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A SIMPLE MANIFOLD FLOW INJECTION ANALYSIS FOR DETERMINING PHOSPHORUS IN PRESENCE OF ARSENATE

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A simple manifold flow injection analysis (FIA) for determining phosphorus in presence of arsenate in water, by the on-line reduction of As(V) to As(III) using sodium sulphite. The FIA method is applicable for the determination of phosphorus in water samples containing less than 0.37 μg·mL^{-1} of AsO_4^{3-}. A solution obtained by mixing 6.30 g of Na_2SO_3 (1 M), 5.0 ml H_2SO_4 18 M completed up to 50 ml with deionized distilled water was used to reduce on line As(V) to As(III), using a reactor of 0.30 m. The limit of detection is 0.05584 ± 0.00167 μg·mL^{-1} $P-PO_4^{3-}$ and sampling frequency is 45 samples per hour. It is a simple and low cost methodology, easily applicable in the determination of phosphorus in samples of water contaminated with arsenate.

Keywords: arsenate, contamination, flow injection, phosphorus, water.

1. Introduction

Phosphorus determination is a subject of great interest in the environmental field. This element is an essential nutrient for the growth of plants and animals, playing a major role in the process of eutrophication [1 – 3]. Phosphorus species determination by batch methods involves tedious and time-consuming steps. By contrast, flow techniques provide precise, accurate and rapid phosphorus determination with a minimal sample handling. Thus, several methods for determining nutrients such as nitrogen [4], [5] and phosphorus [6 – 11] in water and other matrixes based on flow injection analysis (FIA) have been reported.

On the other hand, spectrophotometry is the most common detection technique used in flow analysis since the apparatus required is simple, robust, and can be adapted easily for in situ determination. Phosphate determination by spectrophotometric methods usually involves the reaction between phosphate ions and molybdate in acidic conditions to form a heteropolyacid. The flow-

4. Conclusions

The manifold FIA proposed in this paper is appropriate to determine $P - PO_4^{3-}$ in samples of water with AsO_4^{3-} concentrations lower than 0.37 $\mu g \cdot mL^{-1}$, that might be applicable to water samples with higher arsenic content.

It turned out to be a precise and reproducible method with a detection limit of 0.05584 ± 0.00167 $\mu g \cdot mL^{-1}$ of $P - PO_4^{3-}$ within a linearity range of 0.10 and 2.0 $\mu g \cdot mL^{-1}$ of $P - PO_4^{3-}$. The simplicity of the system proposed, together with the on line reduction of As(V) to As(III) with sodium sulphite, speeds up the analysis and reduces its cost.

Additionally, it proved to be a simple and low cost methodology, easy to apply for determining phosphorus in samples of arsenic contaminated water for consumption.

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Recieved 12.03.2012