Application Note AN-V-233

Selenium(IV) in drinking water

Direct determination in low µg/L range on the scTRACE Gold

The difference between the toxic and essential levels of selenium to human health are very slight. Therefore, the current provisional guideline value for selenium(IV) in the World Health Organization's «Guidelines for Drinking-water Quality» and in the European Drinking Water Directive is set to a maximum concentration of 10 µg/L.

The anodic stripping voltammetric (ASV) technique performed on the unmodified scTRACE Gold can be used to determine concentrations as low as 0.5 µg/L selenium with a 30 s deposition time. These limits can be lowered even further by increasing the deposition time. The linear range at 30 s deposition time ends at approximately 100 µg/L.

The advantage of this method lies in the innovative and cost-effective sensor used for this application: the scTRACE Gold. It is a combined sensor containing the working, reference, and auxiliary electrode integrated on a single ceramic substrate. The scTRACE Gold electrode does not need extensive maintenance such as mechanical polishing. Measurements can be performed in the laboratory with the 884 Professional VA or alternatively in the field with the 946 Portable VA Analyzer. This method is suited for manual or automated systems.

SAMPLE

Drinking water, mineral water

EXPERIMENTAL

The scTRACE Gold is electrochemically activated prior to the first determination. In the next step, the water sample and the supporting electrolyte are pipetted into the measuring vessel. The determination of selenium(IV) is carried out with the 884 Professional VA or with the 946 Portable VA Analyzer using the parameters specified in Table 1. The concentration is determined by two additions of an selenium(IV) standard addition solution.

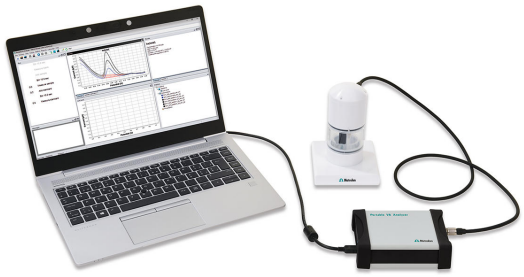

Figure 1. 946 Portable VA Analyzer (scTRACE Gold)

Figure 2. 884 Professional VA, semiautomated for VA analysis

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.375 V
Deposition time	90 s
Start potential	0.375 V
End potential	0.75 V
Peak potential Se	0.62 V

ELECTRODES

- scTRACE Gold

At a 30 s deposition time, this method is suitable for the determination of selenium(IV) in water samples in concentrations of β(Se(IV)) = 0.5–50 µg/L using the 884 Professional VA and β(Se(IV)) = 6–75 µg/L using the 946 Portable VA Analyzer.

