

# Bioinspired Smell and Taste Sensors

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K. Jimmy Hsia  
Editors

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# Preface

The integration of cells/molecules with micro/nano devices for the development of novel sensors with unique functions has attracted intensive interest and substantial research efforts in recent decades. Exciting progress has been achieved due to the combination of micro/nano fabrication technologies with biotechnologies, which introduced new concepts and scientific paradigms to this area. Fast advancements in micro/nano structured devices are providing unprecedented opportunities for them to couple with functional cells/molecules for the development of next generation of cell and molecular sensors. Micro/nano cell and molecular sensors have become increasingly important and found wide applications in a range of areas.

Recently, an impressive number of inventive designs and technological advances for micro/nano cell and molecular-based sensing have been made that greatly contribute to their potential practical applications. These types of micro/nano cell- and molecular-based sensors combine cells/molecules with micro/nano transducers to produce a biosensor and promise to provide a simple, accurate and inexpensive platform for various applications. However, the underlying mechanisms of micro/nano cell- and molecular-based sensing are still not fully clarified, which has become one of the main challenges for their further development and improvement. Considerable basic research on the cellular and molecular sensing mechanisms as well as the coupling of cells and molecules with micro/nano devices is still highly essential and favorable for the sake of practical applications and possible commercialization.

This book summarizes the development and implementation of micro/nano cell and molecular-based sensors. The organization of this book is based on the basic concepts and potential applications of micro/nano cell- and molecular-based sensors. In addition, this book attempts to introduce the key aspects and the future perspectives of micro/nano cell and molecular sensors, especially, the cell and molecular-based biosensors with electric cell–substrate impedance sensing (ECIS), microelectrode arrays (MEAs), light-addressable potentiometric sensor (LAPS), and field-effect transistors (FETs). Throughout the book, in every chapter, the most important and recent developments relevant to the subject matter are introduced.

This book focuses on cell- and molecular-based sensors using micro/nano devices as transducers. The definition, characteristics, type, and application of micro/nano cell and molecular sensors are introduced in this book. For living cell analysis, common micro/nano cell sensors are discussed to monitor the intra- and extracellular physiological signals, including the principle, design and fabrication, application. The two main cell sensors, ECIS- and MEA-based sensors are detailed on their cell impedance and potential study, respectively. For neurons study, neural network-based sensors are focused, including the formation of neural networks on solid surface and their chemical sensing. The book is also devoted to micro/nano molecular sensors and their applications. For molecular analysis, a label-free DNA field-effect device is presented for DNA sensing and application. Micro/nano electrochemical sensors are described for ion sensing and measurement, which is applied in field environment and food analysis. Moreover, the basic structures and properties of micro/nano material are also introduced for recent development and application in biomedicine and food analysis. At the end of this book, the future trends of micro/nano cell and molecular sensors is prospected to establish the micro/nano electromechanical cell/molecular system and Intelligent biosystem for biomimetic devices, health care, and rehabilitation.

The topics covered by this book provide a comprehensive summary of the current state of micro/nano cell and molecular sensors as well as their future development trends, which would be of great interest to the interdisciplinary community active in this area. This book is also suitable to be a comprehensive perspective for the scientists and engineers in a wide range of areas. In addition, this book could inspire and attract more and more researchers and scientists, especially the young scientists, to this area to further advance the development of micro/nano cell and molecular sensors and broaden their application fields.

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Ping Wang

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