

Hydra AF Automated Mercury Analyzer

Questions and Answers



1. ***Hydra AF Series uses atomic fluorescence instead of atomic absorption as a measuring technique. Why?***

The ability of mercury to accumulate in our environment has created a need to measure extremely low levels of mercury. Consequently, government regulations have decreased target levels for mercury to the sub-part per trillion (ppt) ranges.

Cold Vapor Atomic Fluorescence Spectrometry (CVAFS), because of its excellent sensitivity and high selectivity allows analysis at these low levels.

2. ***What is the difference between CVAAS and CVAFS?***

With Atomic Fluorescence, it is the radiation from free atoms which have been excited by photon absorption and which re-radiate this energy at a characteristic wavelength that is measured. Fluorescence radiation is generally measured at a 90° angle to lamp emission.

3. ***What is the biggest analytical concern about Atomic Fluorescence?***

Because of the extreme sensitivity of Atomic Fluorescence, contamination is a major concern. Even if the analyst follows analytical techniques scrupulously, the system can be contaminated by reagents and/or samples that have unexpectedly high concentrations of mercury.

4. ***Why does Teledyne Leeman Labs manufacture more than one model of Hydra AF Mercury Analyzers?***

The Hydra Series of mercury analyzers include two different models addressing different U.S. EPA Methods and analytical requirements.

5. ***Can you summarize the differences between the various models?***
The Hydra AF is a fully automated Atomic Fluorescence Analyzer capable of detection limits of < 1 ppt (typically 0.2 to 0.4 ppt) and a dynamic range in excess of 4 orders of magnitude. This system is intended to address the needs of the analyst whose samples tend to be in the low ppt to high ppb (parts per billion) range. The Hydra AF is ideally suited to satisfy the requirements of methods of U.S. EPA Method 245.7.
- The Hydra AF Gold Plus is a dual detection atomic fluorescence analyzer that extends the analytical capabilities of Hydra AF with selectively pre-concentration of Hg using gold amalgamation in order to enhance detection limits. Hydra AF Gold Plus provides an unparalleled working range (< 0.05 ppt to low ppm levels). The system satisfies the requirements of U.S. EPA Method 245.7 as well as U.S. EPA Method 1631.
6. ***Can Hydra AF be used only to analyze “mercury in water by CVAFS” as per U.S. EPA Method 245.7?***
No. Hydra AF can be used for the analysis of mercury in many other matrices. The Hydra AF optical cell is designed to provide optimum sensitivity and stability as well as high sample throughput.
7. ***What can you tell me about the Hydra AF fluorescence detector?***
The Hydra AF fluorescence optical detector is designed to provide high fluorescence collection efficiency and to minimize optical scatter, which can cause interference in atomic fluorescence. The system yields exceptional signal/background ratios and consequently ultra-sensitivity.
8. ***Does Hydra AF include the same features as the Hydra AA?***
Yes. Hydra AF includes all the important features of Hydra AA such as the innovative gas/liquid separator, continuous flow-through rinse, nafion™ membrane dryer, high concentration protection system and WinHg software.
9. ***How does the High Concentration Protection System work on the Hydra AF Gold Plus***
When using the gold amalgamation feature, mercury is trapped before reaching the fluorescence cell. Therefore, mercury content cannot be anticipated. However, the Hydra AF Gold Plus has two detectors, the second detector can be employed to measure mercury signal without passing the vapor through the gold traps.
10. ***U.S. EPA Method 1631 requires a formal quality assurance program to operate. Does Hydra AF Gold Plus respond to these requirements?***
Yes. Hydra AF Gold Plus operating software includes the “calibration factor” quality control protocols called out for in Method 1631.
11. ***Do Hydra AF Systems comply with European Methods?***
Yes. Hydra AF mercury analyzers comply with European Standard EN-13506:1999 – “Water quality – Determination of mercury by cold vapor atomic fluorescence spectrometry (CVAAS)”. Hydra AF Gold Plus also complies with EN 12338:1998 – “Water Quality – Determination of Mercury – Enrichment methods by amalgamation”.

12. ***Besides offering the peace of mind that samples with unexpectedly high concentration samples will not disrupt analysis, do you have any additional arguments in favor of the Hydra AF Gold Plus?***

Yes. Hydra AF Gold Plus offers insurance against obsolescence. Even if your mercury analysis requirements do not include the need for sub ppt analysis, the capability is there when future requirements demand it. The additional cost of this insurance is marginal.

13. ***I know the Hydra AF Gold Plus is new. Are there already any scientific publications concerning the instrument?***

Yes. The following articles have been published:

Dr. Mark L. Bruce of Severn Trent Laboratories Inc. in Canton, Ohio presented a scientific paper at Pittcon 2001 titled, ***“A new automated Hg Analyzer with Dual Atomic Fluorescence Detectors”***. A copy of the paper can be viewed at the STL website: www.STL-Inc.com.

David Pfeil, ICP & Hg Product Manager and Dr. Mark L. Bruce of Severn Trent Laboratories Inc. in Canton, Ohio published a paper in the September 2001 issue of American Laboratory titled, ***“Automated determination of mercury by cold vapor atomic fluorescence with gold amalgamation”***.

David Pfeil, ICP & Hg Product Manager published a paper in the October 2003 issue of Pollution Equipment News titled, ***“Determining Mercury in Ambient Waters: More Sensitive Methods and Instrumentation are now available”***.

David Pfeil, ICP & Hg Product Manager and Ms. Denise Stalvey, of Oxford Laboratories in Wilmington, NC published a paper in the June 2004 issue of American Laboratory titled, ***“Satisfying Certification Requirements of U.S. EPA Method 1631”***.



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