistry, or microelectronics will find this an invaluable reference.

Development of Anion and Nitric Oxide Selective Chemical Sensors and Biosensors

This book introduces the principles and concepts of chemical and biochemical sensors for analyzing medical as well as biological samples. For applications like analyzing or monitoring gastric juice or blood plasma, the potential of sensors is exceptionally large. Focused on these applications, the interpretation of analytical results is explained. Specific advantages are compared to other analytical techniques. Numerous tables with data provide useful information not easily found elsewhere and make a handy source of reference. Ursula E. Spichiger-Keller is head of the Center for Chemical Sensors/Biosensors and Bioanalytical Chemistry at the Swiss Federal Institute of Technology (ETH) in Zurich.

Biosensor and Chemical Sensor Technology

Covering the huge developments in sensor technology and electronic sensing devices that have occurred in the last 10 years, this book uses an open learning format to encourage reader understanding of the subject. An invaluable distance learning book Applications orientated providing invaluable aid for anyone wishing to use chemical and biosensors Key features and subjects covered include the following: Sensors based on both electrochemical and photometric transducers Mass-sensitive sensors Thermal-sensitive sensors Performance factors for sensors Examples of applications Detailed case studies of five selected sensors 30 discussion questions with worked examples and 80 self-assessment questions 140 explanatory diagrams An extensive bibliography

Biosensors

This book presents an exhaustive overview of electrochemical sensors and biosensors for the analysis and monitoring of the most important analytes in the environmental field, in industry, in treatment plants and in environmental research. The chapters give the reader a comprehensive, state-of-the-art picture of the field of electrochemical sensors suitable to environmental analytes, from the theoretical principles of their design to their implementation, realization and application. The first three chapters discuss fundamentals, and the last three chapters cover the main groups of analytes of environmental interest.

Piezoelectric Sensors

This issue of ECS Transactions honors Professor Jiri (Art) Janata for his 35 years of contribution to the development of chemical sensors. It focuses on all aspects of chemical sensor technology including organic semiconductor devices, sensing materials, micro and nanomachining, fabrication processes, packaging, and the application of these structures and processes to the miniaturization of chemical sensors, biosensors, miniature chemical analysis systems and other devices and methods for chemical analysis.
Chemical Sensors and Biosensors

Proceedings of the 4th European Conference on Optical Chemical Sensors and Biosensors - EUROPT(R)ODE IV


Chemical Sensors and Biosensors

Disposable And Flexible Chemical Sensors And Biosensors Made With Renewable Materials

Do not learn the tricks of the trade, learn the trade I started teaching graduate courses in chemical sensors in early 1980s, ?rst as a o- quarter (30 h) class then as a semester course and also as several intensive, 4–5-day courses. Later I organized my lecture notes into the ?rst edition of this book, which was published by Plenum in 1989 under the title Principles of Chemical Sensors. I started working on the second edition in 2006. The new edition of Principles of Chemical Sensors is a teaching book, not a textbook. Let me explain the difference. Textbooks usually cover some more or less narrow subject in maximum depth. Such an approach is not possible here. The subject of chemical sensors is much too broad, spanning many aspects of physical and analytical chemistry, biochemistry, materials science, solid-state physics, optics, device fabrication, electrical engineering, statistical analysis, and so on. The challenge for me has been to present uniform logical coverage of such a large area. In spite of its relatively shallow depth, it is intended as a graduate course. At its present state the amount of material is more than can be covered in a one-semester course (45 h). Two one-quarter courses would be more appropriate. Because of the breadth of the material, the sensor course has a somewhat unexpected but, it is hoped, bene?cial effect.

