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Handbook of Clinical Nanomedicine
Design of Nanostructures for Theranostics Applications

Nanomedicine for the Treatment of Disease

Presenting unified coverage of the design and modeling of smart micro- and macrosystems, this book addresses fabrication issues and outlines the challenges faced by engineers working with smart sensors in a variety of applications. Part I deals with the fundamental concepts of a typical smart system and its constituent components. Preliminary fabrication and characterization concepts are introduced before design principles are discussed in detail. Part III presents a comprehensive account of the modeling of smart systems, smart sensors and actuators. Part IV builds upon the fundamental concepts to analyze fabrication techniques for silicon-based MEMS in more detail. Practicing engineers will benefit from the detailed assessment of applications in communications technology, aerospace, biomedical and mechanical engineering. The book provides an essential reference or textbook for graduates following a course in smart sensors, actuators and systems.

TiO₂ Nanoparticles

Computational Finite Element Methods in Nanotechnology demonstrates the capabilities of finite element methods in nanotechnology for a range of fields.

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Bringing together contributions from researchers around the world, it covers key concepts as well as cutting-edge research and applications to inspire new developments and future interdisciplinary research. In particular, it emphasizes the importance of finite element methods (FEMs) for computational tools in the development of efficient nanoscale systems. The book explores a variety of topics, including: A novel FE-based thermo-electrical-mechanical-coupled model to study mechanical stress, temperature, and electric fields in nano- and microelectronics The integration of distributed element, lumped element, and system-level methods for the design, modeling, and simulation of nano- and micro-electromechanical systems (N/MEMS) Challenges in the simulation of nanorobotic systems and macro-dimensions The simulation of structures and processes such as dislocations, growth of epitaxial films, and precipitation Modeling of self-positioning nanostructures, nanocomposites, and carbon nanotubes and their composites Progress in using FEM to analyze the electric field formed in needleless electrospinning How molecular dynamic (MD) simulations can be integrated into the FEM Applications of finite element analysis in nanomaterials and systems used in medicine, dentistry, biotechnology, and other areas The book includes numerous examples and case studies, as well as recent applications of microscale and nanoscale modeling systems with FEMs using COMSOL Multiphysics® and MATLAB®. A one-stop reference for professionals, researchers, and students, this is also an accessible introduction to computational FEMs in nanotechnology for those new to the field.

Nanotechnology in Dermatology

Biomedical Applications of Nanoparticles describes the most interesting and investigated biomedical applications of nanoparticles, emphasizing their therapeutic impact. Progress made in the therapy of severe diseases, such as cancer and difficult infections is strictly correlated to the scientific progress and technological development in the field of materials science. Nanoparticles have numerous therapeutic applications, starting with the design of new drugs, delivery systems, therapeutic materials, and their contribution to the development of preventive strategies. The book highlights the impact of nanoparticles on the therapy of infections, antimicrobial effect and also anti-cancer strategies. Successful examples are given throughout the book, along with analysis in order to improve future outcomes of novel therapies. Highlights the term nanotherapeutics and presents several classifications of nanotherapeutics from different points-of-view Presents the recent progress related to nanotherapeutics in the oral cavity Provides the recent progress in the field of biomedical nanoparticles

Functional Polymers for Nanomedicine

Nanostructures for the Engineering of Cells: Tissues and Organs showcases recent advances in pharmaceutical nanotechnology, with particular emphasis on tissue engineering, organ and cell applications. The book provides an up-to-date overview of organ targeting and cell targeting using nanotechnology. In addition, tissue engineering applications, such as skin regeneration are also discussed. Written by a diverse range of international academics, this book is a valuable research resource for researchers working in the biomaterials, medical and pharmaceutical industries. Explains how nanomaterials regulate different cell behavior and

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function as a carrier for different biomolecules Shows how nanobiomaterials and nanobiodevices are used in a range of treatment areas, such as skin tissue, wound healing and bone regeneration Discusses nanomaterial preparation strategies for pharmaceutical application and regenerative medicine

Theory and Applications of Nonparenteral Nanomedicines

The scope of nanotechnology in medical applications has expanded fast in the last two decades. With their unprecedented material properties, nanoscale materials present with unorthodox opportunities in a wide range of domains, including drug delivery and medical imaging. This book assembles the various facets of nanomedicine while discussing key issues such as physicochemical properties that enhance the appeal of nanomedicine. The book is an excellent resource for physicians, PhDs, and postdocs involved in nanomedicine research to learn and understand the scope and complexity of the subject. It begins with a short history of nanotechnology, followed by a discussion on the fundamental concepts and extraordinary properties of nanoscale materials, and then slowly unfolds into multiple chapters illustrating the uses of various nanomaterials in drug delivery, sensing, and imaging.

