BIOMEDICAL MATERIALS AND DIAGNOSTIC DEVICES

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Biomedical Materials and Diagnostic Devices

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Illustration on front cover depicts interaction of stem cells into the nanobiomaterials for tissue engineering.

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Preface

Engineering of advanced biomaterials has resulted in striking solutions to multifarious biomedical and diagnostic conudrums, including cell separation, stem-cell scaffolds, targeted drug delivery, treatments for hyperthermia, automated DNA extraction, gene targeting, resonance imaging, biosensors, tissue engineering and organ regeneration. The biomedical materials with the most promising potential combine biocompatibility with the ability to precisely adjust biological phenomenon in a controlled manner. The world market for biomedicals and diagnostic devices is expanding rapidly and is currently valued over US$1000 trillion. Likewise, academic research has kept pace with the market demand with over 50,000 papers being published in the field last year. While the field of diagnostic devices has achieved considerable success, commercial returns in this sector are dominated by glucose sensing, despite the myriad of other possibilities for novel and useful analytical devices. Key areas such as drug delivery and regenerative medicine, not only represent huge opportunities to improve longevity and quality of life, but will also benefit from the fusion of ideas occurring within the emerging modern field of biomaterials. Molecular design for one application is finding utility across the field in a synergistic combination of solutions that brings together sensing, imaging, therapy and reconstruction in a plethora of exciting medical applications.

This book aims to provide an up-to-date overview of the fascinating field of biomedical materials and devices. This large volume includes twenty chapters divided into four main areas: biomedical materials, diagnostic devices, drug delivery and therapeutics, and tissue engineering and organ regeneration. It covers the latest research and developments in biomedical materials and medical devices: fabrication, performance and uses.

The chapters seek to address progress in successful design strategies for biomedical materials and devices such as the use of collagen, crystalline calcium orthophosphates, amphiphilic polymers, polycaprolactone, biomimetic assembly, bio-nanocomposite matrices, bio- silica, theranostic nanobiomaterials, intelligent drug delivery systems, elastomeric nanobiomaterials, electrospun nano-matrices, metal nanoparticles and a variety of biosensors. This book is intended to be suitable for a wide readership including university students and researchers from diverse backgrounds such as chemistry, materials science, physics, pharmacy, biological science and bio-medical engineering. It can

be used not only as a text book for both undergraduate and graduate students, but also as a review and reference book for researchers in the materials science, bioengineering, pharmacy, biotechnology and nanotechnology.

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