Application Note AN-V-214

饮用水中的铅

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.

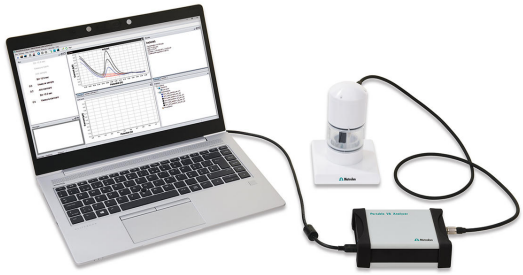

Figure 1. 946 Portable VA Analyzer

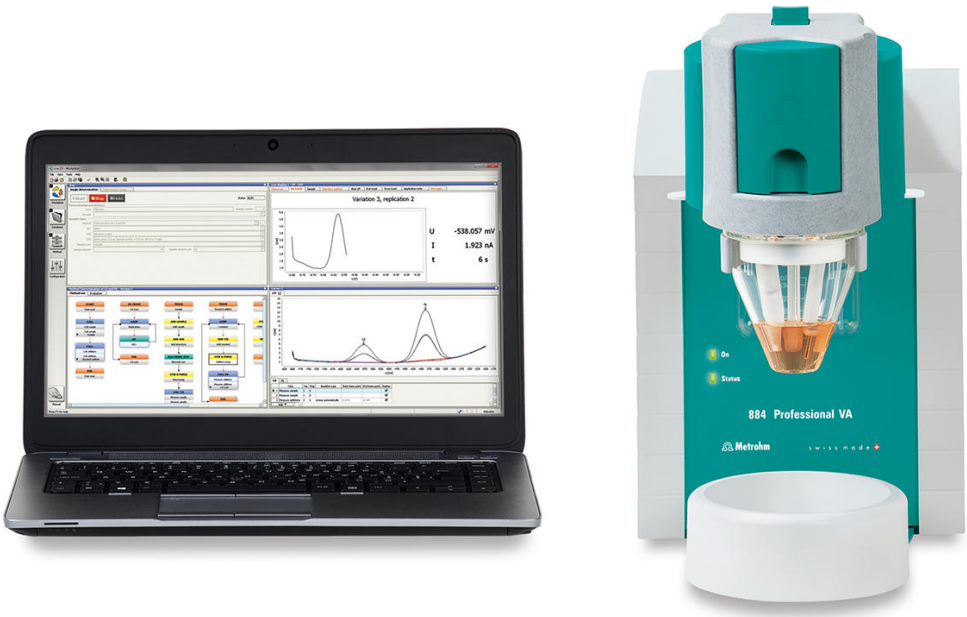

Figure 2. 884 Professional VA

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 Pb	-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.

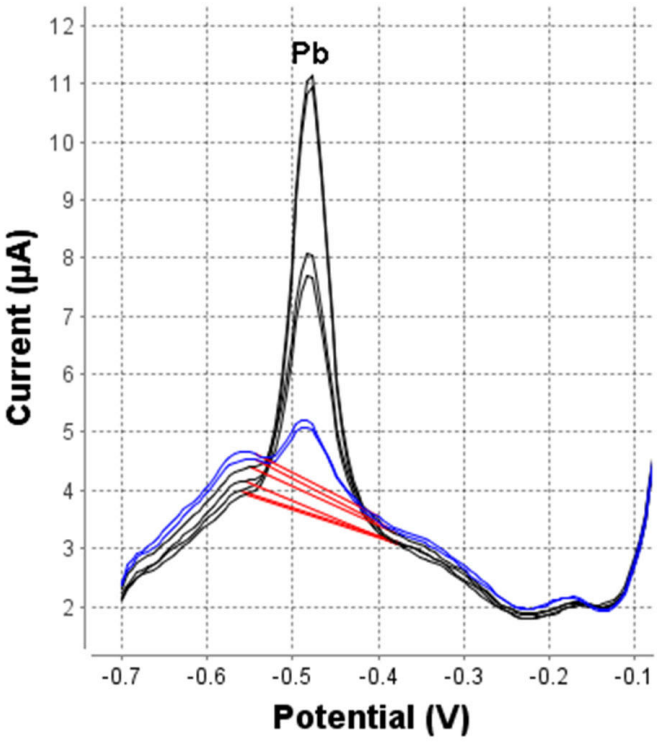

Figure 3. Determination of lead in tap water with 2 standard additions

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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CONFIGURATION

(MME) 884 Professional VA manual

用于多模式电极 (MME) 的 884 Professional VA manual 是借助多模式电极 pro 或 scTRACE Gold 或铋液滴电极使用伏安法和极谱法进行痕量分析的入门仪器。此项已经证实的瑞士万通电极技术与恒电位/恒电位仪以及外接的灵活 viva 软件联用,在重金属测定领域中展现了新的前景。带有经认证的校准器的恒电位仪在每次测量之前均自动冲洗进行校准,确保可能的高精度。

通过此仪器也可使用旋转圆盘电极进行测定,例如借助«循环伏安溶出法»(CVS)、«循环脉冲伏安溶出法»(CPVS)和计时电位法(CP)测定电镀池中的有机添加剂。借助可更换的测量头,可在使用不同电极的各种应用之间实现快速切换。

使用 viva 软件进行控制、数据采集和评估。

用于 MME(多模式电极)的 884 Professional VA manual 供货时配备大量附件,包括用于多模式电极 pro 的测量头。电极组和 viva 许可证则须单独订购。

VA scTRACE Gold Professional VA

整套电极组,用于测定砷或汞。包括用于 scTRACE Gold、scTRACE Gold、搅拌器和量杯的支架。

946 Portable VA Analyzer (scTRACE Gold)

用于测定重金属,如痕量砷,汞,铜,铅,锌,镍,钴,铁、铋或锑之类重金属的便携式金属分析器。scTRACE Gold 适用的仪器版本。该系统由恒电位仪和集成了搅拌器与可更换式电极的独立测量台构成。该设备用 Portable VA Analyzer 软件驱动。电源由 USB 接口和内置的可充电电池提供。设备装在手提箱内交付,包含所有必需的附件。