3D Printing Technology in Nanomedicine

Nanotechnology is a multidisciplinary field that is revolutionizing the way we detect and treat damage to the human body. Nanomedicine applies nanotechnology to highly specific medical interventions for the prevention, diagnosis, and treatment of diseases. They are increasingly being used to overcome biological barriers in the body to improve the way we deliver compounds to specific tissues and organs. In particular, nanomedicines have been shown to be beneficial for stabilizing therapeutic compounds, overcoming obstacles to cellular and tissue uptake, and improving biodistribution of compounds to target sites in vivo. Nanomedicines have demonstrated significant therapeutic advantages for a multitude of biomedical applications, however the clinical translation of these nanotechnology platforms has not progressed as quickly as the plethora of positive results would have suggested. Understanding the advances in nanomedicine to date and the challenges that still need to be overcome, will allow future research to improve on existing platforms and to address the current translational and regulatory limitations. This eBook "Advances and Challenges in Nanomedicine" has brought together experts in the fields of nanomedicine, nanotechnology, nanotoxicology, pharmaceuticals, manufacturing, and translation to discuss the application of nanotechnology to drug delivery. This information is presented as original research, opinion, perspective, and review articles. The goal of this eBook is to generate collaborative discussion on the current status, general trends, challenges, strategies, and future direction of pharmaceutical nanotechnology, as well as highlight current and emerging nanoparticulate platforms with potential medical applications.

Handbook of Harnessing Biomaterials in Nanomedicine

This book focuses on the recent advances in nanomedicine and tissue engineering.

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It outlines the basic tools and novel approaches that are becoming available in nanomedicine and tissue engineering and considers the full range of nanomedical applications which employ molecular nanotechnology inside the human body, from the perspective of a future practitioner in an era of widely available nanomedicine. Topics include: Health benefits of phytochemicals and application of superparamagnetic nanoparticles for hyperthermia Silver nanoparticles in nanomedicine Optical diagnostic of molecules and cells using nanotechnology Nanoparticulate drug delivery system for antiviral drugs Liposomal drug delivery systems, nanoemulsifying drug delivery system (SNEDS) Functionalization of tissue engineering scaffolds Induction of angiogenesis in scaffolds Many other recent achievements Written by some of the most innovative minds in medicine and tissue engineering, this book considers the full range of nanomedical applications which employ molecular nanotechnology inside the human body and will help professionals understand cutting-edge and futuristic areas of nanomedicine and tissue engineering research. Readers will find insightful discussions on nanostructured intelligent materials and devices that are considered technically feasible and that have a high potential to produce advances in medicine in the near future.

Nanotechnology Applications for Tissue Engineering

This book is an introduction to the emerging field of nanomedicine and its applications to health care. It describes the many multidisciplinary challenges facing nanomedicine and discusses the required collaboration between chemists, physicists, engineers and clinicians. The book introduces the reader to nanomedicine's vast potential to improve and extend human life through the application of nanomaterials in diagnosis and treatment of disease.

Nanomedicine Design of Particles, Sensors, Motors, Implants, Robots, and Devices

This new volume, *Nanomedicine for the Treatment of Disease: From Concept to Application*, looks at the application of nanomedicines with a particular focus on their use in the treatment of diseases. The chapters in this volume, contributed by eminent scientists, researchers, and nanotechnologists from across the globe, highlight key advancements, challenges, and opportunities in the area of application of nanomedicines for disease treatment. They explore the design and development of therapeutic nanocarriers for targeting drugs for satiating the demands of disease treatment process. The volume explores the use nanomedicines for the diagnosis and treatment of a multitude various diseases and health conditions, including respiratory diseases, neurological disorders, genetic diseases, pulmonary fungal infections, neuroAIDS, cardiovascular disorders, gastric and colonic diseases, skin disorders, cancer, brain tumors, leishmaniasis and other visceral diseases, hypertension, and ocular diseases.

Smart Material Systems and MEMS

Nanomedicine has emerged as a novel field in medicine integrating nano-scale technologies with materials sciences, chemistry and biology. The medical

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application of nanotechnology has the potential to revolutionize diagnosis and therapy and bring this new field from a notion into reality while impacting the lives of millions around the world. This second edition compiles and details the latest cutting-edge research in science and medicine from the interdisciplinary standpoint who are currently revolutionizing drug delivery techniques through the development of nanomedicines. Edited by Dan Peer, a prominent bio-nanotechnologist, this book will attract anyone involved materials sciences, chemistry, biology and medicine that would like to design applications in the medical field of nanotechnology towards cancer therapy, inflammation, viral infection, imaging and toxicity.

Nanomedicines

Nanomedicine - the application of nanotechnology to human health - is a promising field of research at the interface of physical, chemical, biological, and medical science. Recent advances have made it possible to analyze biological systems at cellular and subcellular levels, offering numerous promising approaches to improve medical diagnosis and therapy. It is expected that nanomedicine will have a great impact especially on drug delivery and imaging. In this context, the development of targeted, highly specific nanoparticles is of pivotal importance. The results of these advances will offer personalized diagnostic tools and treatments in the future. Based on the 2nd Else Kröner-Fresenius-Symposium, this book presents a broad spectrum of topics ranging from nanoscale drug delivery/drug design to nanotoxicity and from diagnostics and imaging to therapeutic applications including antibody therapies. The contributions are authored by leading experts in the field and provide an excellent overview of the current knowledge in nanomedicine. Due to the interdisciplinary nature of the subject area this volume will be of special interest to physicians, biologists, chemists, engineers, and physicists as well as to students in the respective fields.