RESULTS

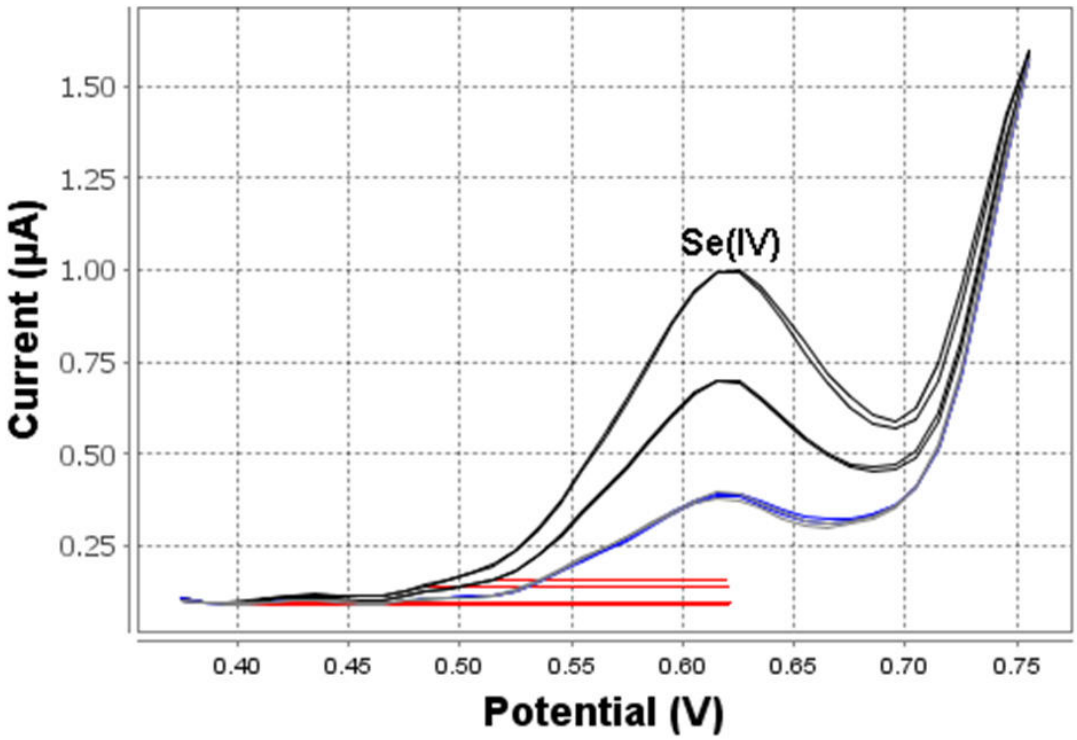

Figure 3. Determination of Se(IV) in mineral water spiked with 10 µg/L (946 Portable VA Analyzer; 90 s deposition time)

Table 2. Results of Se measurement in spiked mineral water

Sample	Se(IV) (µg/L)
Mineral water spiked with 10 µg/L	10.22

RESULTS

Internal references: AW VA CH4-0598-082020, AW VA CH4-0601-092020

CONTACT

CÔNG TY TNHH METROHM
VIỆT NAM
Tòa nhà Park IX, số 08
Đường Phan Đình Giót,
Phường Tân Sơn Hòa
null Thành phố Hồ Chí Minh
info@metrohm.vn

CONFIGURATION

884 Professional VA manual for Multi-Mode Electrode (MME)

884 Professional VA manual for Multi-Mode Electrode (MME) is the entry-level instrument for high-end trace analysis with voltammetry and polarography with the Multi-Mode Electrode pro or the scTRACE Gold or the Bismuth drop electrode. The proven Metrohm electrode methods in combination with a high-performance potentiostat/galvanostat and the extremely flexible viva software open up new perspectives for the determination of heavy metals. The potentiostat with a certified calibrator readjusts itself automatically before each measurement, thus guaranteeing maximum precision.

Determinations with rotating disc electrodes can also be performed with the instrument, e.g. determinations of organic additives in electroplating baths with "Cyclic Voltammetric Stripping" (CVS), "Cyclic Pulse Voltammetric Stripping" (CPVS), and chronopotentiometry (CP). The replaceable measuring head enables rapid changes between the various applications with different electrodes.

The viva software is required for control, data collection, and evaluation.

The 884 Professional VA manual for MME is supplied with extensive accessories and a measuring head for the Multi-Mode Electrode pro. Electrode set and viva license need to be ordered separately.

VA electrode equipment with scTRACE Gold for Professional VA instruments

Complete electrode set for the determination of arsenic or mercury. Includes holders for scTRACE Gold, scTRACE Gold, stirrer and measuring vessel.

viva 2.1 Full CD: 1 license

Computer program for control and data management of Professional VA/CVS instruments. The software permits checks, data acquisition, evaluation, and monitoring, as well as report generation.

Graphic user interface for routine operations, extensive database programs with reevaluation, graphic method editor with numerous templates, system configuration, very flexible user administration, extensive data export functions, individually configurable report generator.

Includes the measuring modes "Differential Pulse" (DP), "Square Wave" (SQW), "Cyclic Voltammetric Stripping" (CVS), "Cyclic Pulse Voltammetric Stripping" (CPVS), and Chronopotentiometry (CP).

The following calibration techniques are supported: standard addition, external calibration, DT (Dilution Titration), LAT (Linear Approximation Technique), MLAT (Modified Linear Approximation Technique), RC (Response Curve).

Dialog languages: German, English, Chinese.

The following instruments are supported:

884 Professional VA, 894 Professional CVS

1 license for a maximum of 4 Professional VA/CVS instruments on a single PC.

946 Portable VA Analyzer (scTRACE Gold)

Portable metal analyzer for the determination of heavy metals such as arsenic, mercury, copper, lead, zinc, nickel, cobalt, iron, bismuth or antimony in the trace range. Instrument version for the scTRACE Gold. The system is comprised of potentiostat and separate measuring stand with integrated stirrer and replaceable electrode. The instrument is operated with the Portable VA Analyzer software. The power is supplied via the USB connector and via the integrated rechargeable battery. The instrument is supplied with all required accessories in a carrying case.