Characterization of polylactide-stabilized gold nanoparticles and its application in the fabrication of electrochemical DNA biosensors

ABSTRACT

In this work, two different approaches to gold nanoparticles (AuNPs) have been explored for the modification of screen-printed electrode based on AuNPs and AuNPs stabilized with polylactic acid (PLA). The modified substrate has been characterized using UV-Vis spectroscopy, X-ray diffraction (XRD), transmission electron microscopy (TEM), field emission scanning electron microscopy (FESEM) and cyclic voltammetry. Both synthesized AuNPs were studied in terms of stability, sensitivity and reproducibility to enhance the sensing capability of modified electrodes. The PLA-stabilized AuNPs form strong structured nanoparticles and stabilize in aqueous solution. A larger active surface area (0.41 cm^2) and lower charge transfer resistance (R_{ct}) value were reported in the modification of sensing material with PLA-stabilized AuNPs, which resulted in enhancement of sensitivity. Therefore, AuNPs in PLA can be used as a potential alternative modifier for sensing chemicals and biomolecules in electrochemical sensors.

Keyword: Electrochemical DNA biosensor; Screen-printed carbon electrode; Polylactic acid; Gold nanoparticles