Principles of Nanomedicine

Recent advances in nanomedicine offer ground-breaking methods for the prevention, diagnosis and treatment of some fatal diseases. Amongst the most promising nanomaterials being developed are magnetic nanomaterials, including magnetic nanoparticles and magnetic nanosensors. Some nanomagnetic medical applications are already commercially available with more set to be released over the coming years. Nanomedicine, Design and Applications of Magnetic Nanomaterials, Nanosensors and Nanosystems presents a comprehensive overview of the biomedical applications of various types of functional magnetic materials. The book provides an introduction to magnetic nanomaterials before systematically discussing the individual materials, their physical and chemical principles, fabrication techniques and biomedical applications. This methodical approach allows this book to be used both as a textbook for beginners to the subject and as a convenient reference for professionals in the field. Discusses magnetic nanoparticles including nanowires, nanotubes, zero-dimensional nanospheres and naturally existing magnetosomes. Examines intrinsically smart magnetic materials and describes their part in the development of biomedical sensors and biochips, which are often used in biomedical tests. Integrates the research efforts of different disciplines - from materials sciences to biology and

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electrical engineering to medicine – in order to provide a unified and authoritative guide to a richly interdisciplinary field. This volume is of great appeal to students and researchers in the fields of electrical and electronic engineering, biomedical engineering, nanotechnology, materials science, physics, medicine and biology. It is also of interest to practising engineers, materials scientists, chemists and research medical doctors involved in the development of magnetic materials and structures for biomedical applications.

Nanotechnology

Nano-carriers for Drug Delivery: Nanoscience and Nanotechnology in Drug Delivery presents recent discoveries in research on the pharmaceutical applications of the various types of nanosystem-based drug delivery systems. As many nanosystems have reached the market over the past decade, this book proves their benefits to patients. It explores these new carriers and the advances in drug delivery they have facilitated. Reflecting the interdisciplinary nature of the subject matter, the book includes experts from different fields, and with various backgrounds and expertise. It will appeal to researchers and students from different disciplines, such as materials science, technology and various biomedical fields. Coverage includes industrial applications that bridge the gap between lab-based research and practical industrial use. The resulting work is a reference and practical source of guidance for researchers, students and scientists working in the fields of nanotechnology, materials science and technology and biomedical science. Enables readers from different fields to access recent research and protocols across traditional boundaries Focuses on protocols and techniques, as well as the knowledge base of the field, thus enabling those in R&D to learn about, and successfully deploy, cutting-edge techniques Includes sections on nanocarrier systems

Nanomaterials for Clinical Applications

Nanotechnology for Biomedical Imaging and Diagnostics: From Nanoparticle Design to Clinical Applications reflects upon the increasing role of nanomaterials in biological and medical imaging, presenting a thorough description of current research as well as future directions. With contributions from experts in nanotechnology and imaging from academia, industry, and healthcare, this book provides a comprehensive coverage of the field, ranging from the architectural design of nanomaterials to their broad imaging applications in medicine. Grouped into three sections, the book: Elucidates all major aspects of nanotechnology and bioimaging Provides comprehensive coverage of the field, ranging from the architectural design of nanomaterials to their broad imaging applications in medicine Written by well-recognized experts in academia, industry, and healthcare, will be an excellence source of reference With a multidisciplinary approach and a balance of research and diagnostic topics, this book will appeal to students, scientists, and healthcare professionals alike

Nanostructures for the Engineering of Cells, Tissues and Organs

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Theory and Applications of Nonparenteral Nanomedicines presents thoroughly analysed data and results regarding the potential of nanomedicines conceived by diverse non-parenteral routes. In the context of nanotechnology-based approaches, various routes such as oral, pulmonary, transdermal, delivery and local administration of nanomedicine have been utilized for the delivery of nanomedicine. This book discusses the non-parenteral application of nanomedicine, its regulatory implications, application of mucus penetrating nanocarrier, and detailed chapters on development of nanomedicines developed for drug delivery by various route. Beginning with a brief introduction to the non-parenteral delivery of nanomedicine and the safety and regulatory implications of the nanoformulations, further chapters discuss the physiology of the biological barriers, the specificity of the nanocarriers as well as their multiple applications. Theory and Applications of Nonparenteral Nanomedicines helps clinical researchers, researchers working in pharmaceutical industries, graduate students, and anyone working in the development of non-parenteral nanomedicines to understand the recent progress in the design and development of nanoformulations compatible with non-parenteral applications. Contains a comprehensive review of non-parenteral nanomedicines Provides analysis of non-parenteral methods of nanomedicines including regulatory implications and future applications Explores a wide range of promising approaches for non-parenteral drug delivery using the latest advancement in nanomedicine written by experts in industry and academia

