BOOK REVIEW

Biosensors Based on Nanomaterials and Nanodevices

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REVIEWED BY TAIUK RIM

NANOTECHNOLOGY IS emerging as a core technology in the early 21st century. Due to the nature of nanoscale materials, astonishing advantages are being realized compared to bulk-scale properties, paticularly the powerful combination of nanotechnology and biotechnology, which can open a novel paradigm on human health care and well-being life care. For example, the unique and tunable optical properties of nanoscale materials such as quantum dots and nanoparticles enable biosensors with high reliability and sensitivity. The nanoscale electrical biosensors enhance sensitivity sufficiently to detect very low concentrations of analytes in any circumstances.

Biosensors Based on Nanomaterials and Nanodevices explains the essential technologies in nanotube-combined biosensors. From the optical biosensors using nanoscale materials, the book covers very recent technologies, including electrical, magnetic, and thermal biosensors. The concise theories of each sensor platform provide a good introduction for a general audience with a background at the university level.

Readers can find information about optical biosensors using nanomaterials and nanodevices in the first section of the book. The optical methods have been studied extensively because of their high potential for biosensing applications. These methods have the advantages of reliability, sensitivity, selectivity, and applicability for in vivo detection, and an extensive discussion is included in the text. In the beginning of the section, the fundamental theories and techniques provide a guideline for beginning scholars, and, using the plasmonic nanomaterials, the surface-enhanced Raman spectroscopy techniques are intensively introduced. Furthermore, photonic crystals and electroluminescence sensor platforms are explained with a new concept of the future biosensors.

In the second section, electrical biosensors are reviewed with novel nanomaterials such as diamond, carbon nanotubes, graphene, and inorganic semiconductor nanowires. The electrical techniques are also widely developed because they are suitable for handheld electronic devices. Using nanomaterials allows for the enhancement of the sensor characteristics, and novel applications, such as neuron interfacing and cellular detection, are enabled. Recent advances on these techniques with well-established theories and examples are found in this book.

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Nanomaterials are being developed not only for the detection but for in vivo treatment. Magnetic nanoparticles are described in the third section, including synthesis and applications. Readers can find recent information about bioseparation, drug delivery, and hyperthermia treatment using these particles. In the final section, other new concepts of nanoscale platforms are introduced, such as multiplexed detection using thermally addressable biosensors and microfluidics for biosensor applications.

The book provides excellent information on well-established and emerging techniques to readers who are interested in next-generation biosensor platforms. It has fulfilled the need to provide information on nanomaterial-based sensors with substantial theory. As a nanoscale semiconductor biosensor engineer, I recommend this book to colleagues and students. N

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