Silicon Carbide Biotechnology A Biocompatible Semiconductor For Advanced Biomedical Devices And Applications

Silicon Carbide Biotechnology: A Biocompatible Semiconductor for Advanced Biomedical Devices and Applications, Second Edition, provides the latest information on this wide-band-gap semiconductor material that the body does not reject as a foreign (i.e., not organic) material and its potential to further advance biomedical applications. SiC devices offer high power densities and low energy losses, enabling lighter, more compact, and higher efficiency products for biocompatible and long-term in vivo applications, including heart stent coatings, bone implant scaffolds, neurological implants and sensors, glucose sensors, brain-machine-interface devices, smart bone implants, and organ implants. This book provides the materials and biomedical engineering communities with a seminal reference book on SiC for developing technology, and is a resource for practitioners eager to identify and implement advanced engineering solutions to their everyday medical problems for which they currently lack long-term, cost-effective solutions. Discusses the properties, processing, characterization, and application of silicon carbide biomedical materials and related technology Assesses literature, patents, and FDA approvals for clinical trials, enabling rapid assimilation of data from current disparate sources and promoting the transition from technology R&D, to clinical trials Includes more on applications and devices, such as SiC nanowires, biofunctionalized devices, micro-electrode arrays, heart stent/cardiovascular coatings, and continuous glucose sensors, in this new edition

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This volume presents the proceedings of the CLAIB 2016, held in Bucaramanga, Santander, Colombia, 26, 27 & 28 October 2016. The proceedings, presented by the Regional Council of Biomedical Engineering for Latin America (CORAL), offer research findings, experiences and activities between institutions and universities to develop Bioengineering, Biomedical Engineering and related sciences. The conferences of the American Congress of Biomedical Engineering are sponsored by the International Federation for Medical and Biological Engineering (IFMBE), Society for Engineering in Biology and Medicine (EMBS) and the Pan American Health Organization (PAHO), among other organizations and international agencies to bring together scientists, academics and biomedical engineers in Latin America and other continents in an environment conducive to exchange and professional growth.

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Silicon Carbide (SiC) is a wide-band-gap semiconductor biocompatible material that has the potential to advance advanced biomedical applications. SiC devices offer higher power densities and lower energy losses, enabling lighter, more compact and higher efficiency products for biocompatible and long-term in vivo applications ranging from heart stent coatings and bone implant scaffolds to neurological implants and sensors. The main problem facing the medical community today is the lack of biocompatible materials that are also capable of electronic operation. Such devices are currently implemented using silicon technology, which either has to be hermetically sealed so it cannot interact with the body or the material is only stable in vivo for short periods of time. For long term use (permanent implanted devices such as glucose sensors, brain-machine-interface devices, smart bone and organ implants) a more robust material that the body does not recognize and reject as a foreign (i.e., not organic) material is needed. Silicon Carbide has been proven to be just such a material and will open up a whole new host of fields by allowing the development of advanced biomedical devices never before possible for long-term use in vivo. This book not only provides the materials and biomedical engineering communities with a seminal reference book on SiC that they can use to further develop the technology, it also provides a technology resource for medical doctors and practitioners who are hungry to identify and implement advanced engineering solutions to their everyday medical problems that currently lack long term, cost effective solutions. Discusses Silicon Carbide biomedical materials and technology in terms of their properties, processing, characterization, and application, in one book, from leading professionals and scientists Critical assesses existing literature, patents and FDA approvals for clinical trials, enabling the rapid assimilation of important data from the current disparate sources and promoting the transition from technology research and development to clinical trials Explores long-term use and applications in vivo in devices and applications with advanced sensing and semiconducting properties, pointing to new product devekipment particularly within brain trauma, bone implants, sub-cutaneous sensors and advanced kidney dialysis devices

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MEMS devices are found in many of today’s electronic devices and systems, from air-bag sensors in cars to smart phones, embedded systems, etc. Increasingly, the reduction in dimensions has led to nanometer-scale devices, called NEMS. The plethora of applications on the commercial market speaks for itself, and especially for the highly precise manufacturing of silicon-based MEMS and NEMS. While this is a tremendous achievement, silicon as a material has some drawbacks, mainly in the area of mechanical fatigue and thermal properties. Silicon carbide (SiC), a well-known wide-bandgap semiconductor whose adoption in commercial products is experiening exponential growth, especially in the power electronics arena. While SiC MEMS have been around for decades, in this Special Issue we seek to capture both an overview of the devices that have been demonstrated to date, as well as bring new technologies and progress in the MEMS processing area to the forefront. Thus, this Special Issue seeks to showcase research papers, short communications, and review articles that focus on: (1) novel designs, fabrication, control, and modeling of SiC MEMS and NEMS based on all kinds of actuation mechanisms; and (2) new developments in applying SiC MEMS and NEMS in consumer electronics, optical communications, industry, medicine, agriculture, space, and defense.

Dedicated to SiC-based 1D nanostructures, this book explains the properties and different growth methods of these nanostructures. It details carburization of silicon nanowires, a growth process for obtaining original Si-SiC core-shell nanowires and SiC nanotubes of high crystalline quality, thanks to the control of the siliconout-diffusion. The potential applications of these particular nano-objects is also discussed, with regards to their eventual integration in biology, energy and electronics.

This collection presents papers from the 150th Annual Meeting & Exhibition of The Minerals, Metals & Materials Society.