Nanomedicine

Nanotechnology-Based Approaches for Targeting and Delivery of Drugs and Genes provides an overview of the important aspects of nanomedicine in order to illustrate how to design and develop novel and effective drug delivery systems using nanotechnology. The book is organized into three sections, beginning with an introduction to nanomedicine and its associated issues. Section two discusses the latest technologies in nanomedicine, while the third section covers future developments and challenges in the field. By focusing on the design, synthesis, and application of a variety of nanocarriers in drug and gene delivery, this book provides pharmaceutical and materials science students, professors, clinical researchers, and industry scientists with a valuable resource aimed at tackling the challenges of delivering drugs and genes in a more targeted manner. Explores a wide range of promising approaches for the diagnosis and treatment of diseases using the latest advances in cutting-edge nanomedical technologies Contains contributions from world-renowned experts and researchers working in the area of nanomedicine and drug delivery Covers the associated challenges and potential solutions to working with nanotechnology in drug delivery Highlights crucial topics, such as biopharmaceutical and toxicity issues, quality by design, drug targeting, and more

Biomedical Applications of Functionalized Nanomaterials

This book covers the most recent advances in using nanoparticles for biomedical imaging, including magnetic resonance imaging (MRI), magnetic particle imaging (MPI), nuclear medicine, ultrasound (US) imaging, computed tomography (CT), and optical imaging. Topics include nanoparticles for MRI and MPI, siRNA delivery,

theranostic nanoparticles for PET imaging of drug delivery, US nanoparticles for imaging drug delivery, inorganic nanoparticles for targeted CT imaging, and quantum dots for optical imaging. This book serves as a valuable resource for the fundamental science of diagnostic nanoparticles and their interactions with biological targets, providing a practical handbook for improved detection of disease and its clinical implementation.

Nanocarriers for Drug Delivery

A unique book that summarizes the properties, toxicology, and biomedical applications of TiO₂-based nanoparticles. Nanotechnology is becoming increasingly important for products used in our daily lives. Nanometer-sized titanium dioxide (TiO₂) are widely used in industry for different purposes, such as painting, sunscreen, printing, cosmetics, biomedicine, and so on. This book summarizes the advances of TiO₂ based nanobiotechnology and nanomedicine, covering materials properties, toxicological research, and biomedical application, such as antibacter, biosensing, and cancer theranostics. It uniquely integrates the TiO₂ applications from physical properties, toxicology to various biomedical applications, and includes black TiO₂ based cancer theranostics. Beginning with a comprehensive introduction to the properties and applications of nanoparticles, TiO₂ Nanoparticles: Applications in Nanobiotechnology, Theranostics and Nanomedicine offers chapters on: Toxicity of TiO₂ Nanoparticles; Antibacterial Applications of TiO₂ Nanoparticles; Surface Enhanced Raman Spectrum of TiO₂ Nanoparticle for Biosensing (TiO₂ Nanoparticle Served as SERS Sensing Substrate); TiO₂ as Inorganic Photosensitizer for Photodynamic Therapy; Cancer Theranostics of Black TiO₂ Nanoparticles; and Neurodegenerative Disease Diagnostics and Therapy of TiO₂-Based Nanoparticles. This title: -Blends the physical properties, toxicology of TiO₂ nanoparticles to the many biomedical applications -Includes black TiO₂ based cancer theranostics in its coverage -Appeals to a broad audience of researchers in academia and industry working on nanomaterials-based biosensing, drug delivery, nanomedicine TiO₂ Nanoparticles: Applications in Nanobiotechnology, Theranostics and Nanomedicine is an ideal book for medicinal chemists, analytical chemists, biochemists, materials scientists, toxicologists, and those in the pharmaceutical industry.

Design and Applications of Nanoparticles in Biomedical Imaging

Nanomedicines and nanopharmacology is a rapidly developing and evolving field with new techniques and applications under constant development. This book will provide an overview of the chemistry of nanocarrier design and the considerations that need to be made when developing a nanomedicine. Providing an understanding of the relationship of nanocarrier, drug and targeting moieties and physico-chemical properties, this title will provide an accurate and current representation of the field by addressing the promises, prospects and pitfalls of nanomedicine. Covering a wide range of areas in detail, this book will provide an excellent companion for medicinal chemists, pharmacologists and biochemists working in industry or academia.

