Enhancement of dna immobilization and hybridization on gold electrode modified using zno nanoparticles/chitosan film

Abstract

Electrochemical DNA biosensor was fabricated using the ZnO nanoparticles/chitosan (CHIT) nanocomposite membrane on modified gold electrode (AuE) as the working electrode. The ZnO/CHIT was used as a modified-AuE for the immobilization of the single-stranded DNA probe. This particular DNA biosensor provided some advantages such as the biocompatibility of the ZnO nanoparticles, good film forming ability of CHIT, and the high conductivity of AuE. Methylene blue was used as the electrochemical indicator for monitoring the hybridization reaction following the hybridization of the target DNA sequence. Differential pulse voltammetry was used for recording the electrochemical response of MB. The specific target DNA sequence could be detected in the concentration range of 1.0×10^{-14} to 1.82×10^{-4} mol L^{-1}, with the detection limit at 1.0×10^{-15} mol L^{-1}. This novel approach of constructing an electrochemical biosensor allowed the hybridization of synthetic target DNA. In addition, it also facilitated hybridization with template- DNA taken from real samples. The results proved that the ZnO/CHIT/AuE electrode has the potential for the sensitive detection of specific sequence related to a Trichoderma harzianum gene.