

Total arsenic in mineral water

Straightforward determination by voltammetry on a gold microwire electrode

Summary

Arsenic is ubiquitous in the earth's crust in low concentrations. Elevated levels can be found in mineral deposits and ores. Arsenic from such deposits leaches into the groundwater in the form of arsenite (AsO_3^{3-}) and arsenate (AsO_4^{3-}), causing its contamination. In addition to the arsenic originating from natural sources, industry and agriculture contribute to the contamination to a lower extent. The guideline value for inorganic total arsenic in the World Health Organization's «Guidelines for Drinking-water Quality» is set to 10 g/L.

With a limit of detection (LOD) of 0.9 g/L, anodic stripping voltammetry is a viable, less sophisticated alternative to atomic absorption spectroscopy (AAS) for the determination of arsenic. While AAS (and competing methods) can only be performed in a laboratory, anodic stripping voltammetry can be used conventionally in the laboratory or alternatively in the field using the 946 Portable VA Analyzer. The determination is carried out on the scTRACE Gold electrode.

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

Bottled mineral water

Experimental



Figure 1. 946 Portable VA Analyzer (scTRACE Gold version)

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 arsenic 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 arsenic standard addition solution.



Figure 2. 884 Professional VA fully automated for VA

Table 1. Parameters

Parameter	Setting
Mode	SQW – Square wave
Deposition potential	-1 V
Deposition time	60 s
Start potential	-0.3 V
End potential	0.4 V
Peak potential As	0V

Electrodes

- scTRACE Gold

Results

With a 60 s deposition time, this method is suitable for the determination of arsenic in water samples in concentrations from (As(total)) = 0.9–10 g/L.

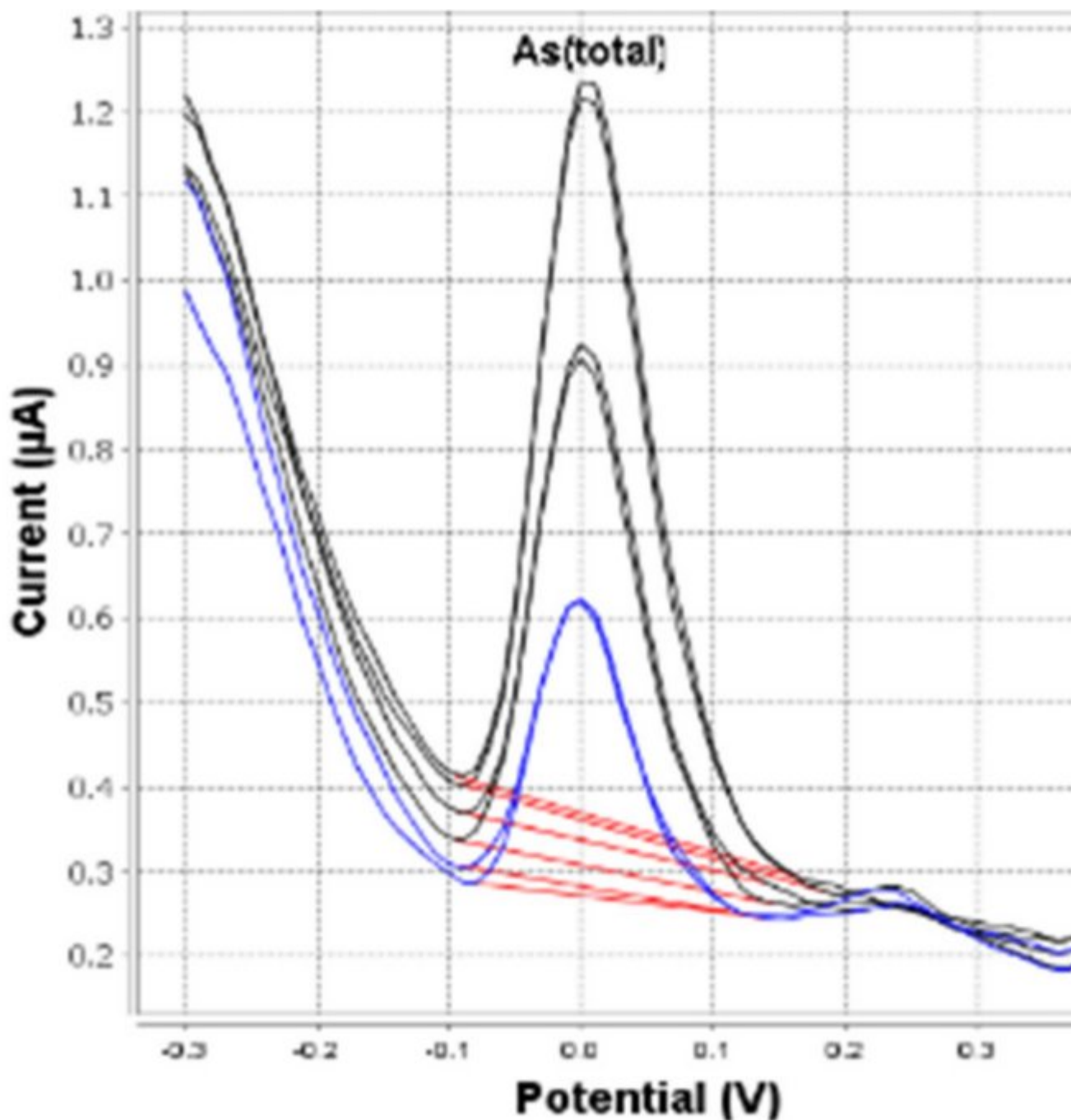


Figure 3. Determination of arsenic in bottled mineral water (946 Portable VA Analyzer; 60 s deposition time)

Table 2. Results of the determination of As in mineral water

Sample	As (g/L)
Bottled mineral water	4.4

References

Application Bulletin 416: Determination of arsenic in water with the scTRACE Gold

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