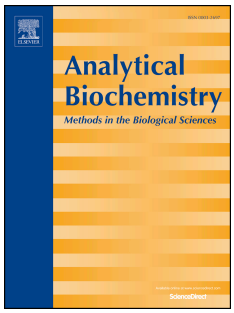
Accepted Manuscript



Acetylcholinesterase biosensor based on functionalized surface of carbon nanotubes for monocrotophos detection

Zou Bin, Chu Yanhong, Xia Jiaojiao, Yao Jing

PII: S0003-2697(18)30415-9

DOI: 10.1016/j.ab.2018.08.024

Reference: YABIO 13119

To appear in: *Analytical Biochemistry*

Received Date: 16 April 2018

Revised Date: 27 August 2018

Accepted Date: 28 August 2018

Please cite this article as: Z. Bin, C. Yanhong, X. Jiaojiao, Y. Jing, Acetylcholinesterase biosensor based on functionalized surface of carbon nanotubes for monocrotophos detection, *Analytical Biochemistry* (2018), doi: 10.1016/j.ab.2018.08.024.

Acetylcholinesterase biosensor based on functionalized surface of carbon nanotubes for monocrotophos detection

Zou Bin *, Chu Yanhong, Xia Jiaojiao*, Yao Jing

School of Food and Biological Engineering,

Jiangsu University, Zhenjiang, 212013, China.

Abstract

Monocrotophos (Ops) has been widely used as pesticide in crop production but simultaneously could accumulate in the nature and seriously impact food safety and human health. It is necessary to develop a high sensitivity biosensor for accurate and fast detection of OPs. In this study, multi-walled carbon nanotubes (MWCNTs) were selected as acetylcholinesterase (AChE) carrier and their surface was modified by introducing different functional groups (-SH, -NH_2, -Cl, -OH), hydrophobic alkyl groups (-CH_3, -$(CH_2)_2CH_3$, -$(CH_2)_7CH_3$, -$(CH_2)_{15}CH_3$) and ionic liquids (-IL_1, -IL_2). The interaction mechanism of MWCNTs functionalized surface and AChE has been revealed by studying characteristics of AChE immobilized on different carrier surface. Finally, compared with reported references and above other modifiers, we found that MWCNTs surface modified by -IL_1 was the best carrier for AChE and the detection limit of IL_1-MWCNTs/AChE/GCE was 3.3×10^{-11} M. At optimum reaction condition (pH 7.0, AChE loading 0.25 U, Inhibition time 14 min), storability test indicated reactivity of IL_1-MWCNTs/AChE/GCE remained above 98.5% within two weeks. For real vegetable sample detection, the recoveries of IL_1-MWCNTs/AChE/GCE were found to be between 90.0% and 104%. These results demonstrated novel biosensors could act as device of high sensitivity for accurate and fast detection of OPs.

Keywords: monocrotophos, acetylcholinesterase, enzyme electrode, carbon nanotubes, surface modification

* To whom correspondence should be addressed. The postal address: Jiangsu University, No. 301 Xuefu Road, Zhenjiang 212013, China. Tel/Fax.: +86-0511-88780201; E-mail: Binzou2009@ujs.edu.cn. Jiaojiaoxia@ujs.edu.cn