



ARSENIC SPECIATION

INTRODUCTION

Arsenic is present in the environment due to natural and anthropogenic processes. The weathering of a huge variety of arsenic containing minerals and human activities (pesticides, wood preservatives, dust emission and disposal of industrial wastes) have contributed significantly to current levels of arsenic in the environment.

Different forms of Arsenic (Organic & Inorganic As) have different physical and chemical properties and these properties have significant impact on their respective toxicities. Hence the need for Arsenic speciation is crucial given their varying biological effects.

To overcome the various matrix and analytical interferences, ALS Malaysia has employed a unique hyphenated analytical technique, LC-ICPMS (Liquid Chromatography- Inductively Coupled Plasma Mass Spectrometry) and is proud to offer this testing service to the local environmental industry.

Analysis of Arsenic speciation

Arsenic is a challenging test analyte because of the chemical interferences faced during analysis and also due to the low detection limit requirements of the environmental health industry. With increasingly stringent regulatory levels on Arsenic detection in drinking water, groundwater, marine water, soil & sediment and biota, accurate determination of the various arsenic species at sub-ppb levels is a requirement. Inorganic arsenic species (Arsenite & Arsenate) have adverse health effects on humans whereas organic arsenic species (MMA, DMA) are much less toxic. Some other arsenic forms which are commonly found in the marine environment (arsenobetaine) are completely non-toxic. The total concentration of arsenic cannot be used solely to explain the toxicity of arsenic in the environment.

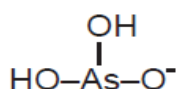
LC-ICPMS Setup



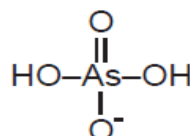
Target Arsenic species analyzed

- Inorganic arsenic

Arsenite As(III)

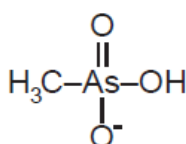


Arsenate As(V)

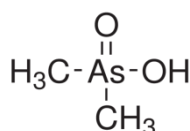


- Organic arsenic

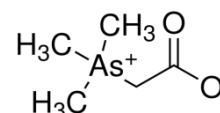
Monomethylarsonic acid, MMA



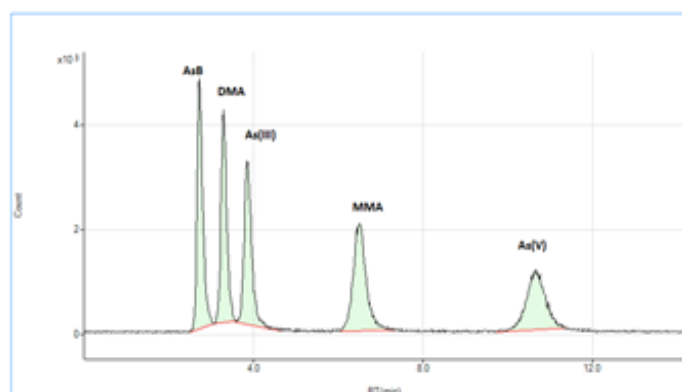
Dimethylarsenic acid, DMA



Arsenobetaine, AsB



Matrix	Fresh water	Marine water	Soil & Sediment	Biota
Minimum amount	100 ml	100 ml	50-100g	10-20g
Preservation	Field filtered (0.45 μm) and acidify to pH 2 with HCl. Top filled into polyethylene bottle with zero headspace; store/ship cool and dark.	Field filtered (0.45 μm) and acidify to pH 2 with HCl. Top filled into polyethylene bottle with zero headspace; store/ship cool and dark.	Top filled glass jar; store cool and dark	Keep sample into sealed zip-lock bags or proper container; keep freeze during shipping
Limit of reporting	0.5 μg/L	2.0 μg/L	0.1 mg/kg	0.05 mg/kg



Arsenic Speciation – Chromatogram