A Simple, Low-Cost and Efficient β -CD/MWCNTs/CP-based Electrochemical Sensor for the Rapid and Sensitive Detection of Methyl Parathion

Runqiang Liu^{1,2,3}, Yashuang Wang³, Dongdong Li³, Li Dong³, Bo Li³, Binbin Liu³,
Huina Ma³, Fang Li³, Xinming Yin^{1,*}, Xiling Chen^{3,*}

¹ College of Plant Protections, Henan Agricultural University, Zhengzhou 450002, China

² Postdoctoral Research Base, Henan Institute of Science and Technology, Xinxiang 453003, China

³ School of Resources and Environment, Henan Institute of Science and Technology, Xinxiang 453003, China

*E-mail: xmyin11@163.com ; chenxiling@hist.edu.cn

doi: 10.20964/2019.10.28

Received: 5 June 2019 / Accepted: 2 August 2019 / Published: 30 August 2019

Based on the β -cyclodextrin/multi-walled carbon nanotubes/carbon paper (β -CD/MWCNTs/CP) composite, a simple, low-cost and efficient electrochemical sensor is first designed in the work for the rapid and sensitive detection of methyl parathion (MP). The characteristic peaks of β -CD and MWCNTs are simultaneously observed in the XRD and FTIR results, and these two materials disperse homogeneously on the surface of CP electrode. The results of electrochemical measurements suggest that the obtained β -CD/MWCNTs/CP composite electrode exhibits remarkable synergetic effect, significantly enhancing the efficiency and sensitivity of electrochemical sensor for the selective adsorption property of β -CD, high electrical conductivity and large surface area of MWCNTs, as well as easy operation of CP electrode. Under the optimal conditions, the β -CD/MWCNTs/CP-based electrochemical sensor exhibits excellent MP determination performance with a low detection limit of 2.4 ng mL^{-1} (S/N=3) and a wide linear concentration range from 0.01 to $13 \text{ } \mu\text{g mL}^{-1}$. Given that the CP is not expensive and the construction of CP-based electrochemical sensor can avoid several complex working procedures, this work has a great significance on promoting the more practical electrochemical sensor for the rapid and sensitive detection of MP.

Keywords: β -CD/MWCNTs/CP composite electrode; Synergetic effect; Electrochemical sensor; Methyl parathion

[FULL TEXT](#)

© 2019 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).