2nd World Congress and Expo on
Nanotechnology and Material Science
April 04-06, 2016 at Dubai, UAE

The electrochemical co-deposition of Reduced Graphene Oxide–Gold nanocomposite on an ITO substrate and its application in detection of dopamine

Jing Tang, Chaoyi Jiang, Xiangzhou Zeng, Qiao Zeng and Wenhui Pang
Key Laboratory of Analysis and Detection Technology for Food Safety, Ministry of Education, College of Chemistry and Chemical Engineering, Fuzhou University, China

The reduced graphene oxide(rGO), a form of graphene, produced by reduction of graphene oxide which contains many functional groups and defects, offers great potential as it is easy and cheap to produce in large scale. Graphene metal nanoparticle has become a highly expanding area in modern research due to various promising applications of the materials in catalysis, energy conversion, fuel cells and in other fields. Recently, an electrochemical reduction method has been described to prepare graphene–metal nanocomposites[1]. This electrochemical method makes the nanocomposite materials more easily accessible[2].

In this work, the electrochemical behavior of rGO-Au/ITO is compared with Au/ITO and rGO/ITO in the solution of 0.2 mM catechol (CC) + 0.2 M acetate buffer solution(ABS). The electrochemical oxidation of dopamine(DA) on the rGO-Au/ITO electrode is compared with the rGO/ITO electrode and Au/ITO electrode, and the analytical application of rGO-Au/ITO is applied preliminarily in the detection of DA.

The electrodepositions of the rGO, Au and rGO-Au on the ITO electrode are studied by cyclic voltammetry(CV). As shown in Figure 1.(a), CV curves are recorded in solutions of 0.2 M ABS, 0.25 mM $HAuCl_4$ + 0.2 M ABS , 0.5 mg/L GO + 0.2 M ABS , 0.5 mg/L GO + 0.25 mM $HAuCl_4$+ 0.2 M ABS. According to the CV curves, the electrodes (Au/ITO, rGO/ITO, rGO-Au/ITO) are prepared by controlling the potential at -0.8V vs.SCE for 100 s. In the Figure 1.(b), the three electrodes are characterized in solution of 0.2 mM catechol (CC) + 0.2 M acetate buffer solution (ABS) with a pH value of 4.5, scanning rate 50 mV/s. Comparing the eletrochemical behaviors of the four different electrodes, the rGO-Au/ITO electrode exhibits a dramatically enhanced peak current of 190.3 μA compared with the peak current of 1.764 μA for the bare ITO electrode and the anode-to-cathode peak potential separation is the smallest (274 mV) of all four electrodes. Figure 2(a) shows the different behavior of dopamine on three kinds of electrodes(ITO, Au/ITO and rGO-Au/ITO), among all the curves, the rGO-Au/ITO shows two well-defined peaks at 218.5 mV and -258.6 mV. However, there are no well-defined peaks of DA oxidation on the ITO electrode and the curves on rGO-Au/ITO shows better reversibility than Au/ITO. Differential pulse voltammetry (DPV) is carried out on the electrode of rGO-Au/ITO for the quantitative detection of DA. As shown in Figure 2(b), the oxidation peak currents of DA increase linearly with its concentrations, indicating the efficient and stable electrocatalytic activity of the rGO-Au/ITO.

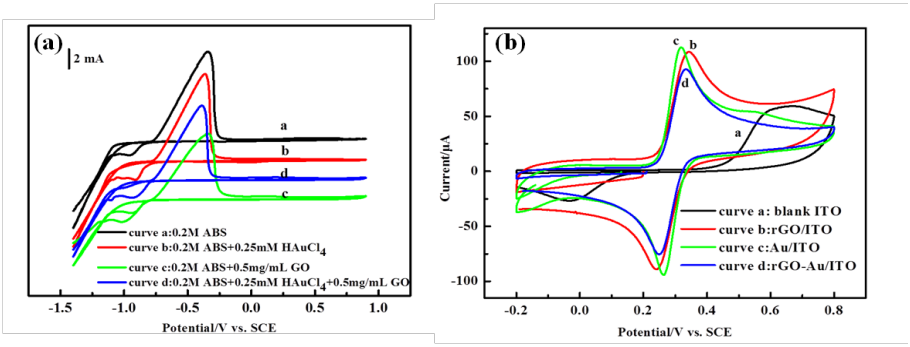

Figure 1.(a) Cyclic voltammograms of ITO electrode in the solution of electrolyte used for the deposition of Au or rGO or rGO-