



Application Note AN-V-233

Selenium(IV) in drinking water

Direct determination in low $\mu\text{g/L}$ 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 $10 \mu\text{g/L}$.

The anodic stripping voltammetric (ASV) technique performed on the unmodified scTRACE Gold can be used to determine concentrations as low as $0.5 \mu\text{g/L}$ 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 $100 \mu\text{g/L}$.

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

RESULTS

At a 30 s deposition time, this method is suitable for the determination of selenium(IV) in water samples in concentrations of $\beta(\text{Se(IV)}) = 0.5\text{--}50\text{ }\mu\text{g/L}$ using the

884 Professional VA and $\beta(\text{Se(IV)}) = 6\text{--}75\text{ }\mu\text{g/L}$ using the 946 Portable VA Analyzer.

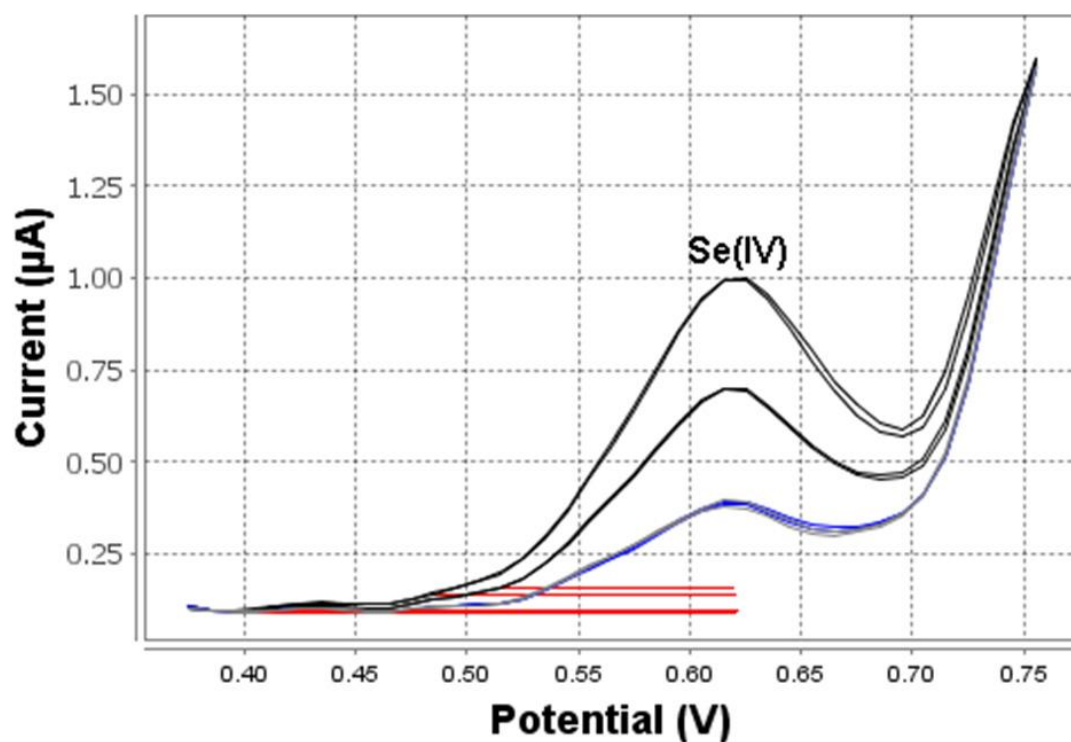


Figure 3. Determination of Se(IV) in mineral water spiked with 10 µg/L (946 Portable VA Analyzer; 90 s deposition time)

Table 2. Results of Se measurement in spiked mineral water

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

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

VA CH4-0601-092020

CONTACT

Metrohm Brasil
Rua Minerva, 161
05007-030 São Paulo

metrohm@metrohm.com.br