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ELECTROCHEMICAL DETECTION OF Hg(II) IN ENVIRONMENTAL WATER SAMPLES BASED ON MULTIWALLED CARBON NANOTUBE-REDUCED GRAPHENE OXIDE HYBRID FILM

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In this work, we describe the fabrication of an electrochemical sensor for the detection of Hg^{2+} in various water samples. The electrochemical sensor is fabricated on an indium tin oxide (ITO) modified with multi-walled carbon nanotubes (MWCNT) and reduced graphene oxide (RGO) hybrid film. The MWCNT was firstly dispersed using graphene oxide (GO) as dispersant. After coating on the ITO, the GO was then electrochemically reduced to RGO. The obtained thin film was characterized by scanning electron microscope (SEM), FTIR, Raman spectroscopy and 3D optical surface profiler. Cyclic voltammetry and differential pulse voltammetry were employed to investigate the electrocatalytic performance towards the Hg^{2+} oxidation. Under optimum conditions, the proposed sensor showed a wider linear range at Hg(II) concentrations of 0.05 – 150 nM. The limit of detection was calculated to be 0.05 nM.

Keywords: electrochemical sensor, Hg(II) detection, graphene oxide, carbon nanotube, water pollution.

Introduction

As is well known, Hg^{2+} ions can cause a number of health problems such as brain damage and kidney failure even at very low concentration [1 – 3]. Also, it accounts for the majority of toxicity events in microorganisms and other species in the environment. Because the Hg^{2+} ions are a major and dangerous contaminant in environmental and potable water, development of an effective analytical method is strongly demanded. So far, many analytical methods have been developed for the detection of Hg^{2+}, such as surface enhanced Raman spectroscopy [4], fluorescent method [5], colorimetric

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