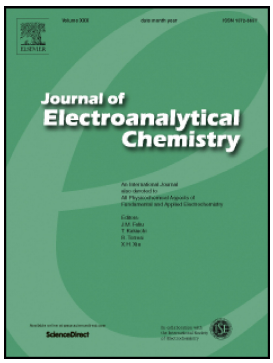

A broad spectrum amperometric pesticide biosensor based on glutathione S-transferase immobilized on graphene oxide-gelatin matrix

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A broad spectrum amperometric pesticide biosensor based on Glutathione S-transferase immobilized on graphene oxide-gelatin matrix

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Abstract

In this work we have fabricated a glutathione-s-transferase based amperometric biosensor for pesticides by immobilizing the enzyme on platinum electrode using graphene oxide-gelatin matrix, evaluated various biosensor parameters, applied the same for detection and quantification of four different classes of pesticides and validated the biosensor results with GC-MS analysis. The enzyme immobilization was confirmed through scanning electron microscopy, electrochemical impedance spectroscopy, cyclic voltammetry and chronoamperometry. The apparent Michaelis-Menten constant for the immobilized glutathione-s-transferase in the said matrix was found to be 0.083 mmol L^{-1} and 0.15 mmol L^{-1} respectively for glutathione and 1-Chloro-2,4-dinitrobenzene. Substrate specificity found to be 2.56 x 10^7 $s^{-1}M^{-1}$ for glutathione and 2.15 x $10^7 s^{-1}M^{-1}$ for 1-Chloro-2,4-dinitrobenzene. Pesticide analysis was done in 25% methanol solution. The biosensor is a promising new tool for pesticide analysis as it can be applied for analysis of a broad spectrum of pesticides covering at least six different classes namely- benzamidazole, organochlorine, organothiophosphate, organocarbamate, polyphenol and pyrethroid.

Keywords: GST; CDNB; Pesticide biosensors; Substrate specificity; Dinocap; Competitive inhibitor.