Chemical Sensors and Biosensors Using Leaky Waveguides

Chemical, Gas, and Biosensors for the Internet of Things and Related Applications brings together the fields of sensors and analytical chemistry, devices and machines, and network and information technology. This thorough resource enables researchers to effectively collaborate to advance this rapidly expanding, interdisciplinary area of study. As innovative developments in the Internet of Things (IoT) continue to open new possibilities for quality of life improvement, sensor technology must keep pace, Drs. Mitsubayashi, Niwa and Ueno have brought together the top minds in their respective fields to provide the latest information on the numerous uses of this technology. Topics covered include life-assist systems, network monitoring with portable environmental sensors, wireless livestock health monitoring, point-of-care health monitoring, organic electronics and bio-batteries, and more. Describes the latest advances and underlying principles of sensors used in biomedicine, healthcare, biotechnology, nanotechnology and food and environment safety Focuses on sensors’ methods of data communication, logging and analysis for IoT applications Explains the specific requirements of sensor design and performance improvement, helping researchers enhance sensitivity, selectivity, stability, reproducibility and response time

Biosensors and Chemical Sensors

Die Forschung und Anwendungsentwicklung in dem Bereich chemischer und biochemischer Sensoren ist weiterhin in einem schnellen Wachstum begriffen. Die Erfahrungen des letzten Jahrzehnts haben jedoch gezeigt, dass die erfolgreiche

**Chemical Sensors and Biosensors**

This is a comprehensive treatment of the field of SPR sensors, in three parts. Part I introduces principles of surface plasmon resonance bio-sensors, electromagnetic theory of surface plasmons, theory of SPR sensors and molecular interactions at sensor surfaces. Part II examines the development of SPR sensor instrumentation and functionalization methods. Part III reviews applications of SPR biosensors in the study of molecules, and in environmental monitoring, food safety and medical diagnostics.

**Chemical Sensors and Biosensors for Medical and Biological Applications**

Provides in-depth coverage of advances in polymeric materials used for designing biosensors and chemical sensors, including permselective membranes and immobilization for enzyme systems, electropolymerized thin films, polymer membranes on planar substrates, and hydration-dependent polymer applications. Covers fundamental aspects relevant to the design and fabrication of biosensors and offers unique insights into materials used for their fabrication. Offers an interdisciplinary approach toward correlating material properties with biosensor and chemical sensor response to optimize sensor performance. Also includes an overview chapter by Elizabeth Hall.

**European Conference on Optical Chemical Sensors and Biosensors**

**Principles of Chemical Sensors**

**Fiber Optic Chemical Sensors and Biosensors**

This ECS Transactions issue is a compilation of papers presented at the PRiME 2008 Joint International Meeting, held in Hawaii from October 12 - October 17, 2008. The papers presented covered the research and development in the field of chemical (gas, ion, bio and other) sensors, including molecular recognition surface, transduction methods, and integrated and micro sensor systems.

**Biosensors and Chemical Sensors**

Chemically and biologically functionalized piezoelectric sensors are attractive alternatives to surface-sensitive transducers due to their surpassing versatility. The fourth volume of the Springer Series on Chemical Sensors and Biosensors includes a comprehensive theoretical treatment and current state-of-the-art applications of the quartz crystal microbalance (QCM). Interface circuits and the study of viscoelasticity and micromechanics as well as surface roughness with the QCM are discussed. The broad field of analytical applications of piezoelectric sensors is covered, which ranges from nucleic acid detection, immnosensors, protein-membrane interactions and monitoring cells by imprinted polymers to the viscoelastic response of living mammalian cells on QCM-resonators. Sophisticated derivatives of the classical QCM, such as rupture event scanning, the use of extraordinary high frequency crystals, and electrochemical QCM, clearly reveal the advantages of combining multiple techniques to realize new detection schemes on the basis of piezoelectric resonators.

