Carbon Paste Electrode Modified with Bismuth Oxychloride as a Sensor for the Determination of Pb^{2+} and Cd^{2+}

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Herein, porous BiOCl microspheres were successfully fabricated by using a hydrothermal method. The as-obtained porous BiOCl microspheres were used as a bulk modifier to decorate a carbon paste electrode (CPE) for the simultaneous determination of Cd^{2+} and Pb^{2+} by square-wave anodic stripping voltammetry (SWASV). The BiOCl-modified CPE showed better detection sensitivity for Pb^{2+} and Cd^{2+} ions than that of a bare CPE. Furthermore, the effect of the preparation conditions (hydrothermal temperature and time) of BiOCl, mass ratio of BiOCl in the carbon paste, pH of the electrolyte solution and preconcentration conditions (deposition potential and time) on the detection sensitivity of target ions was investigated. Under optimized conditions, stripping voltammetric measurements demonstrated that the modified electrode has a wide linear working range (from 10.0 to 400.0 $\mu\text{g L}^{-1}$ for Pb^{2+} and from 10.0 to 450.0 $\mu\text{g L}^{-1}$ for Cd^{2+}), a favorable detection limit (0.42 $\mu\text{g L}^{-1}$ for Pb^{2+} and 0.76 $\mu\text{g L}^{-1}$ for Cd^{2+}) and good reproducibility. The BiOCl-modified CPE is a very promising candidate for the user-friendly and convenient determination of heavy metal ions.

Keywords: bismuth oxychloride; carbon paste electrode (CPE); heavy metal ions; anodic stripping voltammetry

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