Acetylcholinesterase Biosensor for the Detection of Methyl Parathion at an Electrochemically Reduced Graphene Oxide-Nafion Modified Glassy Carbon Electrode

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We report the fabrication of a methyl parathion (MP) biosensor based on acetyl cholinesterase (AChE) immobilized on reduced graphene oxide (ERGO)-Nafion (Nf) modified glassy carbon electrode. ERGO-Nf acts as a biocompatible immobilization matrix for AChE for the analysis of MP. Electrochemical oxidation of acetylthiocholine chloride occurs at 0.7 V vs. Ag/AgCl in phosphate buffer solution (pH 7). Various experimental parameters such as effect of scan rate, MP concentration, acetylthiocholine chloride concentration, AChE loading and incubation time have been optimized for the sensor calibration. The calibration curve of MP has been constructed using square wave voltammetry in the concentration range of 2×10^{-9} M to 7×10^{-7} M and the sensor shows good reproducibility and stability. The sensor is found to have an estimated detection limit of 1×10^{-9} M. The biosensor has been applied for the determination of methyl parathion in a vegetable sample.

Keywords: Pesticide biosensor, acetyl cholinesterase, methyl parathion, electrochemically reduced graphene oxide, Nafion.

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