**Chemical, Gas, and Biosensors for Internet of Things and Related Applications**

This book is a lucid presentation for chemists, electrical engineers, surface scientists, and solid-state physicists, of the fundamentals underlying the construction of simple and small chemical sensors. The first part of the book is a review of the theoretical background in solid state physics, chemistry and electronics. Semiconductor and solid electrolyte bulk models are reviewed as well as solid/gas and solid/liquid interface models. Membranes and catalysis theory are also covered expansively. The second part is a discussion of more complete sensor devices, their essential components, and of the important developments in this area over the last fifteen to twenty years. The book provides guidance through the multidisciplinary world of chemical sensors. It should be understandable to students with some training in physics and chemistry and a general knowledge of electronics. Finally, comments on economic considerations in the development of new
sensor products and suggestions for future research and development should be of value to company R&D planners. Key Features * Introduction * Solid State Background * Solid/Gas Interfaces * Solid/Liquid Interfaces * Catalysis Background * Membrane Background * Biosensor Principles * Principles of ChemFet Operation * Silicon Based Chemical Sensors * Thin Film Gas Sensors * Solid Electrolytes-Devices * Gas Sensors Based on Semiconductor Powders * Application of Solid State Chemical Sensors

Frontiers in Chemical Sensors

This issue of ECS Transactions is a compilation of papers presented at the 218th Meeting of the Electrochemical Society, held in Las Vegas from October 10 - 15, 2010. The papers presented covered the research and development in the field of chemical (gas, ion, bio and other) sensors, including molecular recognition surface, transduction methods, and integrated and micro sensor systems, as well as all aspects of MEMS/NEMS technology, including micro/nanomachining, fabrication processes, packaging, and the application of these structures and processes to the miniaturization of chemical sensors, physical sensors, biosensors, miniature chemical analysis systems and other devices.

Chemical Sensors 8: Chemical (Gas, Ion, Bio) Sensors and Analytical Systems

Chemical sensors are in high demand for applications as varied as water pollution detection, medical diagnostics, and battlefield air analysis. Designing the next generation of sensors requires an interdisciplinary approach. The book provides a critical analysis of new opportunities in sensor materials research that have been opened up with the use of combinatorial and high-throughput technologies, with emphasis on experimental techniques. For a view of component selection with a more computational perspective, readers may refer to the complementary volume of Integrated Analytical Systems edited by M. Ryan et al., entitled “Computational Methods for Sensor Material Selection”.

Combinatorial Methods for Chemical and Biological Sensors

Portable Chemical Sensors

"CRC Press is an imprint of the Taylor & Francis Group, an Informa Business."

4th European Conference on Optical Chemical Sensors and Biosensors

Covering the huge developments in sensor technology and electronic sensing devices that have occurred in the last 10 years, this book uses an open learning format to encourage reader understanding of the subject. An invaluable distance learning book Applications orientated providing invaluable aid for anyone wishing to use chemical and biosensors Key features and subjects covered include the following: Sensors based on both electrochemical and photometric transducers Mass-sensitive sensors Thermal-sensitive sensors Performance factors for sensors Examples of applications Detailed case studies of five selected sensors 30 discussion questions with worked examples and 80 self-assessment questions 140 explanatory diagrams An extensive bibliography

Optical Chemical Sensors and Biosensors

Biosensors are making a large impact in environmental, food, biomedical, and other applications. In comparison to standard analytical detection methods, such as minimal sample preparation and handling, they offer advantages including real time detection, rapid detection of the analytes of concern, use of non-skilled personnel, and portability. The aim of this book is to focus on research related to the rapid detection of agents and weapons of bioterrorism and provide a comprehensive review of the research topics most pertinent to advancing devices applicable to the rapid real-time detection of toxicants such as microbes, pathogens, toxins, or nerve gases. The ongoing war on terrorism and the rising security concerns are driving the need for newer faster biosensors against bio-warfare agents for both military and civil defence applications. The volume brings together contributions from the most eminent international researchers in the field, covering various aspects of work not so far published in any scientific journal and often going beyond the “state of art”. Readers of these review articles will learn new technological schemes that can lead to the construction of devices that will minimize the risk of bio-terrorism.

