

Nanomaterials and (bio)sensing opportunities

Merkoçi, A

Nanobioelectronics & Biosensors Group, Catalan Institute of Nanotechnology
&
Department of chemistry, Autonomous University of Barcelona
Campus UAB, 08193 Bellaterra, Catalonia, Spain

Nanoscience and nanotechnology are offering novel opportunities for biosensing applications. The design of novel nanostructures with special optical and electrochemical properties and their integration into biosensing systems in general and particularly biosensors represent only one aspect of the research in this new field. The biosensor oriented nanotechnology will provide new tools for various applications in fields like medicine, environmental studies, and industry.

Examples related to the integration of gold nanoparticles, quantum dots (QDs) and carbon nanotubes (CNT) in several detection systems will be presented. The use of nanoparticles for biosensing has generated great interest with the increasingly understanding of the structure and function of gene, especially for Human Genome Project. By the other side, sequence specific DNA detection has been a topic of significant interest, for its application in diagnosis of pathogenic and genetic diseases between other fields. DNA and protein detections methodologies based on several nanosstructures will be described. The use of QDs with special interest for the design of the so-called "DNA chips in solution" will be also emphasized.

Beside nanoparticles, CNTs are offering a great promise in the design of novel biosensors. Distinctive properties of CNTs such as a high surface area, ability to accumulate analyte, minimization of surface fouling and electrocatalytic activity are very attractive for electrochemical (bio)sensing systems. The integration of CNTs in several matrix including cells forming novel bionanostructures with interesting applications in sensor technology will be other examples. The obtained results show remarkable electrochemical and mechanical advantages of CNT modified electrode compared to the unmodified ones.