Nanotechnology in Drug Delivery

There is a clear need for innovative technologies to improve the delivery of therapeutic and diagnostic agents in the body. Recent breakthroughs in nanomedicine are now making it possible to deliver drugs and therapeutic proteins to local areas of disease or tumors to maximize clinical benefit while limiting unwanted side effects. *Nanomedicine in Drug Delivery* gives an overview of aspects of nanomedicine to help readers design and develop novel drug delivery systems and devices that build on nanoscale technologies. Featuring contributions by leading researchers from around the world, the book examines: The integration of nanoparticles with therapeutic agents The synthesis and characterization of nanoencapsulated drug particles Targeted pulmonary nanomedicine delivery using inhalation aerosols The use of biological systems—bacteria, cells, viruses, and virus-like particles—as carriers to deliver nanoparticles Nanodermatology and the role of nanotechnology in the diagnosis and treatment of skin disease Nanoparticles for the delivery of small molecules, such as for gene and vaccine delivery The use of nanotechnologies to modulate and modify wound healing Nanoparticles in bioimaging, including magnetic resonance, computed tomography, and molecular imaging Nanoparticles to enhance the efficiency of existing anticancer drugs The development of nanoparticle formulations Nanoparticles for ocular drug delivery Nanoparticle toxicity, including routes of exposure and mechanisms of toxicity The use of animal and cellular models in nanoparticles safety studies With its practical focus on the design, synthesis, and application of nanomedicine in drug delivery, this book is a valuable resource for clinical researchers and anyone working to tackle the challenges of delivering drugs in a more targeted and efficient manner. It explores a wide range of promising approaches for the diagnosis and treatment of diseases using cutting-edge nanotechnologies.

Introduction to Nanomedicine and Nanobioengineering

3D Printing Technology in Nanomedicine provides an integrated and introductory look into the rapidly evolving field of nanobiotechnology. It demystifies the processes of commercialization and discusses legal and regulatory considerations. With a focus on nanoscale processes and biomedical applications, users will find this to be a comprehensive resource on how 3D printing can be utilized in a range of areas, including the diagnosis and treatment of a variety of human diseases. Examines the emerging market of 3D-printed biomaterials and their clinical applications, with a particular focus on both commercial and premarket tools Examines the promising market of 3D-printed nanoparticles, nanomaterial, biomaterials, composite nanomaterial and their clinical applications in the cardiovascular and chemotherapy realms Develops the concept of integrating different technologies along the hierarchical structure of biological systems

Nanoparticles for Biomedical Applications

Nanotechnology is at the forefront of advances in medicine. *Nanomedicine: Technologies and applications* provides an important review of this exciting technology and its growing range of applications. After an introduction to nanomedicine, part one discusses key materials and their properties, including

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nanocrystalline metals and alloys, nanoporous gold and hydroxyapatite coatings. Part two goes on to review nanomedicine for therapeutics and imaging, before nanomedicine for soft tissue engineering is discussed in part three, including organ regeneration, skin grafts, nanotubes and self-assembled nanomaterials. Finally, nanomedicine for bone and cartilage tissue engineering is the focus of part four, with electrically active biocomposites as smart scaffolds investigated, as is cartilage and bone tissue engineering, regeneration and replacement. With its distinguished editor and international team of expert contributors, *Nanomedicine: Technologies and applications* is an indispensable guide for all those involved in the research, development and application of this exciting technology, whilst providing a comprehensive introduction for students and academics interested in this field. Provides an important review of nanomedicine technology and its growing range of applications Discusses key nanomedicine materials and their properties, including nanocrystalline metals and alloys, nanoporous gold and hydroxyapatite coatings Reviews nanomedicine for therapeutics and imaging and nanomedicine for soft tissue engineering

Hybrid Nanomaterials

Nanomaterials in Clinical Medicine: Case Studies in Nanomedicines focuses on the nanomaterials that can be formulated as drug delivery vehicles, such as liposomes, micelles, nanoemulsions and nanogels. Their physicochemical, morphological, thermo-dynamical and nanotoxicological properties are analyzed with respect to the design and development of drug delivery nanosystems for the encapsulation of an active pharmaceutical ingredient and its controlled release. Each chapter covers basic properties, the nanosystem (e.g., liposomes), the added value in drug delivery and targeting, and future perspectives. Case studies and examples of how nanomaterials are being used in clinical medicine, including marketed liposomal medicines and medical utility and regimens are also included. Particular attention is given to new nanocarriers, such as elastic liposomes, lipid polymeric hybrid nanoparticles, organogel, nanofibers carbon nanomaterials, quantum dots and inorganic nanoparticles. This book is an important information source for those wanting to increase their understanding of what major nanomaterials are being used to create more effective drug delivery systems. Summarizes the major nanomaterials used in clinical medicine, explaining how their properties make them suitable for this purpose Explains how nanomaterials are used to create increasingly efficient drug delivery vehicles Includes real-life examples, demonstrating how nanomaterials are being used in medical practice

Nanomedicine - Basic and Clinical Applications in Diagnostics and Therapy

Design of Nanostructures for Versatile Therapeutic Applications focuses on antimicrobial, antioxidant and nutraceutical applications of nanostructured materials. Many books discuss these subjects, but not from a pharmaceutical point-of-view. This book covers novel approaches related to the modulation of microbial biofilms, antimicrobial therapy and encapsulate polyphenols as antioxidants. Written by an internationally diverse group of academics, this book is an important reference resource for researchers, both in biomaterials science and the

