

Application of a Novel Speciation Method on Arsenic Analysis in contaminated Soils and Groundwaters.

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1. Introduction

The technique for true separation of different arsenic species has been challenging in many environmental samples. Achieving a correct analytical results and resolving the lowest detection limit of each species in real samples is desired. USEPA has been documented standardized analytical techniques for arsenic on various geological samples including groundwaters. However the previously documented techniques concerns mostly on total arsenic concentration measurement. Recent analytical techniques for analyzing arsenic species are suggesting the hybrid analytical technique which is regarded as essential method to resolve arsenic species.

Specific determination of various arsenic species is gaining increasing attention because the toxicity of arsenic differs with chemical forms such as organic (MMA, DMA) or inorganic (arsenite, arsenate). Knowledge of extraction method for arsenic speciation in contaminated soils then notified and tested by many researchers.

2. Methods

Extraction method for arsenic speciation have been studied with the use of a variety of extractants such as H_3PO_4 , HCl, Na_2CO_3 , EDTA in contaminated soils and sediments. The extractant, 1M phosphoric acid and 0.1M ascorbic acid, show good recovery efficiencies among the previously recorded extractants for arsenic extraction. Concentrations of the extraction solutions for each ionic species were measured by ICP-AES hyphenated SPE-HG-ICP-AES (Ultima 2C, Jobin Yvon and 138 Ultrace, Jobin Yvon).

Extraction	Separation	Introduction	Detection
Extractant: 1M NaH_2PO_4 , H_2O + 0.1M L-ascorbic acid 1. dry soil sample 1 g + 150 ml extractant 2. sonication for 15 min 3. Centrifuge (2800 rpm, 30 min)	Using SPE Cartridge (Accell Plus QMA, Waters) Eluant : phosphate buffer (20mM, pH6.5) Flow rate : 1.0 ml/min	Using HG Method (1% $NaBH_4$ with 0.1% $NaOH$ + 6N HCl) Carrier gas : Ar	Using ICP-AES (Ultima2C, Jobin Yvon) Target : 193.759nm

3. Results

Various hybrid techniques using ICP were tested to separate arsenic species in

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different type of samples. The anion exchange cartridge (Accell Plus QMA, Waters) or column (PRP X-100, Hamilton) in the part for separation and (HG)-ICP-AES or (HG)-ICP-MS in the part for detection coupled. Hydride generation (HG) method is used to improve detection limits. In separation of inorganic arsenic species, anion exchange cartridge is applicable. The LC-(HG)-ICP-MS technique is applied to natural surface water samples. The leachate from soil samples should be treated carefully because high content of transition metals cause interferences.

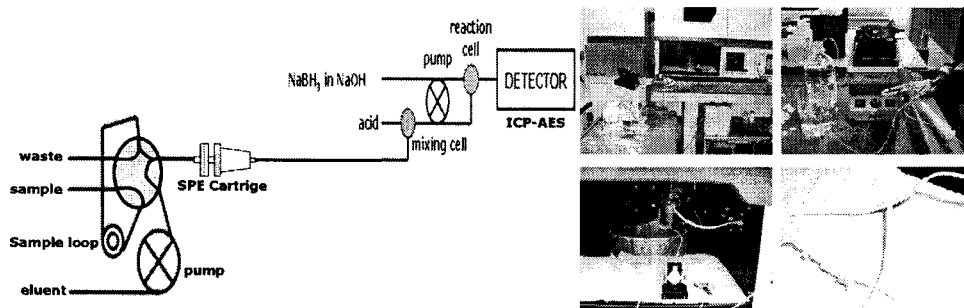


Fig. 1. SPE-HG-ICP-AES hyphenated system for arsenic speciation analysis.

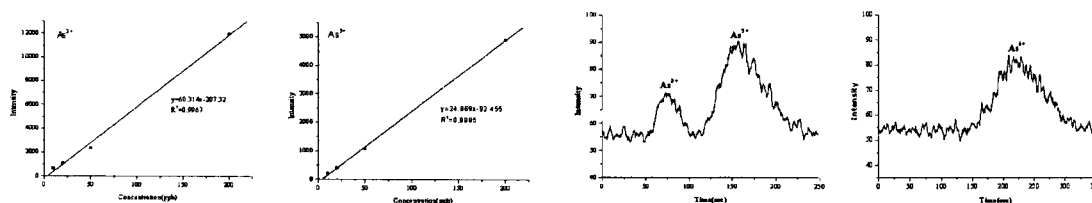


Fig. 2. Calibration curves for the sample arsenic speciation analysis.