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Abstract

Pedot: Pss and gold nanocomposite activated electrochemical sensor for the recognition of fungal DNA

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Abstract:

Electrochemical sensors are designed to observe current or potential changes as a result of interaction between the sample matrix surface and the sensor. The major challenges with the application of sensors is the recognition of small sequences in large amounts of double stranded DNA. A designed functionalized Pedot:Pss with gold nanocomposite modified gold electrode has enhanced the sensitivity of the sensor for easy recognition of DNA. Gold nanoparticles solution was synthesized and characterized using Uv-vis spectroscopy and XRD for the formation of nanocomposite with a conductive Poly(3,4-ethylenedioxythiophen)–poly (styrenesulfonate) (Pedot-Pss) film on gold electrode which was also characterized using FE-SEM. Bare and the modified gold electrode surfaces were characterized using cyclic voltammetry (CV) technique for the active surface area. Immobilization of a 20-mer single stranded peptide nucleic acid (ssPNA) probe as the bioreceptor of the sensor was achieved by covalent attachment of the amine group of the capture probe to a carboxylic group of an activated 3,3'-dithiodipropionic acid layer using EDC/NHSS. The sensitivity of the sensor was optimized using differential pulse voltammetry (DPV) and the sensor demonstrated specific detection for the target concentration ranged between 1.0×10−15M to 1.0×10−9M with a detection limit of 1.55 ×10−18 M. Hybridization of the bioreceptor with perfectly matched target DNA related to Ganoderma boninense fungal disease was successful in TE supporting electrolyte and monitored using a new ruthenium complex [Ru (dppz)2(qtpy)Cl2; dppz=dipyrido [3,2–a:2',3'-c] phenazine; qtpy=2,2',-4,4".4'4"'-quarterpyridyl redox indicator using cylic votammetry (CV). The sensor was also able to detect genomic DNA of Ganoderma boninense (G. boninense) extracted via DNeasy plant mini kit procedure from a cultured fungal isolate harvested from palm oil tree. The probe is found to have good analytical recognition performance.

Biography:

Sabo Wada Dutse has completed his PhD at the age of 50 years from Universiti Putra Malaysia in the year, 2014. He is the director of College of Science and Technology, Hussanini Adamu Federal Polytechnic, Kazaure, Jigawa, Nigeria. He has published papers in reputed journals and has been serving as a lecturer and an administrator.

Publication of speakers:

- Detection and control of Ganoderma boninense: strategies and perspectives, December 2013
- Microfluidics-based lab-on-chip systems in DNA-based biosensing: an overview, June 2011
- DNA-based biosensor for detection of ganoderma boninense, an Oil palm pathogen utilizing newly synthesized ruthenium complex [Ru (phen) 2 (qtpy)] 2 based on a PEDOT-PSS/A, September 2013
- A novel DNA nanosensor based on CdSe/ZnS quantum dots and synthesized Fe3O4 magnetic nanoparticles, April 2014
- An electrochemical DNA biosensor for ganoderma boninense pathogen of the Oil palm utilizing a New ruthenium complex,[Ru (dppz) 2 (qtpy)] Cl2, September 2012
- Facilitating the indirect detection of genomic DNA in an electrochemical DNA biosensor using magnetic nanoparticles and DNA ligase, December 2015
- An Electrochemical Biosensor for the Determination of Ganoderma boninense Pathogen Based on a Novel Modified Gold Nanocomposite Film Electrode, March 2014
- Conductivity of Pedot-Pss with Gold and Silver Nanocomposites Modified Gold Electrodes for Ganoderma boninense DNA Detection, August 2015
- Improving the Sensitivity of Pedot: Pss Modified Gold Electrode Using Gold and Silver Nanoparticles for Ganoderma boninense DNA Detection, 2015

Intenational Webinar on Sensors, December 24, 2020

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