An Overview of Carbon Based Nanosensors and biosensors and their applications in drug assay and life sciences

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Carbon-based nanomaterials have become very important due to their unique combinations of chemical and physical properties, extensive research efforts are being made to utilize these materials for various industrial applications, such as high-strength materials and electronics. These advantageous properties of carbon-based nanomaterials are also actively investigated in several areas of biomedical and drug assay.

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 when 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. Carbon-based nanomaterials have been studied extensively in recent decades, with the synthesis of new nano-sized materials being an active trend for the development of assorted applications focused on their interesting electronic properties. In recent years, nanotechnology with its wide applications has become very popular in the biomedical and pharmaceutical area. Electrochemical devices have recently received considerable attention in the development of nanosensors and nanobiosensors. They are devices that intimately couple a pharmaceutical and biological recognition element to an electrode transducer that relies on the conversion of the nanomaterial-drug, nanomaterial-biological compound, antibody–antigen or Watson–Crick base-pair recognition event into a useful electrical signal. Electrochemical devices offer elegant routes for interfacing – at the molecular level–the target recognition and signal transduction elements and are uniquely qualified for meeting the size, cost, low volume, and power requirements of decentralized working diagnostics [1-3].

The high sensitivity of electrochemical nanosensors or nanobiosensors, coupled with their inherent miniaturization, compatibility with modern microfabrication technologies, low-cost and power requirements, and independence of sample turbidity make such devices excellent candidates for centralized and decentralized the related testing. Nowadays, a lot of different analytical methods are used in environmental, pharmaceutical, or clinical laboratories and also a number of the commercial point-of-care devices work using as sensors. As new procedures for the large-scale production of graphene are expected to be developed in the near future, most of such properties – including the electrochemical ones – will be soon experimentally demonstrated, thus permitting the development of the many important technological applications foreseen for this material.

References

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