



Application Note AN-V-230

Chromium(VI) in drinking water

Sensitive determination on a modified scTRACE Gold (DTPA method)

The guideline value for total chromium in the World Health Organization's (WHO) «Guidelines for Drinking-water Quality» is 50 µg/L. Chromium(VI) is more toxic than its trivalent form (Cr(III)) and is also less abundant. Therefore a robust and sensitive method is required to monitor its concentration in drinking water.

The mercury film modified scTRACE Gold can be used to monitor chromium(VI), offering easy handling and a high grade of stability. The sensor itself contains all necessary electrodes: the gold micro-wire working

electrode, Ag/AgCl reference, and the carbon auxiliary electrode integrated on a ceramic substrate which does not need intensive maintenance like polishing. Adsorptive stripping voltammetry (AdSV) using diethylenetriaminepentaacetic acid (DTPA) as a complexing agent and catalytic signal enhancement allows chromium(VI) detection at very low levels, with a limit of detection of 2 µg/L. The ability to replate the mercury film allows a quick and easy regeneration of the sensor. This method is best suited for field applications.

SAMPLE

Drinking water, mineral water, sea water

EXPERIMENTAL

Prior to the first determination, the ex-situ mercury film is deposited on the scTRACE Gold electrode. In the next step, the electrodes are cleaned with ultrapure water and the measuring vessel is emptied. The water sample, the supporting electrolyte with the complexing agent (DTPA) are pipetted into the measuring vessel. The determination of chromium(VI) is carried out with a 946 Portable VA Analyzer using the parameters specified in **Table 1**. The concentration is determined by two additions of a chromium(VI) standard addition solution. The scTRACE Gold is electrochemically activated prior to the first determination.

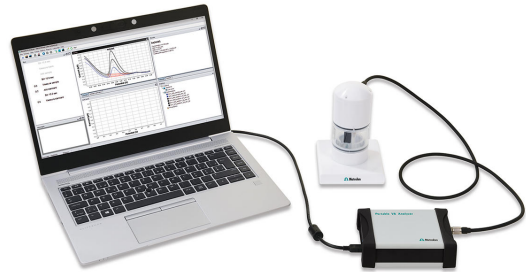


Figure 1. 946 Portable VA Analyzer

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Start potential	-1.15 V
End potential	-1.65 V
Peak potential Cr(VI)	-1.4 V

ELECTRODES

- scTRACE Gold

RESULTS

The method is suitable for the determination of chromium(VI) concentrations up to 40 µg/L. The limit

of detection without deposition time is approximately 5 µg/L.

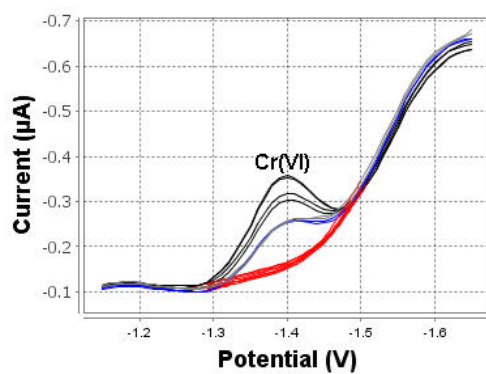


Figure 2. Determination of chromium(VI) in tap water spiked with 30 µg/L

Table 2. Result

Sample	Cr(VI) (µg/L)
Tap water spiked with 30 µg/L Cr(VI)	32.1

Internal reference: AW VA CH4-0596-042020

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CONFIGURATION



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.