analytikjena

mercur

Quality is the difference

Trace analysis of mercury – a global challenge

Analytical certainty down to the ng level

Increasingly stricter requirements

The growing industrialization, with the development of ever new technologies and materials, leads to increasing pollution of the environment.

Mercury is a particularly critical polluting element due to its toxicity. Accordingly, standards and legislation worldwide continue to become ever more stringent.

The maximum permissible concentrations of mercury are lower than those of any other routinely monitored element. Hg contents need to be determined with high certainty and repeatability down to the ultratrace level.

Modern techniques for mercury analysis have to meet a number of clear and exacting requirements:

- High sensitivity and selectivity
- High sample throughput
- Interference-free methods
- Easy routine operation

The method of choice: atomic fluorescence spectrometry

The mercur analyzer detects mercury contents by means of atomic fluorescence. Atomic fluorescence spectrometry, unlike absorption spectrometry, measures the fluorescence emitted by a sample. The intensity of the fluorescence emission is directly proportional to the intensity of the light source.

To excite fluorescence in the sample, the mercur uses a high-energy low-pressure mercury vapor lamp. Its high energy output adds considerably to the sensitivity of the method. Thanks to its high excellent detection limits and its wide linear measuring range, atomic fluorescence spectrometry is the method of choice in mercury trace analysis.

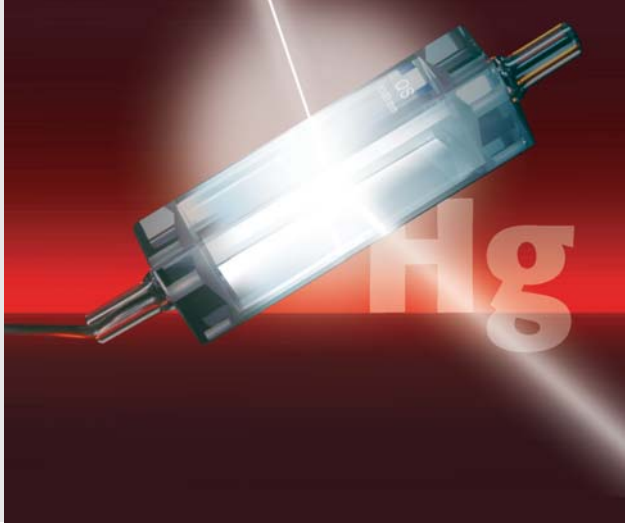
A major advantage of the mercur is the increased working range of AFS by the order of one magnitude to the lower and higher concentrations.

An added advantage: cold vapor technique

The mercur combines atomic fluorescence with the cold vapor technique, so it is possible to use the advantages of both techniques. By the cold vapor technique, mercury is converted to the gaseous state by reduction of the dissolved cation with $SnCl_2$ and separated from the solution. The gaseous mercury is carried by an argon gas stream to the fluorescence cell.

Because the analyte is separated from the matrix, interferences and matrix effects are almost completely eliminated.

mercur – fully automated mercury analyzer with autosampler AS 52 s



Measuring cell

An expanding range of applications

Mercury analysis is employed in an wide range of fields. Due to the harmful influence on the human organism, mercury is a focus of close attention: In medical disciplines such as occupational medicine and dentistry, as well as in drinking water and food control.

The mercur has been designed for dependable mercury analysis in all these fields. Teamed with the customer support provided by Analytik Jena, the instrument meets the statutory concentration limits.

Comprehensive data processing and quality control

Whether you use the mercur as a stand-alone instrument or as a PC-controlled system, its WinAAS® control and data analysis software not only handles all everyday routine tasks but also meets the strictest requirements of quality control.

The software's automatic and versatile quality control system monitors your analytical data, releases appropriate instrument response if permissible limits are exceeded.

