



Application Note AN-V-232

Nickel and cobalt in drinking water

Simultaneous determination in low $\mu\text{g/L}$ range on the 11L SPEs modified with a Bi film

EU legislation specifies 20 $\mu\text{g/L}$ as the limit value for nickel in drinking water. The current provisional guideline value for Ni in the World Health Organization's «Guidelines for Drinking-water Quality» is set to a maximum concentration of 70 $\mu\text{g/L}$. The adsorptive stripping voltammetry (AdSV) technique performed on the ex-situ bismuth film modified Metrohm DropSens 11L screen-printed electrode (SPE) can be used to simultaneously detect concentrations as low as 0.4 $\mu\text{g/L}$ for nickel and 0.2 $\mu\text{g/L}$ for cobalt with a 30 s deposition time. These limits can be lowered

even further by increasing the deposition time. Another advantage of this method lies in the innovative and cost-effective SPE. It is a combined sensor consisting of a carbon working electrode, Ag/AgCl reference, and carbon auxiliary electrode on a ceramic substrate. The disposable sensor does not require any maintenance such as mechanical polishing or mechanical cleaning. It can be used conventionally in the laboratory with the 884 Professional VA, or alternatively in the field with the 946 Portable VA Analyzer. This method is best suited for manual systems.

SAMPLE

Drinking water, mineral water

EXPERIMENTAL

Prior to the first determination, an ex-situ bismuth film is deposited from a Bi solution. In the next step, the electrodes are cleaned with ultrapure water and the bismuth solution is removed. The water sample is placed into the measuring vessel. Ammonia / ammonium chloride buffer along with the complexing agent (dimethylglyoxime) are added, and the simultaneous determination of nickel and cobalt is carried out using the parameters specified in **Table 1**. The concentration is determined by two additions of a nickel and cobalt standard addition solution.



Figure 1. 946 Portable VA Analyzer (SPE)



Figure 2. 884 Professional VA semiautomated

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.9 V
Deposition time	30 s
Start potential	-0.9 V
End potential	-1.3 V
Peak potential Ni	-1.05 V
Peak potential Co	-1.175 V

ELECTRODES

- Screen-printed carbon electrode (Metrohm DropSens 11L)

RESULTS

With a 30 s deposition time, this method is suitable for the determination of both nickel and

cobalt in water samples in concentrations from $\beta(\text{Ni}) = 0.4\text{--}5 \mu\text{g/L}$ and $\beta(\text{Co}) = 0.2\text{--}8 \mu\text{g/L}$.

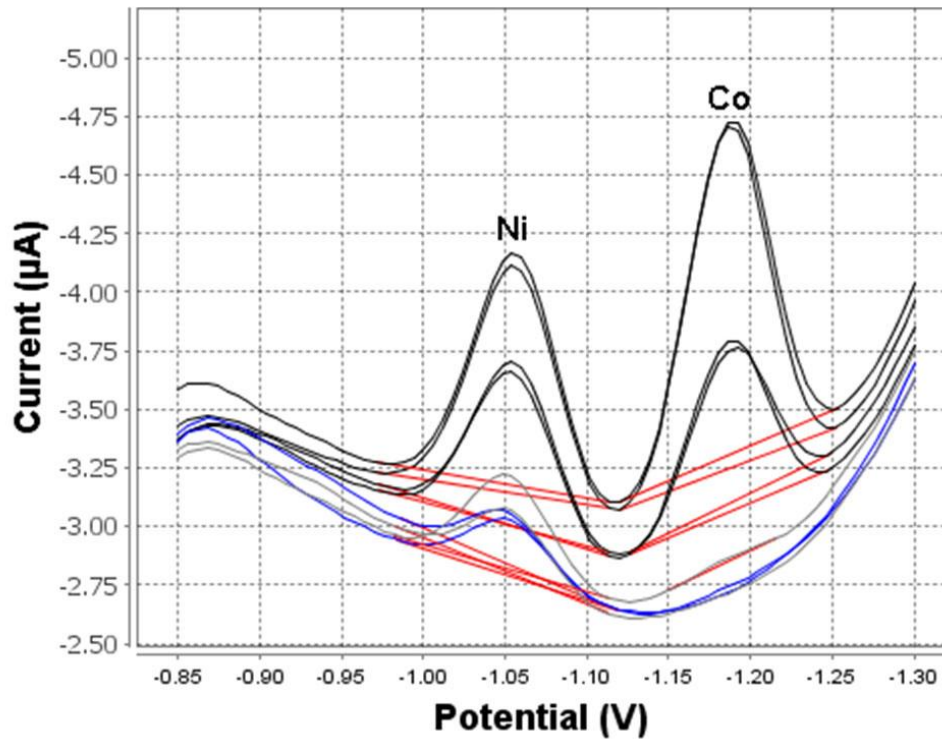


Figure 3. Determination of nickel and cobalt in tap water (946 Portable VA Analyzer; 30 s deposition time)

Table 2. Result

Sample	Ni ($\mu\text{g/L}$)	Co ($\mu\text{g/L}$)
Tap water	1.15	<LOD

Internal references: AW VA CH4-0597-062020;

AW VA CH4-0599-082020

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CONFIGURATION

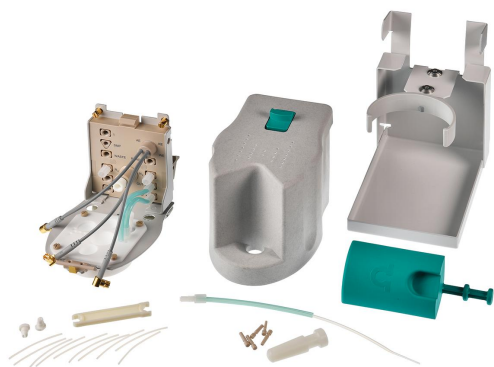


884 Professional VA

884 Professional VA 是 Professional VA/CVS 器系列的通用入。与合的量和用,可使用伏安量和法借助多模式 pro、scTRACE Gold、液滴行痕量分析定,或通«循伏安溶出法»(CVS)、«循脉冲伏安溶出法»(CPVS)和位法(CP)在池中有有机添加行定。此已的瑞士万通技与高效位/恒位以及外接的活 **viva** 件用,展了新的前景。有的校准器的恒位在每次量之前均自冲洗行校准,保可能的最高精度。借助可更的量,可在使用不同的各用之快速切。

使用 **viva** 件行控制、数据采集和估。

884 Professional VA 供少了附件,没有量和。和 **viva** 可独。



SPE Professional VA

厚膜(网印刷,SPE)或 scTRACE Gold 行所需的量。



VA Professional-VA- SPE

使用厚膜(网印刷,SPE)所需的附件配。可厚膜的杆、拌器和量杯。无。



946 Portable VA Analyzer (SPE)

用于定重金属的便携式金属分析器。厚膜(网印刷,SPE)的器版本。系由恒位和集成了拌器与可更式的独立量台成。用 Portable VA Analyzer 件。源由 USB 接口和内置的可充池提供。器装在手提箱内交付,包含了所有必需的附件。厚膜不在准配置范内。



CAg/AgCl

网印刷(助:C;参比:Ag/AgCl)