Contribution ID: **243** Type: **Oral presentation**

Reduced graphene oxide obtained by gamma radiation to produce screen printed glucose biosensor

Screen printed biosensor has attracted attention as point care device due to its fast and accurate response in a compact portable platform. Due the high electrical carrier mobility, reduced graphene oxide (rGO) has been used to modify the working electrode surface and increase the biosensor sensibility. However, there are some disadvantages during the reduction of graphene oxide that include the use of chemical reductants that need to be removed after the reaction and the toxic residues. The purification usually requires tedious steps and a lot of efforts to recover the nanomaterial. In this work screen printed carbon electrode (SPCE) was modified using rGO produced by gamma radiation. Graphene oxide (GO) was prepared by modified Hummers and the reduction was performed in a water/isopropanol solution and inert medium. Sample was irradiated in the Multipurpose Gamma Irradiation Facility at Radiation Technology Center from Nuclear and Energy Research Institute (IPEN/CNEN-SP), a category IV gamma irradiator by the IAEA classification under the radiation dose at 80,0 kGy. rGO characterization was performed by X-Ray Diffraction (XRD). From the XRD patterns: the 2θ the peak located at 11o shift to 23o, demonstrating the reduction of GO to rGO. The decrease of the distance between layers was attributed on partial remove of the oxygen groups from GO. For the glucose biosensor preparation, first of all, the SPCE (Metrohm, model 6. 1208. 110) was modified by drop-coating rGO solution and dried at room temperature for 24h. Then, for Glucose Oxidase (GOx) immobilization, the carboxylic groups from rGO were activated using N-hydroxysuccinimide (NHS) and 1-Ethyl-3-(3-dimethyalaminopropyl) carbodiimide (EDC) for 30 min at room temperature, followed by adding GOx 10KU from A. niger Type II (5mg/mL). The solution was incubated at 4oC overnight. SEM images showed GOx onto SPCE surface and the electrocatalysis of GOx toward glucose was measured to confirm the enzymatic activity. For electrochemical studies, cyclic voltammetry was carried out in a Portable Potentiostat model 910 PSTAT mini, Metrohm and PSTAT software. The fabricated amperiometric biosensor detects glucose ranged from 1mM to 5mM with LOD of 0.9 mM at 0.70V. Moreover, the biosensor exhibited repeatability, reproducibility and practicability.
This study showed that rGO synthesized by gamma radiation without any further purification is a simple and sustainable approach to fabricate electrode for biosensors.

Affiliation

Nuclear and Energy Research Institute (IPEN/CNEN-SP)

Country or Int. Organization

Brazil

Primary author: SAKATA, Solange (IPEN/CNEN-SP)

Co-authors: MARIA SILVA JACOVONE, Raynara; DUARTE, Miguel; GARCIA, Rafael (IPEN); ANGNES, Lucio

Presenter: SAKATA, Solange (IPEN/CNEN-SP)

Track Classification: Track 4: Advanced materials: from fundamentals to applications