MEASURING LEAD IN WATER AS PER ISO:15586:2003

APPLICATION BRIEF

Element: Lead
Matrix: Water
Regulation: ISO 15586:2003
Instrumentation: Agilent 240Z Graphite Furnace AAS

Introduction

The major sources of human exposure to lead (Pb) are food and drinking water. In 2008, the World Health Organization released a guideline value of 10 µg/L as the maximum level of lead in drinking water. Monitoring the amount of lead in drinking water is a critical function of governments and other organisations around the world.

The standard, *ISO 15586:2003 Water quality,* includes the principles and procedures for the determination of trace levels of Pb in water samples.

With its great sensitivity, graphite furnace is a cost-effective technique for such analysis. With the right chemical modifier and use of the Zeeman effect, method optimization has never been easier.

Example analysis

In this example, furnace measurements were performed using an Agilent 240Z Atomic Absorption Spectrometer (AAS) with transverse Zeeman background correction. The instrument features the highly sensitive and accurate Agilent GTA 120 Graphite Tube Atomizer and an Agilent PSD 120 Programmable Sample Dispenser autosampler.

The instrument uses the patented Zeeman effect with longitudinal graphite tube heating and a Constant Temperature Zone (CTZ) design.

Atomization for Lead was from a pyrolytic platform Omega tube. The inert gas used was 99.99% pure argon.

Agilent Technologies

Analytical Conditions

Lamp	UltrAA Lamp Pb
Wavelength	283.3 nm
Slit Width	0.5 nm
Lamp current	10 mA
Mode	Peak Area

Chemical modifier: 1 mL $NH_4H_2PO_4$ 5 g/L + 0.2 mL $Mg(NO_3)_2$ $6H_2O$ 10 g/L

Standard solution: 50 µg/L Pb

Standard Reference Material: SPS SW2: 25.0 ± 0.1 µg/L Pb (from LGC Standards)

Method optimization

Dry steps were optimized by using the integrated camera.

Ash and atomize temperatures were optimized by a chemometric method included in the instrument software (the Surface Response Methodology tool). Tests were performed on a standard reference material and on a spiked water sample. All measurements were made using the Peak Area calculation.

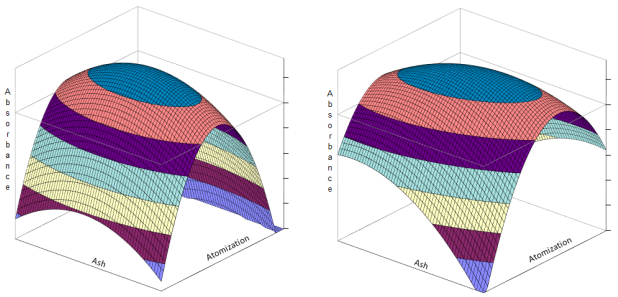
Based on the results of the chemometric analysis, the Surface Response Methodology tool determined the optimum conditions, shown in Tables 1 & 2.

Table 1. Experimental design factors

Ash: 700 °C	Atomize 1600 °C
Change: 200 °C	Change: 250 °C

Table 2. The optimum conditions determined for the standard and sample were very similar, indicating that the modifer mix was ideally suited for the application.

Temperature	Standard	Sample
Ash (°C)	598	614
Atomize (°C)	1435	1476



The Surface Response Methodology tool in the software uses chemometrics to automatically optimize the ash and atomize temperatures. Shown here is the plot for the standard reference material (left) and the spiked sample (right).

Results

- Characteristic concentration in peak area: 0.85 µg/L
- Characteristic Mass in peak area: 13.9 pg
- Detection limit for 20 µL: 0.15 µg/L
- Validated quantification limit for 20 µL: 0.50 µg/L
- % recovery of SRM: 100.1%
- % recovery of water spiked with 25 µg/L: 103.6%

Conclusion

The Agilent 240Z GFAA system delivered excellent recovery and quantification limits for Lead in Drinking Water, using the ISO 15586-2003 method. The system is a cost effective and accurate solution for laboratories routinely performing such testing.

References

ISO 15586:2003. Water Quality. Determination of trace elements using atomic absorption spectrometry with graphite furnace

ISO 15587-1:2002. Water quality—Digestion for the determination of selected elements in water—Part 1: Aqua regia digestion

For more information:
Contact your local Agilent representative or visit:

www.agilent.com/chem

Published March 12, 2018
Publication number: 5991-9076EN

Agilent Technologies