



# Electronic Noses & Sensors for the Detection of Explosives

Edited by

Julian W. Gardner and  
Jehuda Yinon

NATO Science Series

# Electronic Noses And Sensors For The Detection Of Explosives

**Eduard Llobet Valero**



## **Electronic Noses And Sensors For The Detection Of Explosives:**

**Electronic Noses & Sensors for the Detection of Explosives** J. Gardner, Jehuda Yinon, 2004-08-17 This book examines both the potential application of electronic nose technology and the current state of development of chemical sensors for the detection of vapours from explosives such as those used in landmines The two fields have developed somewhat in parallel over the past decade and so one of the purposes of this workshop on which the book is based was to bring together scientists from the two fields in order to challenge the two communities and mutually stimulate both fields It begins with a review of the basic principles of an electronic nose and explores possible ways in which the detection limit of conventional electronic nose technology can be reduced to the level required for the trace levels observed for many explosive materials Next are reviews of the use of several different types of solid state chemical sensors polymer based sensors i e chemiluminescent fluorescent and optical to detect explosive materials metal oxide semiconducting resistive sensors and then electrochemical sensors Next different pattern recognition techniques are presented to enhance the performance of chemical sensors Then biological systems are considered as a possible blue print for chemical sensing The biology can be employed either to understand the way insects locate odorant sources or to understand the signal processing neural pathways Next is a discussion of some of the new types of electronic noses namely a fast GC column with a SAW detector and a micromechanical sensor Finally the important issues of sampling technologies and the design of the microfluidic systems are considered In particular the use of pre concentrators and solid phase micro extractors to boost the vapour concentration before it is introduced to the chemical sensor or electronic nose

*Electronic Noses and Sensors for the Detection of Explosives* J. Gardner, Jehuda Yinon, 2004-08-17 Proceedings of the NATO Advanced Research Workshop held in Warwick Coventry U K 30 September 3 October 2003

**Electronic Noses and Sensors for the Detection of Explosives** J. Gardner, Jehuda Yinon, 2014-01-15 *Chemical Sensors* Ghenadii Korotcenkov, 2011-05-06 Chemical sensors are integral to the automation of myriad industrial processes as well as everyday monitoring of such activities as public safety engine performance medical therapeutics and many more This massive reference work will cover all major categories of chemical sensor materials and devices and their general functional usage from monitoring and analyzing gases to analyzing liquids and compounds of all kinds This is THE reference work on sensors used for chemical detection and analysis In this fourth volume will be found detailed background on all major classes of solid state based chemical sensors including metal oxide based conductometric gas sensors Schottky FET and work function chemical sensors capacitance type chemical sensors pyroelectric thermoelectric gas sensors some new views on Pellistors mass sensitive chemical sensors acoustic wave chemical sensors and integrated chemical sensors

Nanomaterials for Electrochemical Sensing Syed Shahabuddin, Rama Gaur, Nandini Mukherjee, 2025-05-08 This book reviews the fundamentals of electrochemical sensors the preparation of electrodes potential materials for sensing applications and different analytical methods used for electrochemical sensing applications It further

covers the designing of various electrodes and electrode materials instruments sensing mechanisms advanced nanomaterials for sensing and so forth The scalability and commercialization of electrochemical sensors and the challenges and prospects of electrochemical sensors are also described Key Features Provides an overview of the advances in the application of nanomaterials in sensing Covers basic fabrication techniques of electrodes as an important part of electrochemical sensors and analysis Reviews the use and analysis of different types of nanomaterials and nanocomposites used for fabrication of working electrodes Emphasizes carbon based nanomaterials 2D nanomaterials and advanced nanocomposites comprising various matrix systems such as conducting polymers and Explores electron transfer redox behaviour fabrication techniques data interpretation and advanced nanomaterials as working electrode materials This book is aimed at researchers and graduate students in nanomaterials electrochemistry chemical engineering and materials science

