Usage and Importance of Biosensors in the Field of Nanotechnology

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Opinion Article

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DESCRIPTION

Biosensors are available in many varieties and they have numerous potential applications. The identification of a target molecule, the availability of a suitable biological recognition element and the potential for disposable portable detection systems to be preferred as sensitive laboratory-based techniques and the main requirements for a biosensor approach to be valuable in terms of research and commercial applications. Examples include glucose monitoring in diabetics, other medically related targets, environmental applications such as the detection of pesticides and river water contaminants such as heavy metal ions, remote sensing of airborne bacteria for example in counter-bioterrorist activities and remote sensing of water quality in coastal waters by online descriptions of various clam ethology in populations of abandoned bivalves around the world.

Biosensors are mainly used for pathogen detection, harmful material levels prior to and following bioremediation, organophosphate detection and determination, routine analytical measurement of folic acid, biotin, vitamin B12, and pantothenic acid as a substitute for microbiological assay, identification of drug residues in food such as antibiotics and growth promoters, particularly in meat and honey, the development of new drugs and the assessment of their biological activity, the engineering of proteins for use in biosensors and the detection of toxic byproducts such as mycotoxins.

The blood glucose biosensor which uses the enzyme glucose oxidase to break down blood glucose is a typical illustration of a commercial biosensor. For this it first oxidises glucose and then reduces the FAD to FADH2 using two electrons. The electrode proceeds to oxidise this in a number of steps. The resultant current serves as a measure the amount of glucose. The transducer in this case is the electrode, and the physiologically active element is the enzyme.

Many of today's biosensor applications are similar in that they use organisms which respond to toxic substances at lower concentrations than humans can detect to warn of their presence. Such devices can be used in environmental monitoring, trace gas detection and in water treatment facilities.

Glucose monitoring

Commercially available glucose monitors use hydrogen peroxide which is detected by the electrode to measure glucose using amperometric sensing. Hydrogen peroxide is produced when glucose is oxidized by glucose oxidase. There is a bunch of study into new sensing techniques to get around the amperometric sensors' limitations like fluorescent glucose biosensors.

Interferometric reflectance imaging sensor

Based on optical interference theory the silicon-silicon oxide substrate, conventional optics and low-powered coherent LEDs comprise the Interferometric Reflectance Imaging Sensor (IRIS) which uses low-powered coherent LEDs. An interferometric signature is created when shined onto the layered silicon-silicon oxide substrate through a low magnification objective. A change in the interferometric signature happens as biomass which has a similar index of refraction to silicon oxide builds up on the substrate surface and the change can be connected to a quantifiable mass.

Food analysis

Biosensors have many uses in the examination of food. Optics coated with antibodies are frequently employed in the food business to identify pathogens and food allergens. Fluorescence is frequently used as the light source in these biosensors since this sort of optical measurement can significantly magnify the signal. For use on SPR-based sensor systems, a variety of immune and ligand-binding assays frequently modified from existing ELISA or other immunological assays have been developed for the detection and measurement of small molecules such as water-soluble vitamins and chemical contaminants (drug residues) such as sulfonamides and Beta-agonists. The food sector uses them on a regular basis.