Anti-Idiotypic Antibodies As Vaccines

18: Direct Observation of Immunoglobulin Adsorption Dynamics Using the Atomic Force Microscope -- 19: A Comparison of Three Thermal Sensors Based on Fiber Optics and Polymer Films for Biosensor Applications -- 20: Fiber Optic-Based
Chemical Sensors and Biosensors


Chemical Sensors and Biosensors

Proceedings of the 6th European Conference on Optical Chemical Sensors and Biosensors

This book broadly reviews the modern techniques and significant applications of chemical sensors and biosensors. Chapters are written by experts in the field – including Professor Joseph Wang, the most cited scientist in the world and renowned expert on sensor science who is also co-editor. Each chapter provides technical details beyond the level found in typical journal articles, and explores the application of chemical sensors and biosensors to a significant problem in biomedical science, also providing a prospectus for the future. This book compiles the expert knowledge of many specialists in the construction and use of chemical sensors and biosensors including nitric oxide sensors, glucose sensors, DNA sensors, hydrogen sulfide sensors, oxygen sensors, superoxide sensors, immuno sensors, lab on chip, implantable microsensors, et al. Emphasis is laid on practical problems, ranging from chemical application to biomedical monitoring and from in vitro to in vivo, from single cell to animal to human measurement. This provides the unique opportunity of exchanging and combining the expertise of otherwise apparently unrelated disciplines of chemistry, biological engineering, and electronic engineering, medical, physiological. Provides user-oriented guidelines for the proper choice and application of new chemical sensors and biosensors Details new methodological advancements related to and correlated with the measurement of interested species in biomedical samples Contains many case studies to illustrate the range of application and importance of the chemical sensors and biosensors

Surface Plasmon Resonance Based Sensors

Discusses the use of chemical sensors and biosensors for process and environmental monitoring and for medical applications. Presents advances in enzyme- and antibody-based biosensors, including enzyme electrodes and optical immunosensors. Discusses advances in acoustic, optical, and electrochemical biosensors. Describes on-line and off-line monitoring techniques for the fermentation process.

35 Years of Chemical Sensors - An Honorary Symposium for Professor Jiri Janata's 70th Birthday Celebration

Chemical Sensors and Biosensors

For the first time, distinguished scientists from key institutions worldwide provide a comprehensive approach to optical sensing techniques employing the phenomenon of guided wave propagation for chemical and biosensors. This includes both state-of-the-art fundamentals and innovative applications of these techniques. The authors present a deep analysis of their particular subjects in a way to address the needs of novice researchers such as graduate students and post-doctoral scholars as well as of established researchers seeking new avenues. Researchers and practitioners who need a solid foundation or reference will find this work invaluable. This second of two volumes covers the incorporation of periodic structures in waveguides to exploit the Bragg phenomenon, optical fiber sensors, hollow waveguides and micro-resonators as well as a review of the tremendous expansion of terahertz technology for sensing applications.

Chemical Sensors 9 -and- MEMS/NEMS 9

With their similarity to the organs of the most advanced creatures that inhabit the Earth, sensors are regarded as being the...
“senses of electronics”: artificial eyes and ears that are capable of seeing and hearing beyond the range of man perception; electronic noses and tongues that can recognise odours and tastes without a lifetime training; touch that is able not only to feel the texture and temperature of the materials but even to discern their chemical composition. Among the world of chemical sensors, optical devices (sometimes termed “optodes”, from the Greek “the optical way”) have reached a prominent place in those areas where the features of light and of the light-matter interaction show their advantage: contactless or long-distance interrogation, detection sensitivity, analyte selectivity, absence of electrical interference or risks, and lack of analyte consumption, to name just a few. The introduction of optical fibres and integrated optics has added more value to such sensing since now light can be confined and readily carried to difficult-to-reach locations, higher information density can be transported, indicator dyes can be immobilised at the distal end or the evanescent field for unique chemical and biochemical sensing (including multiplexed and distributed measurements), optical sensors can now be subject to mass production and novel sensing schemes have been established (interferometric, surface plasmon resonance, fluorescence energy transfer, supramolecular recognition . . . ).

Chemical Sensing with Solid State Devices

Chemische Sensoren

Introduction; transduction elements; sensing elements; performance factors; electrochemical sensors and biosensors; photometric applications; mass-sensitive and thermal sensors; specific applications.

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