Sensitive Determination of Zn^{2+} , Cd^{2+} and Pb^{2+} at Electrochemically Reduced Nanoporous Graphene Oxide/Bismuth Film Electrode

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A sensitive electrochemical sensor was developed for determination of Zn^{2+} , Cd^{2+} and Pb^{2+} based on electrochemically reduced nanoporous graphene oxide (ERNGO) and bismuth film modified electrode. Nanoporous graphene oxide nanosheets were prepared via sono-Fenton reaction of graphene oxide. The structure of NGO was characterized by atom force microscopy and Raman spectrum, and the porosity of NGO nanosheet was verified. The NGO was electrochemically reduced onto glassy carbon electrode surface (ERNGO/GCE), providing huge surface area for loading alloy. By virtue of in situ plated bismuth-film, the Zn^{2+} , Cd^{2+} and Pb^{2+} exhibited sensitive stripping currents and high potential resolution on ERNGO/GCE via square wave anodic stripping voltammetry (SWASV). Under the optimum experiment conditions, the calibration curves for Zn^{2+} , Cd^{2+} and Pb^{2+} were obtained in the range of 20.0-1000.0 nM, 10.0-1000.0 nM and 10.0-1000.0 nM with the detection limits (S/N=3) of 5.0 nM, 2.0 nM and 0.8 nM, respectively. The proposed sensor also displayed good reproducibility, and was successfully applied to the detection of these metal ions in water samples including tap water and river water.

Keywords: Nanoporous graphene oxide; Bismuth film; Sono-Fenton reaction; Square wave anodic stripping voltammetry; Pb^{2+} ; Cd^{2+}

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