**Trace Analysis with Nanomaterials** David T. Pierce, Julia Xiaojun Zhao, 2011-05-25 Presenting a wide variety of methods this book provides a comprehensive overview of the current state ranging from bioanalysis to electrochemical sensing forensics and chemistry while also covering the toxicity aspects of nanomaterials to humans and the environment Edited by rising stars in the field the first section on biological analysis includes an investigation of nanoparticles and micro and nanofluidic systems while the second environmental analysis looks at the detection monitoring and sensing of explosives as well as pollutants among other topics The final part covers such advanced methods as the synthesis and characterization of gold nanorods For analytical chemists materials scientists chemists working in trace analysis and spectroscopists

**Developments in Strategic Materials and Computational Design II, Volume 32, Issue 10** Andrew Gyekenyesi, Waltraud M. Kriven, Jingyang Wang, 2011-11-11 This book is a collection of papers from The American Ceramic Society's 35th International Conference on Advanced Ceramics and Composites held in Daytona Beach Florida January 23-28 2011 This issue includes papers presented in the Thermal Management Materials and Technologies Advanced Sensor Technology Geopolymers and Computational Design Modeling and Simulation of Ceramics and Composites symposia

**Detection of Explosives and Landmines** Hiltmar Schubert, Andrey Kuznetsov, 2012-12-06 This ARW is the third NATO sponsored workshop on Explosives Detection and Humanitarian Demining The previous events were Detection and Destruction of Anti Personnel Landmines Moscow 1997 Explosives Detection and Decontamination of the Environment Prague 1997 Over the last decade applied research in Humanitarian Demining has made progress to some extent but according to the tremendous tasks of Demining and the lack of scientific methods for practical detection of explosive devices research activities are still of the same importance than ever before Concerning countermeasures against terrorism the detection of explosives is one of the key factors but the practical applications are not sufficient solved An international exchange of research results are therefore urgent to find out the most promising measures for application The coincidence of this ARW and the terrible disaster of New York and Washington may demonstrate the importance of this task In consequence the explosive device detection technologies can make a major

contribution to collective family and individual security In developed countries these technologies provide a strong deterrent and preventative measure against terrorist threats In less developed regions they can improve individual institutional and state security lessening the insecurity that motivates many terrorists acts The elimination of landmine threats is just one of many ways of achieving this However our attempts to meet the extremely difficult technical challenges posed by landmine and UXO contamination are inevitably leading us to new technological approaches

**Modeling and Simulation of Functional Nanomaterials for Forensic Investigation** Rakha, Allah, Munawar, Anam, Khanna, Virat, Bansal, Suneev Anil, 2023-06-12 Nanotechnology continues to contribute to the progress of innovations in the area of forensic science ranging from sensing DNA monitoring and counterfeiting to fingerprinting In recent years functional nanomaterials are widely applied in nanoscience and forensic investigation They can be used in future interdisciplinary research by scientists engineers and biotechnologists Modeling and Simulation of Functional Nanomaterials for Forensic Investigation focuses on multiple applications related to forensics and provides information linked with nanoparticles This book provides nanotechnology results in improving the sensitivity of established forensic techniques It further focuses on different fabrication and characterization techniques of nanomaterials and relates their characteristics with forensic applications Covering topics such as explosive detection nano forensic testing and nano trackers this premier reference source is a comprehensive resource for material engineers chemical engineers nanotechnologists biotechnologists forensic scientists students and educators of higher education researchers and academicians

