Application Note AN-V-229

Antimony(III) in drinking water

Straightforward determination in the low ng/L range on the scTRACE Gold

The toxicity of antimony depends on its oxidation state: antimony(III) is more toxic than antimony(V). Due to its carcinogenicity, EU legislation specifies 5 µg/L and the World Health Organization (WHO) sets a maximum concentration of 20 µg/L as the Sb(III) limit value in drinking water.

Straightforward determination using anodic stripping voltammetry provides a fast (analysis time under 10 minutes) and an ultra-sensitive tool for monitoring the antimony(III) concentration in drinking water. Already with a 30 s deposition time, the limit of detection is around 0.1 µg/L and can be lowered even further. The linear range ends at ca. 20 µg/L. This determination is performed on the scTRACE Gold: a combined sensor containing working, reference, and auxiliary electrodes 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, seawater

EXPERIMENTAL

The water sample and the supporting electrolyte are pipetted into the measuring vessel. The determination of antimony(III) 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 antimony(III) standard addition solution.
The scTRACE Gold is electrochemically activated prior to the first determination.

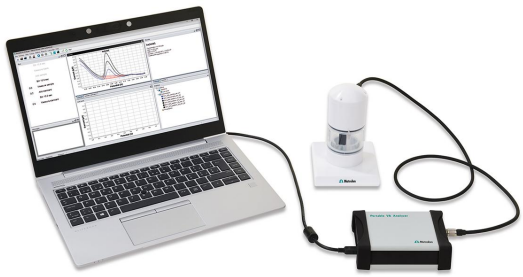

Figure 1. 946 Portable VA Analyzer

Figure 2. 884 Professional VA, fully automated for VA analysis

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.1 V
Deposition time	30 s
Start potential	-0.1 V
End potential	0.2 V
Peak potential Sb(III)	0.06 V

ELECTRODES

- scTRACE Gold

RESULTS

At a 30 s deposition time, this method is suitable for the determination of antimony(III) in water samples in concentrations from β(Sb(III)) = 0.1–10 µg/L.

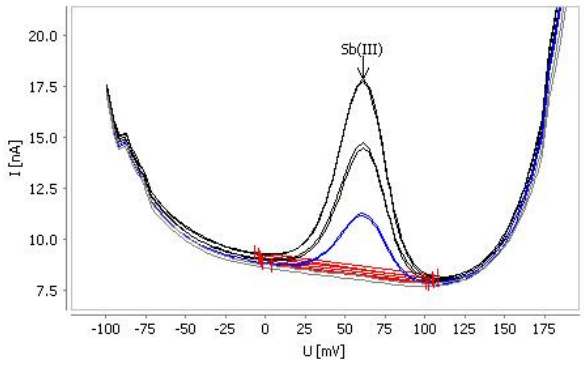

Figure 3. Determination of antimony(III) in tap water spiked with 1 µg/L (30 s deposition time)

Table 2. Result

Sample	Sb(III) (µg/L)
Tap water spiked with 1 µg/L Sb(III)	0.94

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