J Ind Electron Appl 2021, S13

Journal of electrical engineering and electronics technology

Short Communication

A SCITECHNOL JOURNAL

Optimisation of electrochemical deposition parameters to get stable gold nanoparticles film on ITO for electrochemical biosensing of a disease specific biomarkers

Kalpana

Applied Science Department, The NorthCap University, India

Abstract:

Early identification of a nearly fatal disease (contagious/non-contagious) is quite helpful in its control and to reduce the financial burden on government of any under developed/developing nation. For this purpose, biosensors play a very important role in today's scenario specially when the disease is contagious and poses a big threat to humanity. Keeping this in view, optimisation of electrochemical deposition experimental conditions is done by depositing film of gold nanoparticles on indium-tin-oxide (ITO) with and without SAM (self-assembled monolayer) of APTES (3-Aminopropyl)triethoxysilane) on it. AuNP films are electrochemically deposited from a solution containing AuCl4- on two different ITO electrodes one is without and another with SAM of APTES by applying a range of potential through cyclic voltammetry technique for a number of cycles till the saturated anodic current peak is obtained. In both the cases, this peak is almost saturated after electrochemical deposition for sixty cycles and after this there is only slight increase in the anodic peak current. Stability of thin AuNP films thus obtained is confirmed by characterising through DPV for approximately twenty five times in PBS buffer solution (100 mM, pH 7.4, 0.9% NaCl) containing 5 mM [Fe(CN)6] 3−/4− which showed unstability of AuNP film deposited directly on ITO while AuNP film on ITO modified with APTES (AuNP/APTES/ITO) is found to be stable which can be considered suitable for further fabrication of immunoelectrode for biosensing purpose. A disease specific antibodies can be immobilised on to the AuNP/APTES/ITO with help of covalent bonding between negatively charged gold nanoparticles and antibodies. This modified immunoelectrode (Ab/AuNP/APTES/ITO) then can further be used to diagnose the disease specific analyte/biomarker present in the sample. At every stage of modification of ITO, we get different signals when we do electrochemical characterisation of the ITO electrode after every modification with cyclic voltammetry and DPV (Differential Pulse Voltammetry) techniques by applying a range of potential in the same PBS buffer solution (100 mM, pH 7.4, 0.9% NaCl) containing 5 mM [Fe(CN)6] 3−/4−.

Biography

Kalpana is a PhD scholar doing research in the field of biosensors specially by using electrochemical response studies under the valuable guidance of Dr. Aditya Sharma Ghrera who already has many important publications in the same area of research.

Publication of speakers

1. Libo S, Wenwen L, Maojing W, Wei D, Yang J (2017) Development of an electricalchemical impedance immunosensor for myoglobin determination. Int. J. Electrochem. Sci. 12:6170-6179.
2. Hema B, Manoj K.P, Rajesh, Gajjala S (2019) Electrochemical aflatoxin B1 immunosensor based on the use of graphene quantum dots and gold nanoparticles. Microchimica Acta. 186:592
3. T. Ahuja, V.K. Tanwar, S.K. Mishra, D. Kumar, A.M. Biradar, Rajesh (2011) Immobilization of uricase enzyme on self-assembled gold nanoparticles for application in uric acid biosensor. Journal of Nanoscience and Nanotechnology. 11:4692-4701

Citation: Kalpana; Optimisation of electrochemical deposition parameters to get stable gold nanoparticles film on ITO for electrochemical biosensing of a disease specific biomarkers; Webinar on Sensors; February 17.