A Highly Effective Copper Nanoparticle Coupled with RGO for Electrochemical Detection of Heavy Metal Ions

Dan Li¹, Chongxu Wang², Hui Zhang², Youyi Sun^{2,*}, Qianqian Duan¹, Jianlong Ji¹, Wendong Zhang¹, Shengbo Sang^{1,*}

¹ Intelligent Control System of the Ministry of Education and Key Lab of Advanced Transducers & College of Information Engineering, Taiyuan University of Technology, Taiyuan 030024, China.

² Shanxi Province Key Laboratory of Functional Nanocomposites, North University of China, Taiyuan 030051, P.R.China.

*E-mail: sangshengbo@tyut.edu.cn

doi: 10.20964/2017.11.19

Received: 28 June 2017 / Accepted: 26 August 2017 / Published: 12 October 2017

A highly effective copper nanoparticle (CuNP) coupled with reduced graphene oxide was successfully prepared by liquid phase reduction. The as-prepared products were tested with X-ray diffraction, field-emission transmission electron microscopy, and scanning electron microscopy. CuNPs were distributed averagely on the surface of reduced graphene oxide. CuNP/RGO nanocomposites modified bare glassy carbon electrode was measured by electrochemical impedance spectroscopy and cyclic voltammetry. The availability of CuNP/RGO nanocomposites was analyzed by square wave anodic stripping voltammetry (SWASV). The nanocomposites showed a high electroanalytical activity and eximious sensitivity to Hg(II), Cu(II), Cd(II) and Pb(II), these ions exhibited sensitivities of 27.76, 25.86, 66.30 and 50.17 $\mu\text{A}/\mu\text{M}$, respectively, and the limits of detection were 0.051, 0.111, 0.203 and 0.186 μM , respectively. The CuNP/RGO nanocomposite was used firstly to detect individually and simultaneously various heavy metal ions. Furthermore, CuNP/RGO/GCE has good anti-interference properties and stability. In this study, CuNP/RGO nanocomposites are presented as a potential material to detect individually and simultaneously heavy metal ions.

Keywords: CuNP/RGO, SWASV, electrochemical measurement, heavy metals.

[FULL TEXT](#)

© 2017 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).