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GRAPHENE-BASED ELECTROCHEMICAL BIOSENSORS FOR DNA DETECTION IN HEALTHCARE DIAGNOSIS

Quantification of biological events are of great importance for biomedical applications. Electrochemical biosensors based on graphene materials are modern and future approaches to healthcare diagnosis [1]. In this work, we propose to develop electrochemical graphene biosensors using conventional glassy carbon electrode (GCE) and industrial screen-printed electrode (SPE) (figure 1) for DNA detection, molecules which play key roles in the regulation of gene expression. Cyclic voltammetry and electrochemical impedance spectroscopy (EIS) measurements were performed with a potentiostat/galvanostat Autolab model Pgstat 204. The structure, chemistry and morphology of graphene electrodes was investigated by optical microscopy, Raman spectroscopy (Renishaw Invia), and XPS (Thermoflex 1400). This study presents a comparison of various graphene electrodes (multilayer graphene, graphene oxide, reduced graphene oxide, functionalized graphene oxide) highlighting how their structural, morphological and chemical properties influence their ability to sense a DNA probe and DNA target molecules; a key aspect for biosensor development. After DNA immobilization (probe) and hybridization (target), we observed a sensitive decrease of the current in cyclic voltammetry and an increase in the charge transfer in the impedance spectroscopy curves (figure 2).

Figures

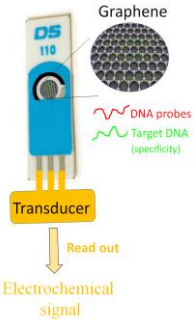

Figure 1: Graphene-based SPE biosensor

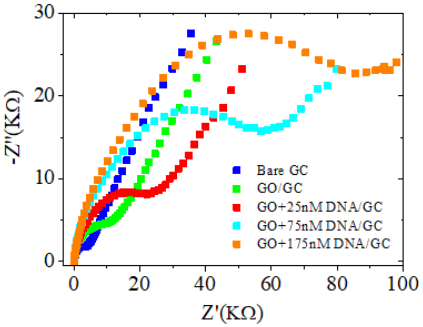

Figure 2: Nyquist plots of GO/GCE upon DNA deposition

References

[1] P. Abdul Rasheed et al., Biosensors and Bioelectronics, 97 (2017) 226

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