

An Introduction to Nanoscience and Nanotechnology

Inorganic Nanoparticles vs Organic Nanoparticles

This book provides up-to-date knowledge of the promising field of Nanobiotechnology with emphasis on the mitigation approaches to combat plant abiotic stress factors, including drought, salinity, waterlog, temperature extremes, mineral nutrients, and heavy metals. These factors adversely affect the growth as well as yield of crop plants worldwide, especially under the global climate change. Nanobiotechnology is viewed to revolutionize crop productivity in future. The chapters discuss the status and prospects of this cutting-edge technology toward understanding tolerance mechanisms, including signaling molecules and enzymes regulation in addition to the applications of Nanobiotechnology to combat individual abiotic stress factors.

The impact and importance of nanotechnology continues to grow, and nanomedicine and biotechnology have become areas of increased development. Biomedical engineers who work with biological processes and structures must have a deeply rooted understanding of the role of bionanotechnology, a rapidly evolving sector of the nanotechnology field. Bionanotechnology II: Global Prospects, a follow-up to the editor's highly successful first volume, contains 26 entirely new contributions that provide a broad survey of research shaping this critical field. With coverage of technical and nontechnical areas, the book offers representative reporting on a wide variety of activity from around the world. It discusses the role of nanotechnology in novel medical devices, bioanalytical technologies, and nanobiomaterials. Topics discussed include: Emerging microscale technologies Bionanotech-based water treatment Tissue engineering and drug delivery Antimicrobial nanomaterials in the textile industry Bionanotechnology applications in plants and agriculture With contributions from researchers in Israel, Egypt, Iran, Jordan, Singapore, South Africa, Turkey, Thailand, Argentina, the United Kingdom, and the United States, this volume presents a worldwide perspective on some of the critical areas shaping bionanotechnology today.

Nanotechnology in Diagnosis, Treatment and Prophylaxis of Infectious Diseases delivers comprehensive coverage of the application of nanotechnology to pressing problems in infectious disease. This text equips readers with cutting-edge knowledge of promising developments and future prospects in nanotechnology, paying special attention to microbes that are now resistant to conventional antibiotics, a concerning problem in modern medicine. Readers will find a thorough discussion of this new approach to infectious disease treatment, including the reasons nanotechnology presents a promising avenue for the diagnosis, treatment, and prophylaxis of infectious diseases. Provides a comprehensive overview of the use of nanotechnology in the treatment and diagnosis of infectious diseases Covers all common types of infective agents, including bacteria, viruses, fungi, and protozoa, along with their vectors, ticks, mosquitoes, flies, etc. Delivers commentary from an international researcher base, providing insights across differing economic statuses Includes a foundation of basic nanotechnological concepts to aid in designing new strategies to combat several pathogenic diseases and cancer Illustrates the high antimicrobial potential of nanoparticles, ultimately demonstrating how they are a promising alternative class that can be successfully used in fighting a myriad of infections

Until the late 20th century, computational studies of biomolecules and nanomaterials had considered the two subjects separately. A thorough presentation of state-of-the-art simulations for studying the nanoscale behavior of materials. Simulations in Nanobiotechnology discusses computational simulations of biomolecules and nanomaterials together. The book gives readers insight into not only the fundamentals of simulation-based characterizations in nanobiotechnology, but also in how to approach new and interesting problems in nanobiotechnology using basic theoretical and computational frameworks. Presenting the simulation-based nanoscale characterizations in biological science, Part 1: Describes recent efforts in MD simulation-based characterization and CG modeling of DNA and protein transport dynamics in the nanopore and nanochannel Presents recent advances made in continuum mechanics-based modeling of membrane proteins Summarizes theoretical frameworks along with atomistic simulations in single-molecule mechanics Provides the computational simulation-based mechanical characterization of protein materials Discussing advances in modeling techniques and their applications, Part 2: Describes advances in nature-inspired material design; atomistic simulation-based characterization of nanoparticles' optical properties; and nanoparticle-based applications in therapeutics Overviews of the recent advances made in experiment and simulation-based characterizations of nanoscale adhesive properties Suggests theoretical frameworks with experimental efforts in the development of nanoresonators for future nanoscale device designs Delineates advances in theoretical and computational methods for understanding the mechanical behavior of a graphene monolayer The development of experimental apparatuses has paved the way to observing physics at the nanoscale and opened a new avenue in the fundamental understanding of the physics of various objects such as biological materials and nanomaterials. With expert contributors from around the world, this book addresses topics such as the molecular dynamics of protein translocation, coarse-grained modeling of CNT-DNA interactions, multi-scale modeling of nanowire resonator sensors, and the molecular dynamics simulation of protein mechanics. It demonstrates the broad application of models and simulations that require the use of principles from multiple academic disciplines.

Nanobioanalytical Approaches to Medical Diagnostics

Principles and Applications