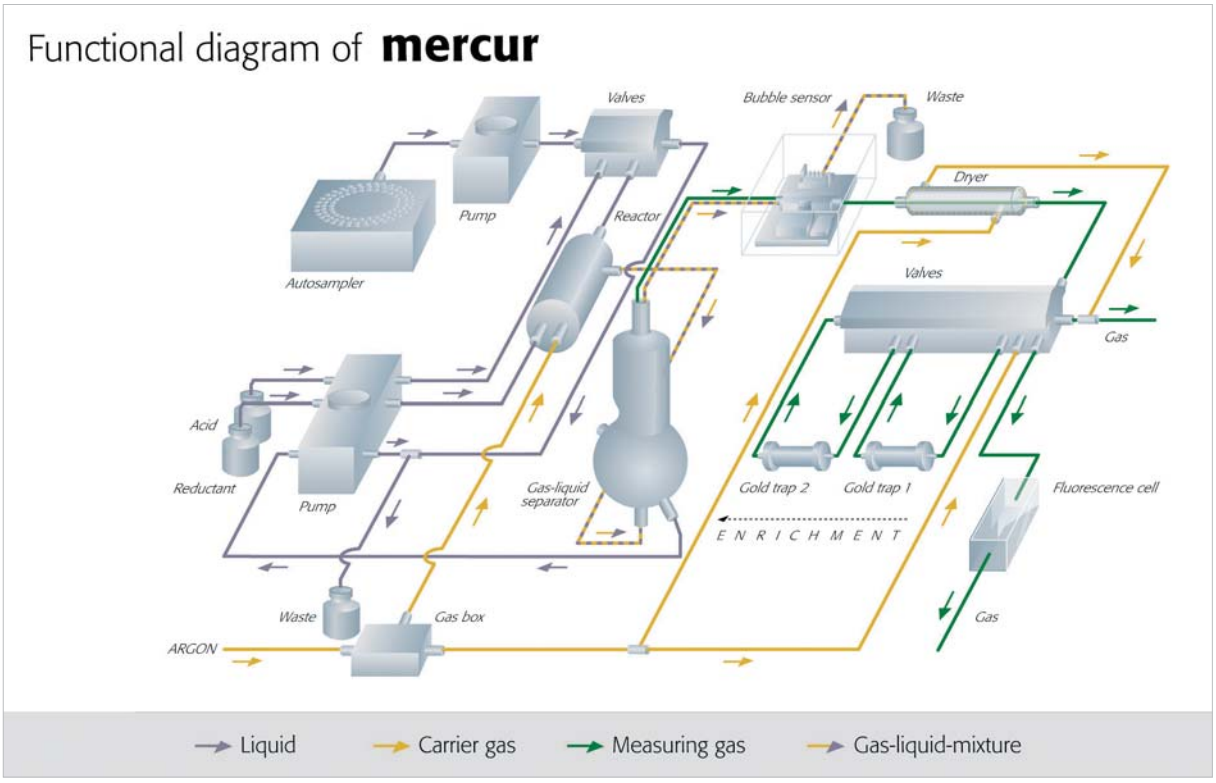
Increasingly stringent standards

Today's most stringent standards governing mercury determination in the USA and Europe are based on the atomic fluorescence method. The U.S. EPA method 1631 "Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry" requires a minimum limit of determination of 0.5 ng/l and a detection limit of 0.2 ng/l, while specifying a maximum permissible concentration of 1.3 ng of mercury per liter in surface waters and ground water. These figures make the EPA the world's most stringent statutory regulation on mercury.

Designed to meet these requirements, the mercur guarantees mercury analyses compliant with:

- EPA 245.7 and EPA 1631
- EN 12338

The difference is in the detail



mercur – the atomic fluorescence analyzer from Analytik Jena

mercur is a compact system specially optimized for the complete, cost-efficient determination of mercury traces.

- Highly automated – in combination with an autosampler and easy to operate, it meets all expected requirements from a modern routine analysis system
- Fast – thanks to continuous flow operation with or without autosampler plus the unique FBR routine (Fast Baseline Return)
- Safe – through the use of a bubble sensor, a specially optimized drying membrane, and cascade enrichment
- Efficient – due to automated, intelligent gas-liquid control, ensuring minimum reagent consumption and short measurement times

Efficient protection

The mercur displays its true strength when handling complicated samples such as foaming solutions. These occur frequently in everyday laboratory practice and involve a high risk of contamination and carry-over. The mercur features an important detail that helps avoid unnecessary cleaning: the Bubble Sensor.

If a liquid threatens to spill into the system, this sensor causes the valves to close, and the liquid is automatically conducted to the waste container.

Positioned between gas-liquid separator and drying membrane, it protects the gold collector and the fluorescence cell against contamination.

left: Measuring cell

right: Gas and Liquid Separator

Clever dosage

Two pump systems separately meter sample and reagents and transport them to the reactor.

