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PII: S1572-6657(17)30248-5
DOI: doi: 10.1016/j.jelechem.2017.04.009
Reference: JEAC 3221

To appear in: *Journal of Electroanalytical Chemistry*

Received date: 22 January 2017
Revised date: 20 March 2017
Accepted date: 5 April 2017

Please cite this article as: Justyna Zuziak, Małgorzata Jakubowska , Voltammetric determination of aluminum-Alizarin S complex by renewable silver amalgam electrode in river and waste waters. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Jeac(2017), doi: 10.1016/j.jelechem.2017.04.009

Voltammetric determination of aluminum-Alizarin S complex by renewable silver amalgam electrode in river and waste waters

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Abstract

The direct voltammetric determination of aluminum is difficult because it is reduced at very low potential −1.75V versus Ag/AgCl. Therefore, in this work a simple and rapid stripping voltammetry method of Alizarin S-Al complex determination on renewable silver amalgam film electrode was proposed. The electrode process in complex electrolyte is irreversible and controlled by the surface phenomena. Experimental conditions such as preconcentration time and operation parameters were optimized. The promising results were obtained in 0.1 M ammonia buffer, 0.01 M $KBrO_3$, 0.25 μM Ca, 0.1 μM EDTA. The calibration graph was linear from 5 to 45 μgL^{-1} with sensitivity of 14.6 $\mu A/mgL^{-1}$, detection limit of 0.2 μgL^{-1} and repeatability below 3.5%. With accumulation time of 4 sec. the sensitivity increases to 17.4 μA / mgL^{-1} with r = 0.9978 but the range of linearity was limited to 20 μgL^{-1}. The problem of the main interferent which is zinc was resolved by the EDTA addition. Procedure was verified using waste waters CRMs with recovery 99-110% and spiked Vistula River water.

Keywords: aluminum, Alizarin S, adsorptive stripping voltammetry, waste water, river water

1. Introduction

Aluminum is the third most abundant element in the earth's crust, with an average content ca. 88 g/kg. It is found in most rocks, air, water and many foods. In compounds, aluminum occurs in its only +3 oxidation state. Aluminum is never found in its elemental state in the environment, but it occurs in the form of salts and oxides [1]. Aluminum enters environment naturally through the weathering of rocks and minerals. Air emissions, waste

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