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PII: S0039-9140(16)30789-5
DOI: http://dx.doi.org/10.1016/j.talanta.2016.10.044
Reference: TAL16964

To appear in: *Talanta*

Received date: 25 July 2016
Revised date: 2 October 2016
Accepted date: 8 October 2016

Cite this article as: Ignacio López-García, Silvia Rengevicova, María J. Muñoz Sandoval and Manuel Hernández-Cordoba, Speciation of very low amounts o antimony in waters using magnetic core-modified silver nanoparticles an electrothermal atomic absorption spectrometry, *Talanta* http://dx.doi.org/10.1016/j.talanta.2016.10.044

Speciation of very low amounts of antimony in waters using magnetic core-modified silver nanoparticles and electrothermal atomic absorption spectrometry

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Abstract

A micro-solid phase extraction procedure for the separation and preconcentration of antimony based in the use of magnetic particles covered with silver nanoparticles functionalized with the sodium salt of 2-mercaptoethane-sulphonate (MESNa) is discussed. After separation by means of a magnetic field, the solid phase is directly introduced into an electrothermal atomizer for antimony determination. Alternatively, the solid can be slurried and then injected into the atomizer. In all cases, palladium nitrate is used as a chemical modifier. The preconcentration factors are close to 205 and 325, with detection limits of 0.02 and 0.03 μg L^{-1} antimony, for the slurry and solid sampling procedures, respectively. Speciation of Sb(III) and Sb(V) is achieved by means of two extractions carried out at different acidity. The results for total antimony are verified using certified reference materials. Water samples are analyzed for antimony speciation.

Keywords: antimony; speciation; waters; magnetic-core particles; electrothermal atomic absorption spectrometry

1. Introduction

Antimony trioxide is often used as a catalyst for the polycondensation reaction in the production of polyethylene terephthalate (PET). Consequently, small amounts of the element are incorporated into PET bottles and could be released to the beverages they contain [1]. The level of antimony in bottled water has aroused special interest [2-4] because of the large daily intake of this liquid and the toxicity of this metalloid, which is also related to its oxidation state. Although the literature reports that PET packages are safe in this respect since the amount of antimony migrated to bottled water is extremely low, there is a clear case for