DESIGN, PRINCIPLE AND APPLICATION OF SELF-ASSEMBLED NANOBIOMATERIALS IN BIOLOGY AND MEDICINE

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About the book

Description

Design, Principle and Application of Self-Assembled Nanobiomaterials in Biology and Medicine discusses recent advances in science and technology using nanoscale units that show the novel concept of combining nanotechnology with various research disciplines within both the biomedical and medicine fields. Self-assembly of molecules, macromolecules, and polymers is a fascinating strategy for the construction of various desired nanofabrication in chemistry, biology, and medicine for advanced applications. It has a number of advantages: (1) It is involving atomic-level modification of molecular structure using bond formation advanced techniques of synthetic chemistry. (2) It draws from the enormous wealth of examples in biology for the development of complex, functional structures. (3) It can incorporate biological structures directly as components in the final systems. (4) It requires that the target self-assembled structures be thermodynamically most stable with relatively defect-free and self-healing. In this book, we cover the various emerging self-assembled nanostructured objects including molecular machines, nano-cars molecular rotors, nanoparticles, nanosheets, nanotubes, nanowires, nano-flakes, nano-cubes, nano-disks, nanorings, DNA origami, transmembrane channels, and vesicles. These self-assembled materials are used for sensing, drug delivery, molecular recognition, tissue engineering energy generation, and molecular tuning.

Key Features

- Provides a basic understanding of how to design, and implement various self-assembled nanobiomaterials
- Covers principles implemented in the constructions of novel nanostructured mate
- Offers many applications of self-assemblies in fluorescent biological labels, drug d gene delivery, bio-detection of pathogens, detection of proteins, probing of DNA structure, tissue engineering, and many more

Details

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Chapter 4 - Recent development in chiral self-assembly of porphyrin and protoporphyrin IX molecular architectures

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Abstract

develop functional biomaterials during the evolutionary process of life. In recent years, the supramolecular self-assembly process of small molecular architecture provides a better understanding of biological systems. Mimicking the biological systems for the fabrication of supramolecular self-assembled functional nano/microstructures are widely adopted by researchers. Porphyrins, π-conjugated molecular building blocks have attracted particular attention for functional nanofabrication, which could mimic the natural biological self-assembly. The bio-mimic nanostructure of porphyrin and protoporphyrin IX (PP-IX) was achieved via noncovalent interactions such as hydrophobic-hydrophobic, π–π stacking, hydrogen bonding, and electrostatic interactions. Modern techniques, including atomic force microscopy, transmission electron microscopy, scanning electron microscopy, and circular dichroism spectroscopy was used to confirm the supramolecular chiral nanostructures. In the following chapter, we discuss in detail the recent progress in chiral supramolecular self-assembly as well as fabrication of nanostructure from porphyrin and PP-IX.