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Perspective

Carbon Based Nano Materials and It's Functions in Biomedical Engineering

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DESCRIPTION

Carbon-based nanoparticles are manufactured and used in a variety of industries. Carbon Nanotubes (CNTs), nanomaterials, carbon nanofibers, carbon black, and greenhouse gas ions are examples of these materials. The principal methods for fabricating these materials (excluding carbon black) include arc discharge, Chemical Vapor Deposition (CVD) and thermal decomposition and the characteristics of carbon-based nanomaterials can be modified by changing fabrication conditions. Exfoliation of graphite, CVD, chemical and electrochemical synthesis routes are the four main methods of interest for synthesizing, graphene is the most significant techniques focus on graphene identification. Carbon black is made using the furnace black and thermal black processes but the furnace black process is the most prevalent commercial procedure. Chemical doping of Nano diamonds has recently been widely explored with the goal of controlling their physical properties and allowing the fabrication of Nano scale diamond based semiconductors and fluorescent biomarkers with the necessary physical qualities.

Carbon-based nanomaterials have physicochemical and biological features as well as their enormous number of derivatives. The science of sensing and measurement known as biosensors is an appealing study topic in which carbon-based nanomaterials have various applications. These nanomaterials are suitable for use in biosensors transducers for improving signal processing because of special properties such as large surface to volume ratio, high electrical conductivity, chemical stability, strong mechanical strength, easy functionalization, biocompatibility, and biodegradability in bio medical enginering. These biosensors have recently been developed used in disease progression tracking, pollution detection and assessment, food safety, and drug development. Using carbon-based nanomaterials which have these significant qualities resulted in improved sensitivity with a lower limit of detection a wider linear range of detection and reusable sensors than conventional sensors. This review provides an overview of recent progress in the development of biosensors based on a wide range of carbon nanomaterials such as grapheme, graphene oxide and reduced graphene oxide, carbon nanotubes, carbon dots, diamond, fullerene, carbon nanofibers, carbon nanohorns, nanoporous carbon, and nano carbon black, as well as their composites. In addition to discussing the construction of the biosensor an attempt has been made to discuss the numerous analyses detected and quantified by these biosensors including glucose, antibodies, dopamine, proteins, nucleic acids (DNA, RNA), and medicines.

Due to the unique combination of chemical and physical properties (i.e. thermal and electrical conductivity, high mechanical strength, and optical properties) of functional Carbon-Based Nanomaterials (CBNs) significant research attempts have also been made to use these materials for various industrial applications such as high-strength materials and electronics. CBNs' beneficial features are also being researched in a number of biomedical engineering fields. This examines the various forms of carbon-based nanomaterials that are now being employed in biomedical applications. Since many of its application fields rely greatly on the performance of biomaterials the area of biomedical engineering has embraced the growing popularity and importance of CBNs in recent years. Because of their multi functionality carbon-based nanomaterials have been broadly considered as highly appealing biomaterials. Incorporating CBNs into current biomaterials could also improve their functionality. As a result CBNs have been used in a variety of biological applications such as drug delivery systems, tissue scaffold reinforcements and cellular sensors.

Because of their distinctive spectra the development of employing CNTs as labeling and imaging agents has been debated since their discovery. Carbon nanotubes have electromagnetic transitions in the Near-Infrared (NIR) range which has been found to be beneficial in biological tissue due to its greater penetration depth and lower excitation scattering. Furthermore auto fluorescence is substantially lower in the NIR range than in the UV or visible areas. For NIR fluorescence microscopy and optical coherence tomography these features make CNTs powerful imaging agents with improved resolution and deeper tissue depth. Although graphene and carbon nanotubes have similar electrical, spectroscopy and thermodynamic conductivity graphene's two-dimensional atomic sheet structure allows for more diverse electronic properties in bio medical engineering.

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