Sample solution and acid are fed to the reactor in segments, controlled by a set of valves. The reductant is fed directly into the reactor. There the two solutions meet at an acute angle. The resulting chemical reaction immediately releases atomic mercury vapor. This mode of separating sample and acid ensures fast cleaning of the pump tubing after aspiration of the sample solution. This helps to save time and reduces the amount of reagents needed. It additionally prevents contamination in case of large concentration gradients within a sequence of measurements.

Intelligent control

To ensure a smooth reaction process in any of the various operating modes, the mercur features an intelligent gas/liquid control system.

Thanks to the instrument's complex valve groups, tubing paths have been minimized to prevent contamination, and to keep carry-over as low as possible.

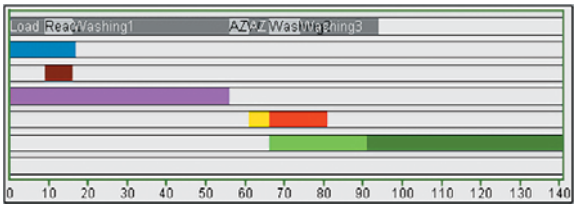
The system-flushing feature can be run in an automatic mode, operating whenever the calibrated concentration range is exceeded, or as a user-defined option. This guarantees a successful analysis in cases of strong variations of the mercury content within a sequence of measurements.
These features are needed in order to take advantage of the wide linear range of the atomic fluorescence spectrometer in everyday routine analysis.

Optimum enrichment

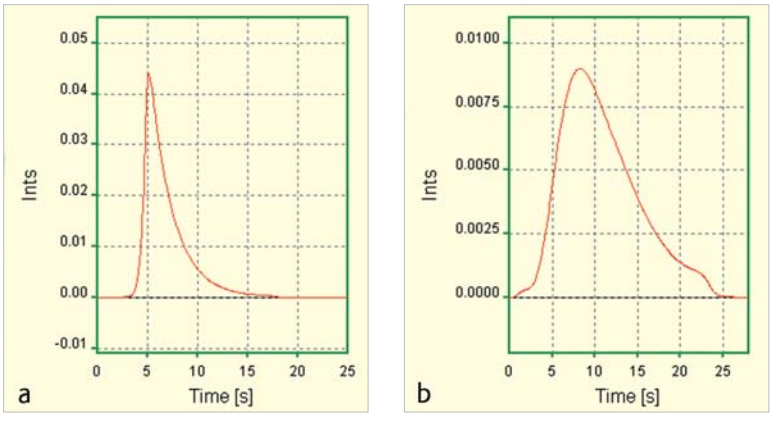
To adapt the mercur to varied analytical tasks, you can choose between three enrichment modes: no enrichment, simple enrichment, and cascade enrichment.

The cascade enrichment feature, compliant to EPA 1631 requirements, comprises two coupled gold collectors, which ensures clean separation of the matrix and prevents quenching effects – thus providing maximum dependability even with complex samples.

Enrichment times can be varied to match the sample matrix or the expected mercury concentration range.



Process with enrichment and FBR



Signal shape with (a) and without (b) enrichment, both with FBR, c = 25 ng/l

Prime considerations: operating convenience and automation

Functionality and comfort from system control to data analysis

The WinAAS® control and data analysis software provides optimum operation, for routine operation as well as for research.

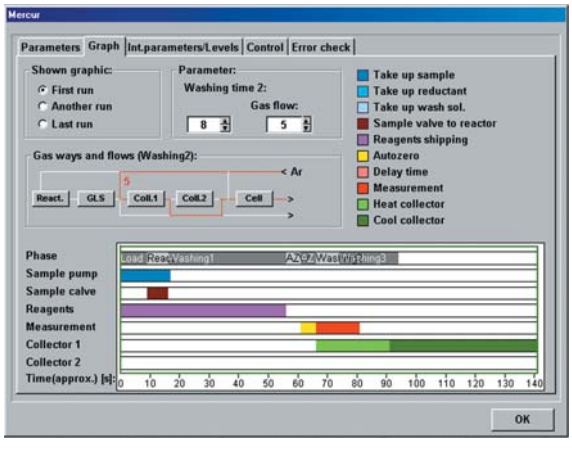
WinAAS® provides all the advantages for which the software concept of the entire AAS family of instruments is known.

