Recent advances in gold nanoparticles modified electrodes in electrochemical nonenzymatic sensing of chemical and biological compounds

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ABSTRACT

Gold nanoparticles (Au NPs) are extensively used nanomaterials that have profound relation with diverse sensor development, catalysis and drug delivery due to their remarkable electrochemical properties. It plays its role as the main catalyst, catalyst support, signal amplifier and electrochemical probe during sensing. Here in this review, we have summarised the recently reported nonenzymatic gold nanoparticles-based electrochemical sensing of different chemical and biological molecules. Although there are numerous conventional methods for detecting these compounds, those detection methods are quite complex, costly, and time-consuming. Gold nanoparticles-based electrochemical sensors have emerged as committed alternatives that address these issues while providing a rapid and highly sensitive detection system. Additionally, enzyme-free sensors reduce the shortcomings of enzymatic sensors, accelerating the widespread use of electrochemical sensors. This review will provide information on the process of combining of Au NPs with other molecules during electrode fabrication and the role of Au NPs in chemical and biological molecule detection. The electrocatalytic mechanisms associated with detection are also discussed. Numerous tables summarise critical features, including electrode composition, detection limits (LOD), linear ranges, and real-time applications. The attached schematic tree diagram will give an idea of what other molecule groups can be combined with gold nanoparticles to fabricate the sensor. We hope that this in-depth assessment of gold nanoparticles-based electrochemical sensors will contribute to a better understanding of the role and behaviour of Au NPs in sensing systems and hence to future advanced research.

KEYWORDS

Amperometric sensors; Aptasensors; Cancer biomarker; Electrochemical nonenzymatic (bio) sensing; Gold nanoparticles; Immunosensors; Toxic chemical

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