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pharmaceutical industry. Assesses the most recently developed nanostructures that have potential antimicrobial properties, explaining their novel mechanical aspects Shows how nanoantibiotics can be used to more effectively treat disease Provides a cogent summary of recent developments in nanoantimicrobial discovery, allowing readers to quickly familiarize themselves with the topic

Nanotechnology-Based Approaches for Targeting and Delivery of Drugs and Genes

This handbook (55 chapters) provides a comprehensive roadmap of basic research in nanomedicine as well as clinical applications. However, unlike other texts in nanomedicine, it not only highlights current advances in diagnostics and therapeutics but also explores related issues like nomenclature, historical developments, regulatory aspects, nanosim

Medical Nanotechnology and Nanomedicine

This important new book provides the fundamental understanding of the peptide and protein drug delivery systems with a special focus on their nanotechnology applications. Addressing an increasing interest in peptide and protein drug delivery systems in both academic and industrial circles worldwide, this book fills the need for a comprehensive review and assessment of conventional and nonconventional routes of administration.

Nanotechnology Applications for Cancer Chemotherapy

Design of Nanostructures for Theranostics Applications focuses on the theranostics applications of nanostructures. In particular, multifunctional nanoparticles for diagnostics and treatment of different diseases, including those relating to the blood-brain barrier, are discussed in detail. Chapters explore different type of nanostructures, covering design, fabrication, functionalization and optimization, helping readers obtain the desired properties. Written by a diverse range of international academics, this book is a valuable reference resource for those working in both nanoscience and the pharmaceutical industry. Explores how the design of a range of nanomaterials make them effective theranostic agents, including multifunctional core-shell nanostructures, mesoporous silica nanoparticles, and quantum dots Shows how nanomaterials are used effectively for a range of diseases, including breast cancer, prostate cancer and neurological disorders Assesses the pros and cons of using different nanomaterials for different types of treatment

Nanomedicine in Drug Delivery

Considering the fluid nature of nano breakthroughs—and the delicate balance between benefits and consequences as they apply to medicine—readers at all levels require a practical, understandable base of information about these developments to take greatest advantage of them. Medical Nanotechnology and Nanomedicine meets that need by introducing non-experts to nanomedicine and its evolving organizational infrastructure. This practical reference investigates the

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impact of nanotechnology on applications in medicine and biomedical sciences, and the broader societal and economic effects. Eschewing technological details, it focuses on enhancing awareness of the business, regulatory, and administrative aspects of medical applications. It gives readers a critical, balanced, and realistic evaluation of existing nanomedicine developments and future prospects—an ideal foundation upon which to plan and make decisions. Covers the use of nanotechnology in medical applications including imaging, diagnosis and monitoring, drug delivery systems, surgery, tissue regeneration, and prosthetics Part of the Perspectives in Nanotechnology series—which contains broader coverage of the societal implications of nanotechnology—this book can be used as a standalone reference. Organized by historical perspective, current status, and future prospects, this powerful book: Explores background, definitions and terms, and recent trends and forces in nanomedicine Surveys the landscape of nanomedicine in government, academia, and the private sector Reviews projected future directions, capabilities, sustainability, and equity of nanomedicine, and choices to be made regarding its use Includes graphical illustrations, references, and keywords to reinforce concepts and aid further research In its assessment of alternative and sometimes conflicting concepts proposed for the application of nanotechnology to medicine, this book surveys major initiatives and the work of leading labs and innovators. It uses informative examples and case summaries to illustrate proven accomplishments and imagined possibilities in research and development.

Nanomedicine

Over the last decade, an unprecedented expansion in the field of nanomedicine has resulted in the development of new nanomaterials for diagnosis and therapy of various diseases such as cancer. This book covers the design, synthesis and applications of various functionally-hybridized nanomaterials for biomedical applications. It includes strategies for design and synthesis of hybrid nanomaterials, surface engineering of various nanoparticle-based hybrid nanosystems for cancer imaging and therapy, toxicity aspects of nanomaterials and the challenges in translation research of hybrid nanomaterials.

Application of Nanotechnology in Drug Delivery

Nanoparticles for Biomedical Applications: Fundamental Concepts, Biological Interactions and Clinical Applications brings into one place information on the design and biomedical applications of different classes of nanoparticles. While aspects are dealt with in individual journal articles, there is not one source that covers this area comprehensively. This book fills this gap in the literature. Outlines an in-depth review of biomedical applications of a variety of nanoparticle classes Discusses the major techniques for designing nanoparticles for use in biomedicine Explores safety and regulatory aspects for the use of nanoparticles in biomedicine

Nanotechnology for Biomedical Imaging and Diagnostics

Nanotechnology: An Introduction, Second Edition, is ideal for the newcomer to nanotechnology, someone who also brings a strong background in one of the

