SPECIATION ANALYSIS OF ARSENIC BASED ON VOLATILE SPECIES GENERATION AND DIELECTRIC BARRIER DISCHARGE PLASMA ATOMIZATION

Abstract

Volatile species generation (VSG) comprises a group of techniques based on analyte derivatization in order to form a volatile compound prior to spectrometric detection. Selective analyte conversion from liquid to gas phase results in enhanced analyte introduction efficiency, but also in matrix separation and reduced risk of interferences. Moreover, VSG step can be utilized during speciation analysis or analyte preconcentration. The most frequent atomizers of volatile species are externally heated quartz tubes (QTA). Dielectric barrier discharge (DBD) atomizers have proved to be alternative hydride atomizers to QTA. The significant difference in toxicity of various species of the same element leads to the urgent need to develop new strategies for speciation analysis. Various approaches to speciation analysis of toxicologically relevant arsenic species including inorganic iAs^{III} and iAs^{V}, monomethylarsonic acid (MMA), dimethylarsinic acid (DMA) and trimethylarsine oxide (TMAsO) by hydride generation atomic absorption spectrometry (HG-AAS) were investigated in this work. All these species can be converted to volatile compounds. i.e. arsane and its methylated analogues. Firstly, the ability of both atomizers, QTA and DBD, to atomize volatile As species was investigated. Comparable sensitivity was found among the species in given atomizer under the optimized conditions. Secondly, two approaches to speciation analysis were compared. The first one employed a cryotrap device (CT) to separate and also preconcentrate the As species at the same time. This strategy is compatible with both atomizers reaching better sensitivity and limits of detection for the QTA. The second approach was based on HPLC separation of the species in the liquid phase to be subsequently treated by post-column HG followed by *in-situ* preconcentration in DBD and AAS detection in a fully automated procedure operated by a self-designed control unit. The QTA cannot be employed for *in-situ* preconcentration in that way. Developed methods were validated by analysis of certified reference materials.

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2024