Forensic Investigation of Explosions, Second Edition Alexander Beveridge, 2011-11-02 Now in its second edition Forensic Investigation of Explosions draws on the editor's 30 years of explosives casework experience including his work on task forces set up to investigate major explosives incidents Dr Alexander Beveridge provides a broad multidisciplinary approach assembling the contributions of internationally recognized experts who present the definitive reference work on the subject Topics discussed include The physics and chemistry of explosives and explosions The detection of hidden explosives The effect of explosions on structures and persons Aircraft sabotage investigations Explosion scene investigations Casework management The role of forensic scientists Analysis of explosives and their residues Forensic pathology as it relates to explosives Presentation of expert testimony With nearly 40 percent more material this new edition contains revised chapters and several new topics including A profile of casework management in the UK Forensic Explosives Laboratory one of the world's top labs with a discussion of their management system training procedures and practical approaches to problem solving Properties and analysis of improvised explosives An examination of the Bali bombings and the use of mobile analytical techniques and mobile laboratories The collection analysis and presentation of evidence in vehicle borne improvised explosive device cases as evidenced in attacks on US overseas targets This volume offers valuable information to all members of prevention and post blast teams Each chapter was written by an expert or experts in a specific field and provides well referenced information underlying best practices that can be used

in the field laboratory conference room classroom or courtroom      Forensic Investigation of Explosions Alexander Beveridge, 2011-11-02 Now in its second edition *Forensic Investigation of Explosions* draws on the editor's 30 years of explosives casework experience including his work on task forces set up to investigate major explosives incidents Dr Alexander Beveridge provides a broad multidisciplinary approach assembling the contributions of internationally recognized experts      Advanced Nanomaterials for Inexpensive Gas Microsensors Eduard Llobet Valero, 2019-11-13 *Advanced Nanomaterials for Inexpensive Gas Microsensors Synthesis Integration and Applications* presents full coverage in the area of gas sensing nanomaterials from materials transducers and applications to the latest results and future direction Experts present work on metal oxides carbon based and hybrid materials fabrication and application The book brings together three major themes including synthesis functionalization and the characterization of advanced nanomaterials all emphasizing synthesis techniques that ease the integration of nanomaterials in transducers Chapters encompass a wide spectrum of sensing technologies including advanced nanomaterials metal oxides carbon materials and graphene and organic molecular materials and atomic layers MoS<sub>2</sub> The book's authors examine the coupling of sensitive nanomaterials to different types of transducer elements and their applications including direct growth and additive fabrication techniques as a way to obtain inexpensive gas microsensors principal transduction schemes and advanced operating methods Presents technological solutions and applications of gas sensors in varied areas of chemistry physics material science and engineering Examines advanced operating methods e.g. temperature modulation self heating light activated response noise methods to enhance stability sensitivity selectivity and reduce power consumption Provides a critical review of current applications and their expected future evolution demonstrating the most promising approaches and future expectations in the development of inexpensive gas micro and nanosensors      Counterterrorist Detection Techniques of Explosives Avi Kagan, Jimmie C. Oxley, 2021-12-03 *Counterterrorist Detection Techniques of Explosives Second Edition* covers the most current techniques available for explosive detection This completely revised volume describes the most updated research findings that will be used in the next generation of explosives detection technologies New editors Drs Avi Kagan and Jimmie Oxley have assembled in one volume a series of detection technologies written by an expert group of scientists The book helps researchers to compare the advantages and disadvantages of all available methods in detecting explosives and in effect allows them to choose the correct instrumental screening technology according to the nature of the sample Covers bulk remote trace contact or contact less detection Describes techniques applicable to indoor public transportation human and freight and outdoor vehicle detection Reviews both current techniques and those in advanced stages of development Provides detailed descriptions of every technique including its principles of operation as well as its applications in the detection of explosives      Electronic Nose Technologies and Advances in Machine Olfaction Albastaki, Yousif Abdullatif, Albalooshi, Fatema, 2018-04-13 The design and study of materials is a pivotal component to new discoveries in the various fields of

science and technology By better understanding the components and structures of materials researchers can increase its applications across different industries Electronic Nose Technologies and Advances in Machine Olfaction is an academic scholarly resource that examines the emerging applications of odor sensing devices as well as a better understanding of the designing process with the aid of neural networks and various other technologies Featuring coverage on a broad range of topics including food spoilage detection chemical sensing and olfactometer this book is a vital resource for engineers academicians researchers students and practitioners seeking current research on the advancements in applications of odor sensing devices

