

Determination of Aluminum by Bismuth Film Electrode Coated with Nafion

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Abstract

Electrochemical detection of ultratrace aluminum using bismuth film electrode was described. Bismuth film was prepared by electrodeposition of Bi(III) onto glassy carbon electrode. The electrode was later coated with Nafion and employed for the determination of aluminum. Since the reduction potential of aluminum is far below the working potential of bismuth film, cupferron was used as complexing agent to increase the reduction potential to be within the working range of the bismuth film. Aluminum-cupferron complexes were then accumulated by adsorption on the surface of the electrode, and the stripping step was performed using square-wave voltammetry. Under the optimized voltammetric condition, the electrode shows linear response between 50 and 800 ppb. It was found that the electrode was best response for the complexes that accumulated for 240 s at -0.8 V (vs. Ag/AgCl) in acetate buffer pH 6.0. Other important parameters for coating the electrode with bismuth film and Nafion was also investigated and described.

Keywords: bismuth film electrode, aluminum sensor, aluminum determination, Nafion, trace analysis, square wave voltammetry, electrochemistry

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