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Novel Electrochemical Acetylcholinesterase Biosensor Based on Core-Shell Covalent Organic Framework@Multi-Walled Carbon Nanotubes (COF@MWCNTs) Composite for Detection of Malathion

Xue Wang[*], *Shuang Yang, Jiajia Shan, Xuting Bai*

School of Ocean Science and Technology, Dalian University of Technology, Panjin, 124221, China
[*]E-mail: wangxue@dlut.edu.cn

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In this study, a novel electrochemical acetylcholinesterase (AChE) biosensor based on covalent organic framework@multi-walled carbon nanotubes (COF@MWCNTs) composite was developed for the detection of organophosphorus pesticides (OPs). The COF@MWCNTs was prepared via in-situ formation of COF-DhaTab on the surface of multi-walled carbon nanotubes (MWCNTs) by a facile solvothermal method. The COF@MWCNTs composite displayed a typical core-shell structure, which was used as an ideal host for enzyme immobilization and exhibited strong electron transfer ability in electrochemical sensing. These properties were originated from the synergistic effect of COF and MWCNTs. According to the inhibition effect of malathion toward AChE activity, the sensitive detection of malathion was obtained using the electrochemical AChE biosensor. Under the optimal conditions, the proposed biosensor exhibited a linear range from 1 nM to 10 μM with a detection limit of 0.5 nM for malathion determination. The AChE biosensor also showed good anti-interference ability, reproducibility, storage stability. In practice, the biosensor was employed to detect malathion in water and spinach samples with satisfactory recovery.

Keywords: Acetylcholinesterase; Electrochemical biosensor; Malathion; Covalent organic frameworks; Core-shell

FULL TEXT