Aspects of flow injection sample introduction for atomic absorption spectrometry

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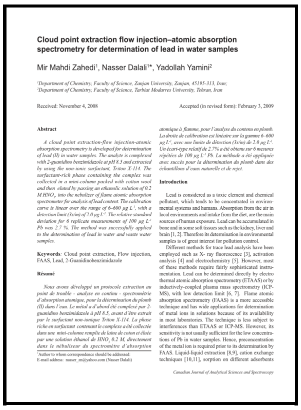

Cloud point extraction flow injection–atomic absorption spectrometry for determination of lead in water samples

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Abstract

A cloud point extraction-flow injection-atomic absorption spectrometry is developed for determination of lead (II) in water samples. The analyte is complexed with 2-guanidino benzimidazole at pH 8.5 and extracted by using the non-ionic surfactant, Triton X-114. The surfactant-rich phase containing the complex was collected in a mini-column packed with cotton wool and then eluted by passing an ethanolic solution of 0.2 M HNO_3, into the nebulizer of flame atomic absorption spectrometer for analysis of lead content. The calibration curve is linear over the range of 6–600 μg L^{-1}, with a detection limit (3s/m) of 2.0 μg L^{-1}. The relative standard deviation for 6 replicate measurements of 100 μg L^{-1} Pb was 2.7 %. The method was successfully applied to the determination of lead in water and waste water samples.

Keywords: Cloud point extraction, Flow injection, FAAS, Lead, 2-Guanidinobenzimidazole

Résumé

Nous avons développé un protocole extraction au point de trouble - analyse en continu - spectrométrie d'absorption atomique, pour la détermination du plomb (II) dans l'eau. Le métal a d'abord été complexé par 2-guanidino benzimidazole à pH 8.5, avant d'être extrait par le surfactant non-ionique Triton X-114. La phase riche en surfactant contenant le complexe a été collectée dans une mini-colonne remplie de laine de coton et éluée par une solution éthanol de HNO_3 0.2 M, directement dans le nébuliseur du spectromètre d'absorption atomique à flamme, pour l'analyse du contenu en plomb. La droite de calibration est linéaire sur la gamme 6–600 μg L^{-1}, avec une limite de détection (3s/m) de 2.0 μg L^{-1}. Un écart-type relatif de 2.7% a été obtenu sur 6 mesures répétées de 100 μg L^{-1} Pb. La méthode a été appliquée avec succès pour la détermination du plomb dans des échantillons d'eaux naturelle et de rejet.

Introduction

Lead is considered as a toxic element and chemical pollutant, which tends to be concentrated in environmental systems and humans. Absorption from the air in local environments and intake from the diet, are the main sources of human exposure. Lead can be accumulated in bone and in some soft tissues such as the kidney, liver and brain [1, 2]. Therefore its determination in environmental samples is of great interest for pollution control.

Different methods for trace lead analysis have been employed such as X- ray fluorescence [3], activation analysis [4] and electrochemistry [5]. However, most of these methods require fairly sophisticated instrumentation. Lead can be determined directly by electro thermal atomic absorption spectrometry (ETAAS) or by inductively-coupled plasma mass spectrometry (ICP-MS), with low detection limit [6, 7]. Flame atomic absorption spectrometry (FAAS) is a more accessible technique and has wide applications for determination of metal ions in solutions because of its availability in most laboratories. The technique is less subject to interferences than ETAAS or ICP-MS. However, its sensitivity is not usually sufficient for the low concentrations of Pb in water samples. Hence, preconcentration of the metal ion is required prior to its determination by FAAS. Liquid-liquid extraction [8,9], cation exchange techniques [10,11], sorption on different adsorbents

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Atomic Absorption Spectrometry

This is the most important disadvantage of the method against emission techniques. The very low detection limits for rare earth elements and the actinides permit occasional studies relating to the biochemistry and unusual sources of exposure to these elements. Parameter Techniques Wavelength FAAS, ETAAS, OES, HG—AAS, AFS Mass number ICP—MS Temperature ETAAS Power supplied OES, OES—MS Gas flow FAAS, ETAAS, OES, AFS, HG—AAS, ICP—MS Sample flow FAAS, OES, AFS, ICP—MS However, taking into account the great number of variables which can affect the atomic signals absorbance, fluorescence, emission or counts at a specific mass number , it is common practice in atomic spectrometry to do customarily analytical measurements of both samples and appropriate standards.

Thermospray sample introduction to atomic spectrometry

The outward expansion of the solar wind, combined with the rotation of the sun, causes an important physical phenomenon in the heliosphere: The solar magnetic field is tied firmly to the sun by the highly conducting solar atmosphere. This becomes important when data extracted from different databases are merged together.

Thermospray sample introduction to atomic spectrometry

These shock waves themselves can accelerate interplanetary particles to higher energies and can greatly agitate the magnetosphere. Solid samples can be directly analyzed in particular cases, for instance, when using graphite furnace GF -AAS, INAA, and ICP-MS with laser ablation LA interface. The latter type is a wavelength calculated from the energy difference between the two levels involved in the transition.

Atomic Spectroscopy

Flame, quartz furnace, and electrothermal AAS have all been applied with LC separation, although the interface must cope with a continuous flow of solvent, which is not ideal.

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