An Ultrasensitive Method for Detecting Picomolar Levels of Cadmium(II) by Fast-Scan Anodic Stripping Voltammetry

Weiqliang Meng¹, Peng Liu², Pingru Cai¹, Tingting Hao¹, Shaohua Ma³, Yufang Hu¹, Sui Wang¹, Yangbo Wu^{2,*} and Zhiyong Guo^{1,*}

¹ School of Materials Science and Chemical Engineering, The State Key Laboratory Base of Novel Functional Materials and Preparation Science, Ningbo University, Ningbo 315211, PR China

² Faculty of Electrical Engineering and Computer Science, Ningbo University, Ningbo 315211, PR China

³ School of Medical Technology, Ningbo College of Health Sciences, Ningbo 315100, PR China

*Email: wuyangbo@nbu.edu.cn, guozhiyong@nbu.edu.cn

doi: 1020964/2018.12.31

Received: 8 August 2018 / Accepted: 24 September 2018 / Published: 5 November 2018

This work reported an approach for the determination of the heavy metal ion cadmium Cd(II) using a bismuth-film electrode (Bi-FE) with fast-scan anodic stripping voltammetry (FSASV). The experiment was divided into two steps. First, the Bi-FE was prepared by electrodepositing a metallic bismuth-film onto the electrode, and then the target metal ion Cd(II) was electrochemically preconcentrated on the Bi-FE. Second, the target metal was measured with FSASV. At a scan rate of 400 V/s, the anodic stripping peak current increased gradually with increasing Cd(II) concentration, and a linear relationship between the peak current and the logarithm of Cd(II) concentration was obtained from 0.1 $\mu\text{mol/L}$ to 1.0 pmol/L , with a detection limit of 0.3 pmol/L (S/N=3). Furthermore, the method was successfully applied to detect Cd(II) in spiked tap water samples, with sufficient recoveries in the range of 94.0% to 105.2% and corresponding relative standard deviations ranging from 2.9% to 6.4%. Therefore, FSASV is a simple, rapid and ultrasensitive method for the detection of picomolar levels of Cd(II).

Keywords: Fast-scan anodic stripping voltammetry; Ultrasensitive determination; Cadmium(II); Bismuth-film electrode (Bi-FE)

[FULL TEXT](#)

© 2018 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/>).