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traditional disciplines, such as physics, mechanical or electrical engineering, or chemistry or biology, or someone who has experience working in microelectromechanical systems (MEMS) technology. This book brings together the principles, theory, and practice of nanotechnology, giving a broad, yet authoritative, introduction to the possibilities and limitations of this exciting and rapidly developing field. The book's author, Prof Ramsden, also discusses design, manufacture, and applications and their impact on a wide range of nanotechnology areas. Provides an overview of the rapidly growing and developing field of nanotechnology Focuses on key essentials, and structured around a robust anatomy of the subject Brings together the principles, theory, and practice of nanotechnology, giving a broad, yet authoritative, introduction to the possibilities and limitations of this exciting and rapidly developing field

Nanomedicine

This book collects reviews and original articles from eminent experts working in the interdisciplinary arena of nanotechnology use in drug delivery. From their direct and recent experience, the readers can achieve a wide vision on the new and ongoing potentialities of nanotechnology application of drug delivery. Since the advent of analytical techniques and capabilities to measure particle sizes in nanometer ranges, there has been tremendous interest in the use of nanoparticles for more efficient methods of drug delivery. On the other hand, this reference discusses advances in design, optimization, and adaptation of gene delivery systems for the treatment of cancer, cardiovascular, pulmonary, genetic, and infectious diseases, and considers assessment and review procedures involved in the development of gene-based pharmaceuticals.

Polymer Science and Nanotechnology

Nanotechnology in Dermatology is the first book of its kind to address all of the important and rapidly growing aspects of nanotechnology as it relates to dermatology. In the last few years there has been an explosion in research and development for products and devices related to nanotechnology, including numerous applications for consumers, physicians, patients, and industry. Applications are underway in medicine and dermatology for the early detection, diagnosis, and targeted therapy of disease, and nanodesigned materials and devices are expected to be faster, smaller, more powerful, more efficient, and more versatile than their traditional counterparts. Written by experts working in this exciting field, Nanotechnology in Dermatology specifically addresses nanotechnology in consumer skin care products, in the diagnosis of skin disease, in the treatment of skin disease, and the overall safety of nanotechnology. The book also discusses future trends of this ever-growing and changing field, providing dermatologists, pharmaceutical companies, and consumer cosmetics companies with a clear understanding of the advantages and challenges of nanotechnology today.

Nanomedicine and Tissue Engineering

Tissue engineering involves seeding of cells on bio-mimicked scaffolds providing

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adhesive surfaces. Researchers though face a range of problems in generating tissue which can be circumvented by employing nanotechnology. It provides substrates for cell adhesion and proliferation and agents for cell growth and can be used to create nanostructures and nanoparticles to aid the engineering of different types of tissue. Written by renowned scientists from academia and industry, this book covers the recent developments, trends and innovations in the application of nanotechnologies in tissue engineering and regenerative medicine. It provides information on methodologies for designing and using biomaterials to regenerate tissue, on novel nano-textured surface features of materials (nano-structured polymers and metals e.g.) as well as on theranostics, immunology and nano-toxicology aspects. In the book also explained are fabrication techniques for production of scaffolds to a series of tissue-specific applications of scaffolds in tissue engineering for specific biomaterials and several types of tissue (such as skin bone, cartilage, vascular, cardiac, bladder and brain tissue). Furthermore, developments in nano drug delivery, gene therapy and cancer nanotechnology are described. The book helps readers to gain a working knowledge about the nanotechnology aspects of tissue engineering and will be of great use to those involved in building specific tissue substitutes in reaching their objective in a more efficient way. It is aimed for R&D and academic scientists, lab engineers, lecturers and PhD students engaged in the fields of tissue engineering or more generally regenerative medicine, nanomedicine, medical devices, nanofabrication, biofabrication, nano- and biomaterials and biomedical engineering. Provides state-of-the-art knowledge on how nanotechnology can help tackling known problems in tissue engineering Covers materials design, fabrication techniques for tissue-specific applications as well as immunology and toxicology aspects Helps scientists and lab engineers building tissue substitutes in a more efficient way

Design of Nanostructures for Versatile Therapeutic Applications

Recent advances in nanomedicine offer ground-breaking methods for the prevention, diagnosis and treatment of some fatal diseases. Amongst the most promising nanomaterials being developed are magnetic nanomaterials, including magnetic nanoparticles and magnetic nanosensors. Some nanomagnetic medical applications are already commercially available with more set to be released over the coming years. Nanomedicine, Design and Applications of Magnetic Nanomaterials, Nanosensors and Nanosystems presents a comprehensive overview of the biomedical applications of various types of functional magnetic materials. The book provides an introduction to magnetic nanomaterials before systematically discussing the individual materials, their physical and chemical principles, fabrication techniques and biomedical applications. This methodical approach allows this book to be used both as a textbook for beginners to the subject and as a convenient reference for professionals in the field. Discusses magnetic nanoparticles including nanowires, nanotubes, zero-dimensional nanospheres and naturally existing magnetosomes. Examines intrinsically smart magnetic materials and describes their part in the development of biomedical sensors and biochips, which are often used in biomedical tests. Integrates the research efforts of different disciplines – from materials sciences to biology and electrical engineering to medicine – in order to provide a unified and authoritative guide to a richly interdisciplinary field. This volume is of great appeal to students

and researchers in the fields of electrical and electronic engineering, biomedical engineering, nanotechnology, materials science, physics, medicine and biology. It is also of interest to practising engineers, materials scientists, chemists and research medical doctors involved in the development of magnetic materials and structures for biomedical applications.

