A Portable Electrochemical workstation using Disposable Screen-Printed Carbon Electrode decorated with Multiwall Carbon Nanotube-Ionic Liquid and Bismuth Film for Cd(II) and Pb(II) Determination

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Heavy metal ions endangered human health seriously when they were absorbed and accumulated into in plants and animals. However, instruments using in labs and testing agencies were large size, expensive and complex operations, which were difficulty applying for heavy metal ions determination in situ. To solve this problem, we explored a portable electrochemical workstation and disposable screen-printed carbon electrode(SPCE), which were employed to determinate Cd(II) and Pb(II). This SPCE was modified with multi-walled carbon nanotube(MWNT) and ionic liquid(IL), and then reduced a bismuth film(BI) in situ. The characteristics of BI/MWNT-IL/SPCE were investigated through electrochemical methods including cyclic voltammetry and impedance spectroscopy. Some parameters of BI/MWNT-IL/SPCE were optimized with our portable device. By optimizing and testing, the linear relationship between peak currents and concentrations of Cd(II) and Pb(II) was established, which got the linear range from 1.0 to 60 µg/L for Cd(II) and for Pb(II) with the detection limit of 0.5 µg/L and 0.12 µg/L (S/N = 3). Finally, this portable electrochemical workstation and electrode were employed to the determination of Cd(II) and Pb(II) in soil samples with satisfactory results.

Keywords: Electrochemistry, Heavy metal ion, Screen-Printed Carbon Electrode, Bismuth Film, Multiwall Carbon Nanotube, Ionic Liquid

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