

Immobilization of tyrosinase in nanocrystalline cellulose/chitosan composite film for amperometric detection of phenol

ABSTRACT

Nanocrystalline cellulose (NCC)/chitosan composite for immobilization of tyrosinase enzyme for the determination of phenol have been developed. The NCC/Chitosan composite film on screen printed carbon electrode (SPCE) was prepared by using drop casting technique. Characterization of the modified SPCE surface was investigated by using Transmission Electron Microscopy (TEM) and Fourier Transform Infrared (FTIR), respectively. Chronoamperometric (CA) technique is used to perform the electrochemical measurements. The detection of phenols by the developed system is derived on the direct electrochemical reduction of quinones produced by enzymatic reaction. The results demonstrated that the maximum response was observed at ratio of NCC/chitosan of 1 to 1 (v/v), tyrosinase concentration of 10 mg/mL and pH buffer of 7, respectively. It was found that the developed system gave linear response in the phenol concentration range of 0.39 – 7.74 μM (slope = 28.316, $R^2 = 0.9808$) with the detection limit of 0.38 μM . The reproducibility of the system was also estimated and the Relative Standard Deviation (RSD) was found to be at 4.27%.

Keyword: Nanocrystalline cellulose; Nanocomposite; Immobilization; Electrochemical; Phenol