A single step electrochemical modification of screen printed carbon electrode with platinum/reduced graphene oxide/poly(3-aminobenzoic acid) for biosensing applications

Sopit Phetsang\textsuperscript{1,2,4}, Pitchaya Mungkornasawakul\textsuperscript{1,3}, Jaroon Jukmunee\textsuperscript{1}, Kontad Ounnunkad\textsuperscript{1*}, Rawiwan Laocharoensuk\textsuperscript{4**}

\textsuperscript{1}Department of Chemistry and Center of Excellence for Innovation in Chemistry, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
\textsuperscript{2}The Graduate School, Chiang Mai University, Chiang Mai 50200, Thailand
\textsuperscript{3}Environmental Science Program, Faculty of Science, Chiang Mai University, Chiang Mai 50200, Thailand
\textsuperscript{4}National Nanotechnology Center, National Science and Technology Development Agency, Pathum Thani 12120, Thailand

*E-mails: suriyaacmu@yahoo.com, rawiwan.lao@nanotec.or.th

Abstract: This work demonstrated a one-step modification of screen printed carbon electrode (SPCE) with platinum/reduced graphene oxide/poly(3-aminobenzoic acid) (Pt/rGO/P3ABA) nanocomposite film by a simple and facile electrodeposition procedure. Cyclic voltammetry (CV) was applied for deposition of rGO/Pt nanocomposite and electropolymerized P3ABA onto working electrode where during deposition, GO was reduced via electrochemical reduction, thus enhancing surface area and electrical properties. The modified electrode significantly improved the electrochemical performances and exhibited an excellent electrocatalytic response to H$_2$O$_2$. Moreover, the platform was developed for cholesterol biosensing via immobilization of enzyme cholesterol oxidase (ChOx) onto fabricated electrode. The immobilized ChOx showed a good linear range with response to cholesterol standard solution from 250 µM to 1750 µM. It also provided a good limit of detection and sensitivity of 31.10 µM and 7.0741 x 10$^{-3}$ µA.µM$^{-1}$.cm$^{-2}$ respectively. This sensing platform offers the advantages of simple preparation, low reagent/sample consumption, low cost, and short analysis time, which can be an alternative tool for cholesterol detection and also further developed as glucose and uric biosensors.

Keywords: Cholesterol biosensor; Reduced graphene oxide; Single step; Platinum; Biosensor