

Tellurium(IV) in drinking water

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

Summary

Tellurium is one of the elements recently identified as technologically critical for photovoltaic conversion, quantum dots, as well as in thermoelectric technology, and has the potential to become a new emergent contaminant. Until now there is no guideline value in the World Health Organization's «Guidelines for Drinking-water Quality» and in the European Drinking Water Directive for tellurium(IV) concentration in drinking water.

To monitor the tellurium(IV) levels in drinking water, anodic stripping voltammetry (ASV) performed on the unmodified scTRACE Gold is recommended. This method allows determination of tellurium(IV) in the concentration range between 1 g/L and 60 g/L when using a 90 s deposition time.

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.

Configuration



2.884.0110 - 884 Professional VA manual for MME

884 Professional VA manual for 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. The proven Metrohm electrode methods in combination with a completely new design of potentiostat/galvanostat and the extremely high-performance viva software opens 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 various applications with different electrodes. The viva software is required for control, data acquisition, 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.



6.5339.050 - 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.



2.946.0010 - 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.

Sample

Drinking water, mineral water

Experimental



Figure 1. 946 Portable VA Analyzer (scTRACE Gold)

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 tellurium(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 a tellurium(IV) standard addition solution.



Figure 2. 884 Professional VA, semiautomated for VA analysis

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.3 V
Deposition time	90 s
Start potential	0.1 V
End potential	0.8 V
Peak potential Te	0.475 V

Electrodes

- scTRACE Gold

Results

At a 90 s deposition time, this method is suitable for the determination of tellurium(IV) in water samples in concentrations of (Te(IV)) = 1–30 g/L using the 884 Professional VA and (Te(IV)) = 2–75 g/L using the 946 Portable VA Analyzer.

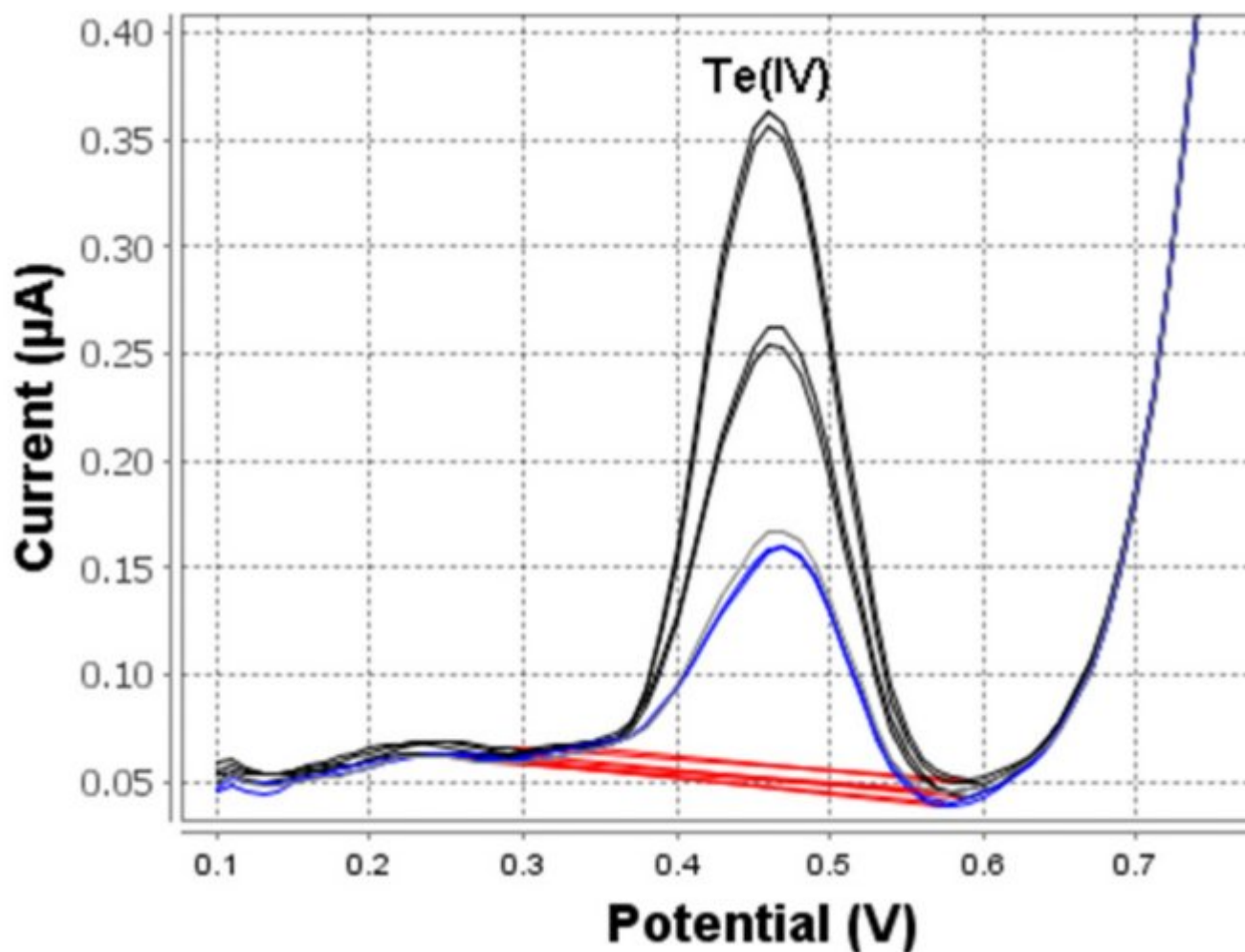


Figure 3. Determination of Te(IV) in mineral water spiked with 10 g/L (946 Portable VA Analyzer; 90 s deposition time)

Table 2. Results of Te measured in a spiked mineral water sample

Sample	Te(IV) (g/L)
Mineral water spiked with 10 g/L	11.5

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