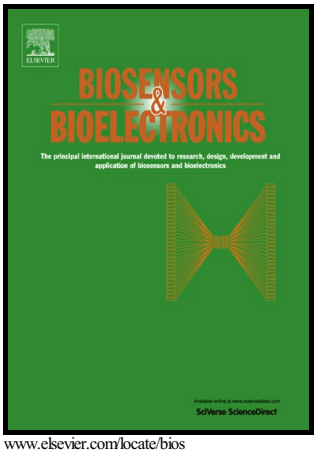

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A highly sensitive electrochemical biosensor for catechol using conducting polymer reduced graphene oxide-metal oxide enzyme modified electrode

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Abstract

The fabrication, characterization and analytical performances were investigated for a catechol biosensor, based on the PEDOT-rGO-Fe_2O_3-PPO composite modified glassy carbon (GC) electrode. The graphene oxide (GO) doped conducting polymer poly (3,4-ethylenedioxythiophene) (PEDOT) was prepared through electrochemical polymerization by potential cycling. Reduction of PEDOT-GO was carried out by amperometric method. Fe_2O_3 nanoparticles were synthesized in ethanol by hydrothermal method. The mixture of Fe_2O_3, PPO and glutaraldehyde was casted on the PEDOT-rGO electrode. The surface morphology of the modified electrodes was studied by FE-SEM and AFM. Cyclic voltammetric studies of catechol on the enzyme modified electrode revealed higher reduction peak current. Determination of catechol was carried out successfully by Differential Pulse Voltammetry (DPV) technique. The fabricated biosensor investigated shows a maximum current response at pH 6.5. The catechol biosensor exhibited wide sensing linear range from 4×10^{-8} to 6.20×10^{-5} M, lower detection limit of 7×10^{-9} M, current maxima (I_{max}) of 92.55 µA and Michaelis - Menten (K*m*) constant of 30.48 µM. The activation energy (Ea) of enzyme electrode is 35.93 $KJmol^{-1}$ at 50 $^{\circ}$C. There is no interference from D-glucose and L-glutamic acid, ascorbic acid and o-nitrophenol. The PEDOT-rGO-Fe_2O_3-PPO biosensor was stable for at least 75 days when stored in a buffer at about 4 °C.

Keywords: Catechol, Tyrosinase, Hydrothermal, Electrochemical, Biosensor.