A Biosensor for Genetic Modified Soybean DNA Determination via Adsorption of Anthraquinone-2-sulphonic Acid in Reduced Graphene Oxide

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Abstract: An electrochemical DNA biosensor for DNA determination of genetically modified (GM) soybean (CaMV 35S target genes) was developed utilizing a new detection concept based on the adsoption of anthraqui-none-2-sulphonic acid (AQMS) on the reduced graphene oxide nano-particles (rGO) during DNA hybridization events. The aminated DNA probe for CaMV 35S was immobilized onto poly(*n*-butyl acrylate) film modified with succinimide functional groups [poly(*n*BA-NAS)] via peptide covalent bond. Nanosheets of rGO were en-trapped in the poly(*n*BA-NAS) film to form a conducting [poly(*n*BA-NAS)-rGO] film of the DNA biosensor. Be-sides facilitating the electron transfer reactions, the rGO also functioned as an adsorbent for AQMS. The sensing mechanism of the proposed DNA biosensor involved measuring the oxidation current of the AQMS adsorbed on the electrode surface at −0.50 V using differential pulse voltammetry (DPV) before and after a DNA hybridization event. Under optimum conditions, the DNA biosensor demonstrated a linear proportionality between AQMS oxidation signal and logarithm cDNA concentra-tion from 1.0 3 10−15 M to 1.0 3 10−8 M target DNA with a detection limit of 6.3 3 10−16 M. The electrochemical DNA biosensor possessed good selectivity and a shelf life of about 40 days with relative standard deviation of reprodu-cibility obtained in the range of 3.7–4.6% (n= 5). Evalua-tion of the DNA biosensor using GM soybean DNA extracts showed excellent recovery percentages of 97.2–104.0.

Keywords: AQMS · DPV · GMO biosensor · Graphene · Poly(*n*-butyl acrylate)