Application Note AN-V-214

Lead in drinking water

Straightforward determination by voltammetry using a gold microwire electrode

Lead is known to be highly toxic to humans as it interferes with enzyme reactions. Chronic lead poisoning can be caused by Pb leaching into drinking water from piping systems. The current provisional guideline for lead in the World Health Organization's «Guidelines for Drinking-water Quality» sets a maximum concentration of 10 µg/L.

With a limit of detection (LOD) of 0.2 µg/L, anodic stripping voltammetry using the scTRACE Gold is a viable, less sophisticated alternative to atomic absorption spectroscopy (AAS) to determine lead in drinking water. While AAS (and competing methods) can only be performed in a laboratory, anodic stripping voltammetry can be used conventionally in the laboratory with the Metrohm 884 Professional VA or alternatively in the field with the 946 Portable VA Analyzer.

The determination is carried out on a silver film applied to the scTRACE Gold electrode. It is a combined sensor consisting of a gold microwire working electrode, Ag/AgCl reference electrode, and carbon auxiliary electrode on a ceramic substrate. It is easy to handle and needs no extensive maintenance such as mechanical polishing.

EXPERIMENTAL

The water sample is pipetted into the measuring vessel. Citric acid buffer is added as supporting electrolyte. The determination of lead can be carried out on the 946 Portable VA Analyzer or on the 884 Professional VA using the scTRACE Gold sensor via anodic stripping voltammetry using the parameters listed in Table 1. The lead concentration is determined by two additions of lead standard addition solution.

The scTRACE Gold is modified with a silver film prior to the determination of lead. The silver film is electrochemically deposited from a silver solution.

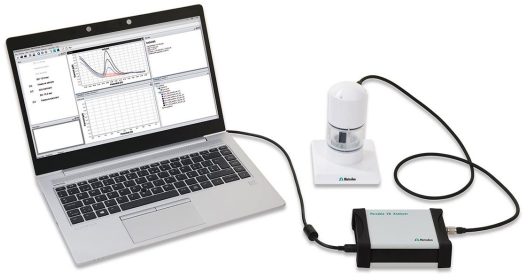

Figure 1. 946 Portable VA Analyzer

Figure 2. 884 Professional VA

Table 1. Parameters

Parameter	Setting
Mode	SQW – Square wave
Deposition potential	-0.7 V
Deposition time	90 s
Start potential	-0.7 V
End potential	0 V
Peak potential As	-0.48 V

RESULTS

The method is suitable for the determination of lead concentrations in unpolluted water samples in concentrations up to 30 µg/L. The limit of detection of the method is approximately 1 µg/L.

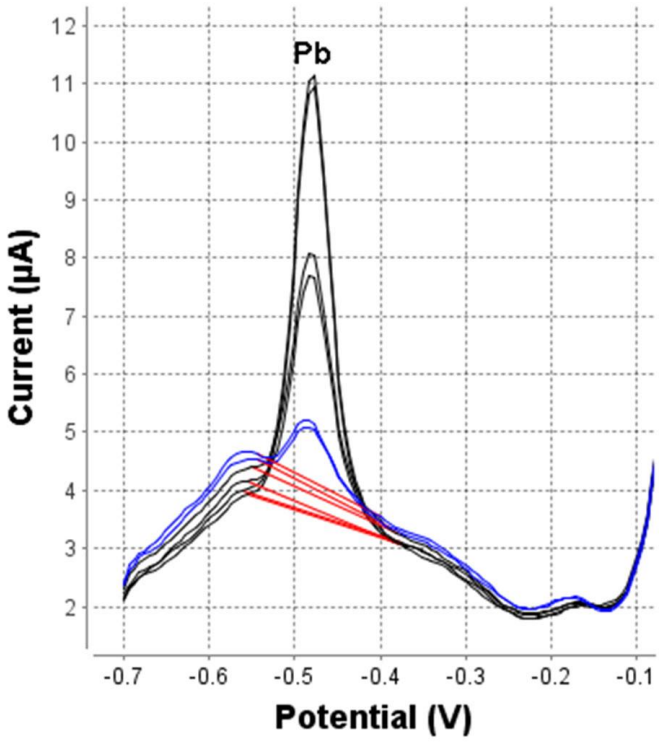

Figure 3. Determination of lead in tap water with 2 standard additions

Table 2. Result

Sample	Concentration [µg/L]
Tap water	1.1

REFERENCES

Application Bulletin 433: Determination of lead in water with the scTRACE Gold modified with a silver film

Internal reference: AW CH4-0587-092019

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