World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:14, No:07, 2020

Construction and Performance of Nanocomposite-Based Electrochemical Biosensor

Authors : Jianfang Wang, Xianzhe Chen, Zhuoliang Liu, Cheng-An Tao, Yujiao Li

Abstract : Organophosphorus (OPs) pesticide used as insecticides are widely used in agricultural pest control, household and storage deworming. The detection of pesticides needs more simple and efficient methods. One of the best ways is to make electrochemical biosensors. In this paper, an electrochemical enzyme biosensor based on acetylcholine esterase (AChE) was constructed, and its sensing properties and sensing mechanisms were studied. Reduced graphene oxide-polydopamine complexes (RGO-PDA), gold nanoparticles (AuNPs) and silver nanoparticles (AgNPs) were prepared firstly and composited with AChE and chitosan (CS), then fixed on the glassy carbon electrode (GCE) surface to construct the biosensor GCE/RGO-PDA-AuNPs-AgNPs-AChE-CS by one-pot method. The results show that graphene oxide (GO) can be reduced by dopamine (DA) and dispersed well in RGO-PDA complexes. And the composites have a synergistic catalysis effect and can improve the surface resistance of GCE. The biosensor selectively can detect acetylcholine (ACh) and OPs pesticide with good linear range and high sensitivity. The performance of the biosensor is affected by the ratio and adding ways of AChE and the adding of AuNPs and AChE. And the biosensor can achieve a detection limit of 2.4 ng/L for methyl parathion and a wide linear detection range of 0.02 ng/L ~ 80 ng/L, and has excellent stability, good anti-interference ability, and excellent preservation performance, indicating that the sensor has practical value.

Keywords : acetylcholine esterase, electrochemical biosensor, nanoparticles, organophosphates, reduced graphene oxide
Conference Title : ICNNM 2020 : International Conference on Nanobiosensors, Nanomaterials and Microfluidics
Conference Location : Toronto, Canada
Conference Dates : July 16-17, 2020