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VOLTAMMETRIC STUDIES OF NANO ZIRCONIUM DIOXIDE/CARBON NANOTUBES/CHITOSAN-MODIFIED GLASSY CARBON ELECTRODES

Nor Amirah Mohd Maamor, Tan Wee Tee and Nor Azah Yusof.
Department of Chemistry, Faculty of Science, Universiti Putra Malaysia,
43400 UPM Serdang, Selangor, Malaysia

ABSTRACT

Voltammetric studies of a sensitive electrochemical DNA sensor based on ZrO_2 nanoparticles and multi-walled carbon nanotube (MWNTs) for DNA immobilization is described. Layer deposition technique was used to prepare nano ZrO_2/MWNTs/chitosan-modified glassy carbon electrode (GCE) and oligonucleotides were immobilized to the GCE. The immobilization of DNA on the electrode was monitored by cyclic voltammetry (CV) analysis by measuring the change of peak currents using electroactive methylene blue (MB) as an indicator. Compared with previous DNA sensor with oligonucleotides directly incorporated on carbon electrodes, this carbon nanotubes-based assay with its large surface area and good charge-transport characteristics increased DNA attachment quantity. Parameters used on this study including electrochemical characterization, scan rate study, pH optimization, and scanning electron microscope (SEM) as well as chronoamperometry (CA) and chronocoulometry (CC). The electrochemical reduction and oxidation of the redox couples of methylene blue (as a DNA indicator) can be recognized easily by the solid-phase voltammetry of microparticles. The cyclic voltammograms for three differently modified electrodes, nano ZrO2/chitosan, MWNTs/chitosan and nano ZrO2/MWNTs/chitosan, showed 2 major peaks responding to redox couple of methylene blue.

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