Synergistic Effect of Zinc/aluminium-layered Double Hydroxide-clopyralid Carbon Nanotubes Paste Electrode in the Electrochemical Response of Dopamine, Acetaminophen, and Bisphenol A

Nurashikin Abd Azis¹, Illyas Md Isa^{1,2,*}, Norhayati Hashim^{1,2}, Mohamad Syahrizal Ahmad^{1,2}, Siti Nur Akmar Mohd Yazid¹, Mohamad Idris Saidin^{1,2}, Suyanta M.Si³, Rahadian Zainul⁴, Alizar Ulianas⁴, Mawardi Mawardi⁴, Siriboon Mukdasai⁵

¹ Department of Chemistry, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

² Nanotechnology Research Centre, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, 35900 Tanjong Malim, Perak, Malaysia

³ Department of Chemistry Education, Faculty of Mathematics and Natural Science, Yogyakarta State University, Yogyakarta, Indonesia

⁴ Fakultas Matematika dan Ilmu Pengetahuan Alam, Universitas Negeri Padang, Kota Padang, Sumatera Barat, Indonesia

⁵ Department of Chemistry, Faculty of Science, Khon Kaen University, Khon Kaen 40002, Thailand

*E-mail: illyas@fsmt.upsi.edu.my

doi: 10.20964/2020.09.04

Received: 20 April 2020 / Accepted: 30 June 2020 / Published: 10 August 2020

A voltammetric sensor was developed using multiwalled carbon nanotubes (MWCNTs) paste electrode based zinc/aluminium-layered double hydroxide-clopyralid for simultaneous determination of dopamine (DA), acetaminophen (ACT), and bisphenol A (BPA). Several experimental conditions such as percent of modifier, pH of the solution, and square wave voltammetry parameters were optimized. The effective surface area of the electrodes was determined by chronocoulometry studies. The sensor demonstrated a linear plot of $7.0 \times 10^{-6} - 5.0 \times 10^{-4}$ M for DA, $3.0 \times 10^{-5} - 5.0 \times 10^{-4}$ M for ACT, and $3.0 \times 10^{-6} - 5.0 \times 10^{-4}$ M for BPA, with detection limit of 1.7×10^{-7} M, 1.8×10^{-7} M, and 1.4×10^{-7} M respectively. The interferences from 10 to 40-fold concentration of ascorbic acid, sodium salicylate, glucose, sucrose, glutamic acid, and captopril were negligible. The electrode also applicable for DA, ACT, and BPA determination in urine, pharmaceutical tablets, and plastic products samples with recoveries between 92.3 % and 109.7 %.

Keywords: Dopamine, Acetaminophen, Bisphenol A, Multiwalled carbon nanotubes, Square wave voltammetry, Nanocomposite

[FULL TEXT](#)

© 2020 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/>).