Determination of Heavy Metals in water using printed electrodes

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Abstract
Heavy-metal pollution poses severe threat to ecological systems and presents a great challenge for global sustainability.[1] The electrochemical method for heavy metal detections has attracted intensive attention due to its capability for achieving better quantitative results, more rapid analysis, and higher sensitivity.[1] The main goal of this study is to develop a sensor, suitable for the monitoring of Heavy Metals in environment. We used a single-step technique to produce reduced graphene oxide (rGO) conductive films integrating gold NPs.[2] The rGO- , Au@rGO- based electrodes and AuNPs –Inkjet printed electrodes have been challenged to detect heavy metals in water. The electrochemical characterization of integrated sensors was accomplished via Cyclic Voltammetry (CV) and Square Wave Anodic Stripping Voltammetry (SWASV). Bare and modified electrode surfaces were carried out with a 5 mM $K3Fe(CN)_6$ redox probe in 0.1 M KCl aqueous solution using cyclic voltammetry. Well-defined anodic stripping peaks were obtained for Pb^{2+} and the calibration curves of the tested electrodes showed a line correlation R^2 = 0.9957 for AuNPs – Inkjet printed electrodes and R^2 = 0.9436 for Au@rGO- based electrodes. Based on obtained results, AuNPs –Inkjet printed electrodes show better analytical performance than Au@rGO- based electrodes for determination of Heavy Metals in environment.

References

[1] Liu-Liu Shen , et al., ACS Omega 2017, 2, 4593−4603
[2] A. Scroccarello,et al., ACS Sens. (2023) , 8, 598−609

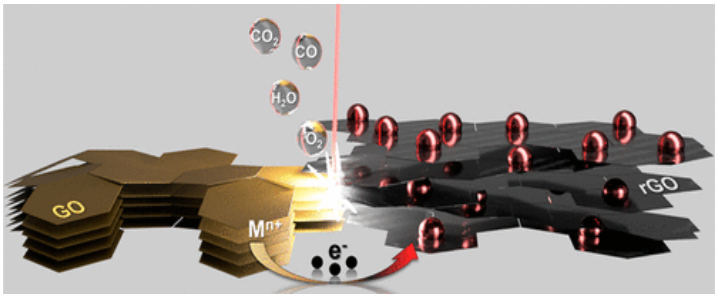

Figure 1: Sketch of the proposed MNPs@rGO mechanism of nanostructured film formation.[2]

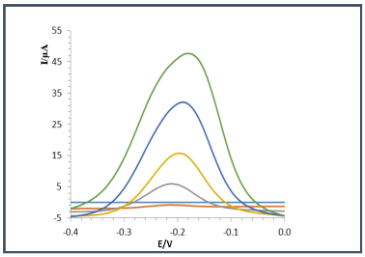

Figure 2: Typical SWASVs of Pb^{2+} using AuNPs-IjP sensor

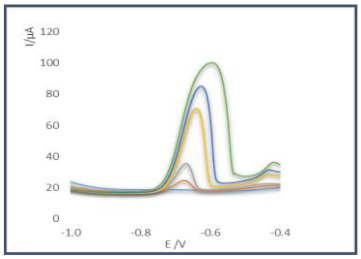

Figure 3: Typical SWASVs of Pb^{2+} using Au@rGO- sensor