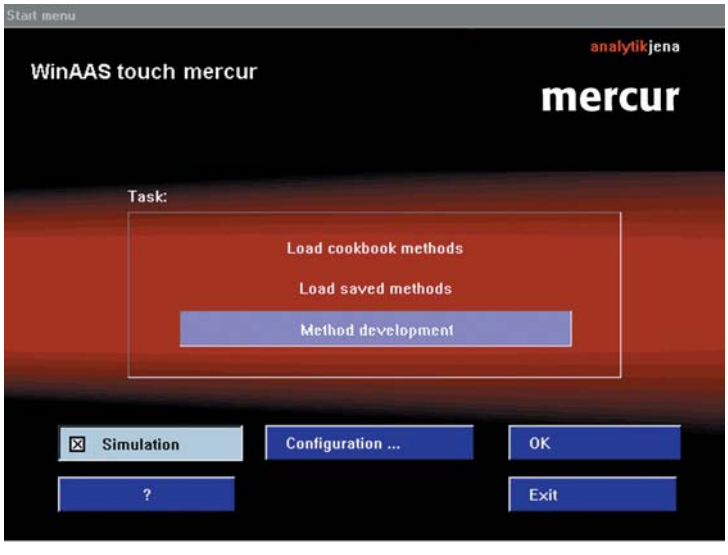
- Intuitive and user-friendly operation
- Optimization flexibility
- Integration of all accessories
- Complete documentation and reporting, conforming to GLP
- Quick and easy saving and loading of methods and parameter files
- Convenient sample table with many actions to choose from
- Automatic quality control for monitoring your analytical data

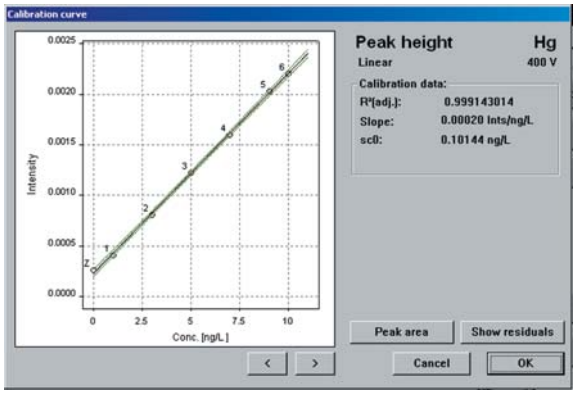
A cookbook comprising a number of different basic routine methods matching the various operating modes, facilitates the use of the mercur in everyday routine and permits method optimization in the case of more complex analyses.

A schematic action chart visualizes the simultaneous and sequential processes during a measurement cycle, so that you can follow the course of the analysis exactly.

The FBR feature (Fast Baseline Routine) substantially reduces the total analysis time and ensures fast sample throughput, with no compromise on the quality of measured data.







Autosampler AS 52s

Continuous, efficient operation

Whether manual configuration is used in case of non-continuous delivery of samples, or when it is used in combination with the AS 51/52s autosampler for maximum sample throughput, the fundamental concept of the mercur permits continuous operation:

- Automatic metering of reagents and sample
- Automatic flushing of the tubings
- Automatic cleaning of the carrier gas

Combination with the autosampler ensures highly efficient laboratory work in your lab. High sample throughput, shortest possible tubing paths due to integration of the sampler, continuous flushing to avoid carry-over – it is the combination of these features that facilitates the routine analysis of mercury traces.

The wide linear working range of atomic fluorescence guarantees smooth operation with widely varying concentration ranges.

The mercur – an instrument for many applications

Wherever mercury concentrations must be strictly monitored to avoid violation of prescribed concentration limits, a system which can measure lowest Hg contents with certainty and repeatability is required.

With its high detection sensitivity, the mercur is especially designed for analyzing and monitoring the toxic element mercury at trace and ultratrace levels.

Environment	Drinking water, fresh water, rain water, waste water, soil ...
Medicine	Blood, urine, serum, saliva ...
Food	Fish, beverages, cereals ...
Geology	Rocks, ashes, minerals ...
Industry	Quality inspection, paper, plastics ...
Research and teaching	Universities, research institutions ...

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