An Overview of Electrocanalytical Carbon Based Nanosensors and Their Applications: The Current and Future Prospect

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Abstract
A sensor is a device that detects and responds to some input from the physical environment. The specific input could be voltage, light, or any of many other environmental phenomena. In addition, the sensor can convert the measurement into a readable signal.
For electroanalytical sensor technologies, nanomaterials are primarily used for creating a biosensor, biomarker or nanosensor. In recent years, sensor technology has become very popular in the biomedical and pharmaceutical fields with broad applications. Sensor technology covers the synthesizing and use of nanomaterials at the level of atoms, molecules, biomolecules, and supramolecular structures. In addition, nano-sized materials can give sensors beneficial properties from analytical perspectives.
Electrochemical approaches are useful for sensor technology since one atom-level electrochemical change can be followed using electrochemical methods, such as cyclic voltammetry, differential pulse, square wave, adsorptive stripping voltammetry, etc. Sensor studies provide an overview of some of the important and recent developments brought about by applying carbon-based nanostructures to nanotechnology for both chemical and biological sensor development and their application in pharmaceutical and biomedical areas.
Nanoscience is simply science and engineering carried out on the nanometer scale, 10^{-9} meters. In the past two decades, researchers began developing the ability to manipulate matter at the level of single atoms and small groups of atoms and to characterize the properties of materials and systems at that scale. Electrochemical nanosensors have recently found extensive applications in pharmaceutical and biomedical industries with some advantages, such as lower detection limits, wider linear response range, sensitivity, good stability, and reproducibility compared with other sensors and techniques. As the demand for smaller, faster, cheaper, and ultrasensitive qualification and quantification of samples rapidly increases, these methods provide a viable path toward the next generation of electrochemical sensors.
Nowadays, different analytical methods are used in environmental, pharmaceutical, or clinical laboratories, and a number of commercial point-of-care devices work using nanosensors. Electroanalytical biosensors and/or biomarkers are analytical devices that convert a biological response into an electrical signal. Biosensors have been applied in many fields, namely food, pharmaceutical, medical, and marine. Various biosensors are used: enzyme-based, tissue-based, immunosensors, DNA biosensors, and thermal and piezoelectric biosensors. In the early stages of some diseases, trace levels of biomarkers exist in the cells and in the body fluids. Hence, it is very important to develop credible and sensitive detection tests. Therefore, electroanalytical biomarker studies and strategies for using different nanomaterials are continuously being verified, developed, and utilized to increase the sensitivity of biomarkers determination in the body fluids and tissues.
Electrochemical biosensors and nanosensors have recently found extensive applications in pharmaceutical and biomedical industries with some advantages, such as lower detection limits, sensitivity, good stability, and reproducibility compared with other sensors and techniques. Nowadays, many different analytical methods are used in environmental, pharmaceutical, or clinical laboratories, and many commercial point-of-care devices work using sensors.