*Carbon Nanomaterials and their Nanocomposite-Based Chemiresistive Gas Sensors* Shivani Dhall, 2023-01-20 Carbon Nanomaterials and their Nanocomposite Based Chemiresistive Gas Sensors Applications Fabrication and Commercialization sets out how carbon nanomaterials based chemiresistive gas sensor are made and their applications at lab and industrial levels The book focuses on major advances in the field of chemiresistive gas sensors in recent years and their potential applications in environmental monitoring and healthcare Carbon Nanomaterials and their Nanocomposite Based Chemiresistive Gas Sensors Applications Fabrication and Commercialization provides systematic and effective guidelines to the researchers as well as learners about sensor their fabrication and applications Chemiresistive sensors are widely used in automation of numerous industrial processes as well as for everyday monitoring of various activities as public safety engine performance medical therapeutics and in many other situations hence the book will catch the attention of readers and motivate them for advanced research for the development of smart and efficient gas sensors With full coverage of the state of the art in this active research field the book will appeal to researchers in a broad range of disciplines including nanotechnology engineering materials science chemistry and physics Offers a one stop resource bringing together information currently scattered over journal papers industrial lab outcomes and project reports Presents information about the properties synthesis of nanomaterials their device fabrication and applications as sensing materials Combining fundamental experimental and theoretical knowledge with industrial needs and engineering design methods

*Information Technology and Systems* Álvaro Rocha, Carlos Ferrás, Manolo Paredes, 2019-01-28 This book features a selection of articles from The 2019 International Conference on Information Technology organizational models and information systems software and systems modeling software systems architectures applications and tools multimedia systems and applications computer networks mobility and pervasive systems intelligent and decision support systems big data analytics and applications human computer interaction ethics computers health informatics information technologies in education cybersecurity and cyber defense electromagnetics sensors and antennas for security

**Sensors and Low Power Signal Processing** Syed Kamrul Islam, Mohammad Rafiqul Haider, 2009-12-02 Low power sensors and their applications in various fields ranging from military to civilian lives have made tremendous progress in the recent years Low power and extended battery life are the key focuses for long term reliable and easy operation of these sensors Sensors and Low Power

Signal Processing provides a general overview of a sensor's working principle and a discussion of the emerging sensor technologies including chemical, electro-chemical and MEMS based sensors. Also included is a discussion on design challenges associated with low power analog circuits and the schemes to overcome them. Finally, a short discussion of some of the simple wireless telemetry schemes best suited for low power sensor applications and sensor packaging issues is discussed. Applications and sensor prototypes included are environmental monitoring, health care monitoring and issues related to the development of sensor prototypes and associated electronics to achieve high signal to noise ratio will also be presented.

*Biochemical Sensors* Kiyoshi Toko, 2016-04-19 This book is the first to comprehensively treat sensors for gustatory and olfactory senses. It will be highly useful to students and researchers in a wide variety of scientific fields and also to those in the fields of foods, perfumes, medicines and robotics as the sensor applications.

**Modern Approaches To Quality Control** Ahmed Badr Eldin, 2011-11-09 Rapid advances have been made in the last decade in the quality control procedures and techniques. Most of the existing books try to cover specific techniques with all of their details. The aim of this book is to demonstrate quality control processes in a variety of areas ranging from pharmaceutical and medical fields to construction engineering and data quality. A wide range of techniques and procedures have been covered.

*Nanoelectronics, Nanophotonics, Quantum And Emerging Technologies* Faquir C Jain, C Broadbridge, M Gherasimova, Hong Tang, 2024-11-25 This timely compendium provides state of the art articles covering research areas in Nanoelectronics, Nanophotonics, Quantum and Emerging Technologies. Contributed by eminent researchers from both the academia and industry, this useful reference text details research outputs and findings in Microelectronics and Optoelectronics for High Speed Electronics.



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