Advances and Challenges in Nanomedicine

Applications of Nanotechnology in Cancer Chemotherapy offers a complete and concise summary of nanotechnological interventions for cancer management. It highlights the basics of oncology, the cancer microenvironment, targets for active drug delivery, the underlying mechanisms and molecular pathways to enhance the drug delivery to the cancer site. The book discusses the principles of basic and innovative nanocarrier-based therapeutic approaches to modulate the progression of the disease. In addition, this book also explores the evolving targeting approaches specific to the cancer site and type. The scope of the book is not limited to targeted drug delivery for various cancers, but also explores the advancements in cancer imaging and diagnostics employing the nanotechnological tools. Emphasis has been given on the important evaluation techniques like in-vitro cell culture and in-vivo animal models to assess the performance of cancer nanomedicines. The book includes clinical study reports of various drug moieties explored using variety of nanoconstructs in myriad cancer conditions with the input of global market and pharmacoeconomics. Discusses how organic and inorganic nanoplateforms are being used in cancer treatment Shows how nanotechnology is being used to create new and more accurate diagnostic tools Surveys the current generation of cancer nanomedicines, assessing their advantages and challenges

Computational Finite Element Methods in Nanotechnology

Polymer Science and Nanotechnology: Fundamentals and Applications brings together the latest advances in polymer science and nanoscience. Sections explain the fundamentals of polymer science, including key aspects and methods in terms of molecular structure, synthesis, characterization, microstructure, phase structure and processing and properties before discussing the materials of particular interest and utility for novel applications, such as hydrogels, natural polymers, smart polymers and polymeric biomaterials. The second part of the book examines essential techniques in nanotechnology, with an emphasis on the utilization of advanced polymeric materials in the context of nanoscience. Throughout the book, chapters are prepared so that materials and products can be geared towards specific applications. Two chapters cover, in detail, major application areas, including fuel and solar cells, tissue engineering, drug and gene delivery, membranes, water treatment and oil recovery. Presents the latest applications of polymers and polymeric nanomaterials, across energy, biomedical, pharmaceutical, and environmental fields Contains detailed coverage of polymer nanocomposites, polymer nanoparticles, and hybrid polymer-metallic nanoparticles Supports an interdisciplinary approach, enabling readers from different disciplines to understand polymer science and nanotechnology and the interface between them

Biomedical Applications of Nanoparticles

Interest in the application of nanotechnology to medicine has surged in recent years and could transform the way we diagnose, treat and prevent diseases such as cancer. However, the clinical success of nanomedicine is limited because of problems with toxicity and therapeutic efficacy. To overcome this it is essential to produce new nanosystems with specific functions, which can be achieved by designing new polymers with particular properties that can be used for nanomedicine. *Functional Polymers for Nanomedicine* provides a complete overview of the different strategies for designing polymers for nanomedicine applications. The first part of the book looks at the current problems and direction in nanomedicine including a review of current design and targeting of nanocarriers. The second part explores the design of polymers with different functions including hyperbranched polymers, polymersomes, polysaccharides, polymeric micelles and zwitterionic polymers and their applications in gene therapy and drug delivery. This timely book is edited by a leading scientist in nanomedicine and provides a suitable introduction and reference source for advanced undergraduates, postgraduates and academic and industrial researchers in polymer science, nanotechnology and pharmacy interested in materials for medical applications.

Handbook of Clinical Nanomedicine

Annotation This resource outlines the new tools that are becoming available in nanomedicine. The book presents an integrated set of perspectives that describe where advancements are now and where they should be headed to put nanomedicine devices into applications as quickly as possible

Design of Nanostructures for Theranostics Applications

Biomedical Applications of Functionalized Nanomaterials: Concepts, Development and Clinical Translation presents a concise overview of the most promising nanomaterials functionalized with ligands for biomedical applications. The first section focuses on current strategies for identifying biological targets and screening of ligand to optimize anchoring to nanomaterials, providing the foundation for the remaining parts. Section Two covers specific applications of functionalized nanomaterials in therapy and diagnostics, highlighting current practice and addressing major challenges, in particular, case studies of successfully developed and marketed functionalized nanomaterials. The final section focuses on regulatory issues and clinical translation, providing a legal framework for their use in biomedicine. This book is an important reference source for worldwide drug and medical devices policymakers, biomaterials scientists and regulatory bodies. Provides an overview of the methodologies for biological target identification and ligand screening Includes case studies showing the development of functionalized nanomaterials and their biomedical applications Highlights the importance of functionalized nanomaterials for drug delivery, diagnostics and regenerative medicine applications

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