

Title : Development of a Simple Electrochemical Sensor for Simultaneous Determination of Cadmium and Lead

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ABSTRACT

In this research, a simple electrochemical sensor was developed for the simultaneous determination of cadmium and lead ions. The surface of the screen-printed carbon electrode (SPCE) was modified with carbon black to enhance its analytical performance. A differential pulse anodic stripping voltammetry (DPASV) was employed as the analytical technique. To improving detection performance, the effects of various parameters were investigated. These included the type of modifier used on the electrode surface, the volume of the modifier applied to the SPCE, the concentration of the bismuth solution, the pH of the electrolyte, the deposition potential, the deposition time, and the stirring speed. Under optimized conditions, a linear relationship between the current signal and concentration were obtained for both Cd^{2+} and Pb^{2+} ions in the range of 5–100 $\mu\text{g/L}$. The limits of detection (LOD) were 2.0 $\mu\text{g/L}$ and 1.1 $\mu\text{g/L}$ for Cd^{2+} and Pb^{2+} , respectively. The relative standard deviation (%RSD) values were 4.5% and 4.2% ($n=10$) for Cd^{2+} and Pb^{2+} , respectively. To evaluate the applicability of the developed method, it was applied to the determination of cadmium (II) and lead (II) ions in concrete roof tile samples, with recoveries ranging from 85.5% to 93.8% of Cd^{2+} and 85.4% to 95.8% for Pb^{2+} . Furthermore, the developed method was compared to graphite furnace atomic absorption spectrometry (GFAAS) as a standard analytical technique. The results obtained with the developed method showed excellent agreement with GFAAS.

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