
CHEMICAL SENSING

with

SOLID STATE DEVICES

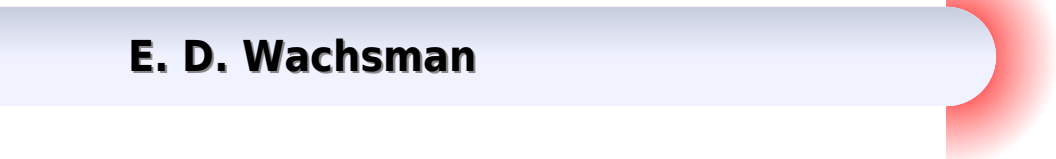


Marc J. Madou

S. Roy Morrison

Chemical Sensing With Solid State Devices

E. D. Wachsman



Chemical Sensing With Solid State Devices:

Chemical Sensing with Solid State Devices Marc J. Madou, S. Roy Morrison, 1989-04-28 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

Chemical Sensing with Solid State Devices Marc J. Madou, S. Roy Morrison, 2012-12-02 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

Chemical Sensors Ghenadii Korotcenkov, 2012-08-15 Chemical sensors are integral to the automation of myriad industrial processes and everyday monitoring of such activities as public safety engine performance medical therapeutics and many more This 4 volume reference work covering simulation and modeling will serve as the perfect complement to Momentum Press's 6 volume reference works *Chemical Sensors Fundamentals of Sensing Materials and Chemical Sensors Comprehensive Sensor Technologies* which present detailed information related to materials technologies construction and application of various devices for chemical sensing This 4 volume comprehensive reference work analyzes approaches used for computer simulation and modeling in various fields of chemical sensing and discusses various phenomena important for chemical sensing such as bulk and surface diffusion adsorption surface reactions sintering conductivity mass transport interphase interactions etc In this work it will be shown that theoretical modeling and simulation of the processes being a basis for chemical sensors operation could provide considerable progress in choosing both optimal materials and optimal

configurations of sensing elements for using in chemical sensors Each simulation and modeling volume in the present series reviews modeling principles and approaches peculiar to specific groups of materials and devices applied for chemical sensing Volume 3 Solid State Devices covers phenomenological and molecular modelling of processes which control sensing characteristics and parameters of various solid state chemical sensors including surface acoustic wave MIS microcantilever thermoelectric based devices and sensor array aimed for electronic nose design Modeling of nanomaterials and nanosystems promising for solid state chemical sensors design is analyzed as well *Solid State Gas Sensing* Elisabetta Comini, Guido Faglia, Giorgio Sberveglieri, 2008-12-16 Solid State Gas Sensing offers insight into the principles applications and new trends in gas sensor technology Developments in this field are rapidly advancing due to the recent and continuing impact of nanotechnology and this book addresses the demand for small reliable inexpensive and portable systems for monitoring environmental concerns indoor air quality food quality and many other specific applications Working principles including electrical permittivity field effect electrochemical optical thermometric and mass both quartz and cantilever types are discussed making the book valuable and accessible to a variety of researchers and engineers in the field of material science

Solid-state Ionic Devices II E. D. Wachsman, 2001 *Solid State Chemical Sensors* Jiri Janata, 2012-12-02 Solid State Chemical Sensors reviews the basic chemical and physical principles involved in the construction and operation of solid state sensors A major portion of the book is devoted to explanation of the basic mechanism of operation and the many actual and potential applications of field effect transistors for gas and solution sensing This text is comprised of four chapters the first of which describes the basics of device fabrication Emphasis is placed on the physical description of semiconductor devices with catalytic metal gates along with their drawbacks and their promise The behavior of hydrogen in the Pd SiO₂ system is also considered and some applications of hydrogen sensitive transistors such as smoke detection and biochemical reaction monitoring are described The second chapter focuses on chemically sensitive field effect transistors and their thermodynamics while the third chapter explains the general fabrication procedure for solid state chemical sensors The final chapter introduces the reader to piezoelectric and pyroelectric chemical sensors paying particular attention to the sensor nature of piezoelectricity the piezoelectric gravimetric sensor and pyroelectric gas analysis This book is intended to assist electrical engineers in understanding the chemistry involved in the construction and operation of solid state sensors and to educate chemists in solid state science Solid State Ionic Devices 6 - Nano Ionics E. D. Wachsman, 2009-09 Solid state electrochemical devices such as batteries fuel cells membranes and sensors are critical components of technologically advanced societies in the 21st Century and beyond The development of these devices involves common research themes such as ion transport interfacial phenomena and device design and performance regardless of the class of materials or whether the solid state is amorphous or crystalline The intent of this international symposia series is to provide a forum for recent advances in solid state ion conducting materials and the design fabrication and performance of devices that utilize them The

papers in this issue of ECS Transactions were presented at the 6th Solid State Ionic Devices symposium at the 214th meeting of The Electrochemical Society October 12-17 2008 in Honolulu Hawaii Solid-state Electronics and Photonics in Biology and Medicine 5 Y.-L. Wang, A. M. Hoff, C.-T. Lin, W. Wu, L. F. Marsal, M. J. Deen, T. Sakata, Z.-H. Lin, Z. P. Aguilar, 2018-05-04

Chemical Sensor Technology, Volume 4 S. Yamauchi, 2012-12-02 This volume is the fourth in a series of annual reviews on progress in the research and technology both basic and applied of chemical sensors New principles new devices and the detailed mechanism of various chemical sensors are described Chemical sensors continue to grow rapidly in importance encompassing a broad spectrum of technologies covering safety pollution fuel economy medical engineering and industrial processes More than half the papers in this volume are relevant to biosensing a strategic field for medical and health care equipment especially in geriatric medicine Frequent health checks at home will be increasingly necessary as the proportion of the aged in the population steadily grows In some cases health conditions will have to be monitored constantly to give warnings or provide emergency assistance at the right time Because biochemical substances play major roles in physiological processes such as metabolism excitation and contraction of skeletal muscle and neurotransmission chemical sensing of the related biochemical substances will eventually become indispensable Each chapter is written by an expert active in the front lines of chemical sensor research Not only is the technological essence of the subject provided but also the background and philosophy an evaluation of achievements to date and problems to be dealt with Each topic is described in sufficient depth to be useful to researchers worldwide *Hybrid Nanostructures as Solid-State Sensors for IoT* Aniruddha Mondal, Arindam Biswas, 2024-12-27 The book provides an in depth discussion of various Hybrid Nanostructures as solid state sensors in the context of the Internet of Things IoT It explains the vital role that sensors play in IoT to aid in discovering what possibilities ought to be addressed to make the data more meaningful The book highlights the applicability of biosensing field effect transistor FET technology with a specific emphasis on the progress being made in integrating existing FET technology and nanotechnology using semiconductor nanowires and organic structures Offers in depth discussion on Hybrid Nanostructures as solid state sensors Elaborates upon the fabrication of gas sensors using metal oxide semiconductor nanostructures Studies biosensors based on metal oxide semiconductor nanostructures Discusses the suitability of various Hybrid Sensors in solving the problems of the Internet of Things IoT Provides extensive support for the development of Hybrid Nanostructures as solid state sensors The book is meant for researchers and scholars of Computer Science and associated disciplines It also serves as a valuable reference for graduate students researchers seeking to deepen their knowledge and engage with the latest advancements in these Hybrid Nanostructures as solid state sensors

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Chemical Sensing With Solid State Devices Introduction

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