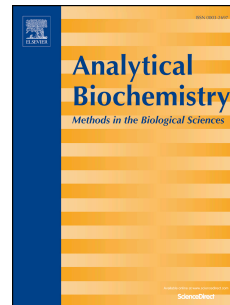


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Acetylcholinesterase biosensor based on functionalized surface of carbon nanotubes for monocrotophos detection

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1 Acetylcholinesterase biosensor based on functionalized surface 2 of carbon nanotubes for monocrotophos detection

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6 Abstract

7 Monocrotophos (Ops) has been widely used as pesticide in crop production but
8 simultaneously could accumulate in the nature and seriously impact food safety and
9 human health. It is necessary to develop a high sensitivity biosensor for accurate and
10 fast detection of OPs. In this study, multi-walled carbon nanotubes (MWCNTs) were
11 selected as acetylcholinesterase (AChE) carrier and their surface was modified by
12 introducing different functional groups (-SH, -NH₂, -Cl, -OH), hydrophobic alkyl
13 groups (-CH₃, -(CH₂)₂CH₃, -(CH₂)₇CH₃, -(CH₂)₁₅CH₃) and ionic liquids (-IL₁, -IL₂).
14 The interaction mechanism of MWCNTs functionalized surface and AChE has been
15 revealed by studying characteristics of AChE immobilized on different carrier surface.
16 Finally, compared with reported references and above other modifiers, we found that
17 MWCNTs surface modified by -IL₁ was the best carrier for AChE and the detection
18 limit of IL₁-MWCNTs/AChE/GCE was 3.3×10^{-11} M. At optimum reaction condition
19 (pH 7.0, AChE loading 0.25 U, Inhibition time 14 min), storability test indicated
20 reactivity of IL₁-MWCNTs/AChE/GCE remained above 98.5% within two weeks. For
21 real vegetable sample detection, the recoveries of IL₁-MWCNTs/AChE/GCE were
22 found to be between 90.0% and 104%. These results demonstrated novel biosensors
23 could act as device of high sensitivity for accurate and fast detection of OPs.

24
25 **Keywords:** monocrotophos, acetylcholinesterase, enzyme electrode, carbon
26 nanotubes, surface modification

27

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