



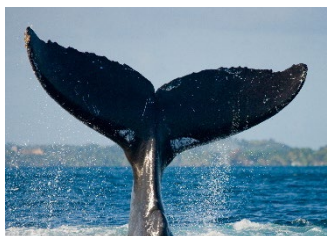
## Using Atomic Fluorescence Spectrometry for the determination of Mercury (Hg), Arsenic (As), Selenium (Se) & Antimony (Sb) in Environmental samples.



Hg, As, Se and Sb are 4 of the 13 trace metals and metalloids that are considered environmental priority pollutants. They do not degrade and can be derived from both natural and anthropogenic sources. As such the analysis of these metals represents a significant routine workload for many contact labs and it's important to be able to complete the work with a high degree of accuracy, precision and sensitivity.

Soils are the major sink of these metal contaminants, while in aquatic systems, sediments are the major recipients for these pollutants. Run off from soils and sediments, along with contaminated wastewater disposal, may subsequently impact freshwater and groundwater environments causing issues with aquatic flora and fauna - potentially reaching the drinking water supply.

Plants growing in metal-polluted sites exhibit altered metabolism, growth reduction and lower biomass.



In some jurisdictions the acceptable method detection limit for the concentration of Hg in drinking water is set at an analytically challenging 0.2ng/L (part-per-trillion). Analytical sensitivity, therefore, is a critical requirement.

Coupling **Atomic Fluorescence Spectrometry (AFS)** with either cold vapour generation or hydride generation has been PSA's core competency for over 35 years. With the addition of analyte separation capabilities (which is becoming more routine) allowing for speciation studies, PSA offers powerful analytical tools to help contract laboratories, research teams and regulators alike with these determinations.

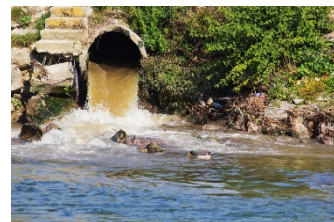
## AFS Environmental Applications

(application notes & experimental details available on request)

- Potable water
- Municipal Supply
- Wastewater
  - Seawater
  - Soils
    - Sediments
    - Biota
    - Plant material



Fully automated online AFS wastewater analysers for these elements are also available for those industries requiring 24/7 monitoring and compliance capability. Details for these online wastewater systems are also available on request.



PSA systems offer ultimate detection performance, combined with ease of use and affordability.

## AFS Laboratory Analysers

### Millennium Merlin (MM) for Hg Determinations



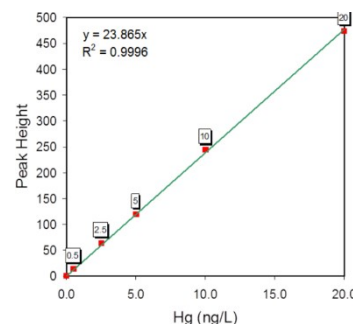
With a limit of detection of 0.1ng/L and linear range from 0.1ng/L to 10mg/L the **MM** AFS analyser is a robust system that is ideally suited to all environmental samples. The MM also complies to many standard methods.

EPA Method 245.7 "Mercury in Water by Cold Vapor AFS"

EPA Method 7474 "Mercury in Sediments and Tissues Samples by AFS"

### Millennium Merlin 1631 for Hg Determinations

Especially designed to meet the exacting performance requirements of EPA Method 1631 "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor AFS" the **MM 1631** houses an on-board gold pre-concentration trap for even lower detection limits.



Hg in Water Samples	Certified	Found
BCR 579 Coastal Seawater ng/Kg	1.85 +/- 0.2	1.90 +/- 0.13
ERM CA400 Seawater ng/L	16.80 +/- 1.10	16.68 +/- 2.22
ERM CA615 Ground Water ng/L	37.00 +/- 4.00	36.98 +/- 4.62
ERM CA713 Wastewater ug/L	1.84 +/- 0.11	1.91 +/- 0.26

### Soil Sampler for Elemental Hg

Primarily used for contaminated sites and to assess remediation requirements the **soil sampler** uses a purge and trap method coupled with the Millennium Merlin 1631 (and Scarifier module)





## PS ANALYTICAL – ENVIRONMENTAL



### Millennium Excalibur (ME) (10.055 Total As, Se, Sb, Bi & Te)



Limits of Detection	ng/L
As	2
Se	1
Sb	2
Bi	10
Te	10

The automated **ME**, with its built-in hydride generation manifold & boosted hollow cathode lamp is the ideal analyser for all environmental sample matrices

### Examples from our applications library;

- Arsenic in soils and sludges

Sample Reference	Certified Value	Value obtained mg/kg
AQC 83 Sewage Sludge	4.12	4.7
AQC 85 Sewage Sludge	3.1	3.2
2.2 Contaminated Land	20.0 +/- 5.6	20.2 +/- 0.3
5.3 Contaminated Land	15.3 +/- 5.0	18.2 +/- 0.1
C7403 Chinese Soil	4.4	4

- Selenium in potable and seawater

Sample Reference	Certified Value ppb	Value obtained ppb
IAEA/W4 Fresh Water	10.0 +/- 0.5	10.0 +/- 0.4
NASS 2 Open Ocean	0.024 +/- 0.004	0.027 +/- 0.005

## AFS Speciation Studies

Metal transport and toxicological properties of these elements critically depend on the form (species) in which they occur in the sample. As a consequence, trace element speciation, particularly for toxic trace elements, is nowadays considered of major importance to ensure environmental safety and compliance disposal.

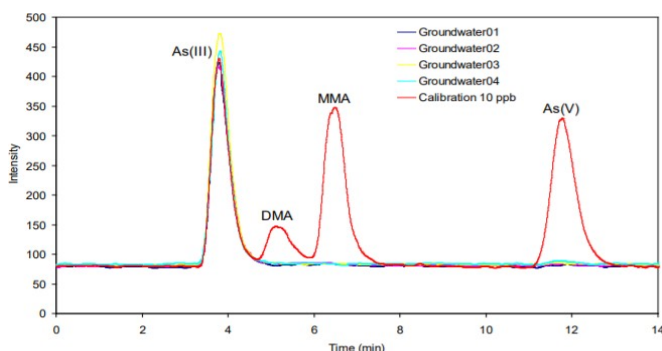
To increase the range of applications including speciation studies we employ a configurable chromatographic front end; the **Modular Interface (MI)**, which is equipped with LC pump, injection valve, UV cracker, heater and cooling modules. This simple interface couples directly to the **Millennium Merlin** or **Excalibur** for seamless speciation determinations.

### Modular Interface (MI) 10.820



### Examples from our applications library;

- Arsenic Speciation in Natural Waters
- Selenium Speciation in FGD Wastewater
- Speciation of Arsenic in soils
- Speciation of Antimony in soils and waters



## HPLC-ICP-MS v HPLC- HG-AFS

The coupling of the ICP-MS with HPLC has a number of negative consequences for a busy laboratory:

- The system is tuned for single element analysis and cannot carry out normal high-speed, multi-element determinations.
- Speed is dependent on the chromatographic run times.
- Long run times consume large volumes of argon (30L/min).
- Severe polyatomic interferences are common and need to be managed carefully.
- A dedicated technician is normally employed to operate the HPLC-ICP-MS.

These issues are not experienced with the PSA approach.

For Further Details

PLEASE CONTACT US AT:

<http://www.psanalytical.com/information/inforeq.html>

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