Application Note AN-V-232

饮用水镍钴双金属丝网印刷碳电极检测

Simultaneous determination in low µg/L range on the 11L SPEs modified with a Bi film

EU legislation specifies 20 µg/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 µg/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 µg/L for nickel and 0.2 µg/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 the946 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.

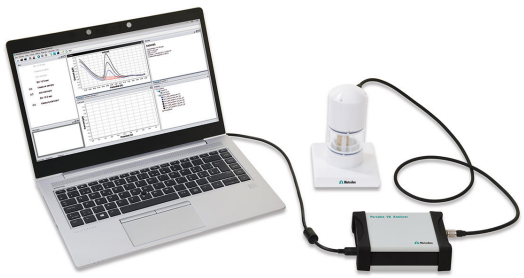

Figure 1. 946 Portable VA Analyzer (SPE)

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 β(Ni) = 0.4–5 µg/L and β(Co) = 0.2–8 µg/L.

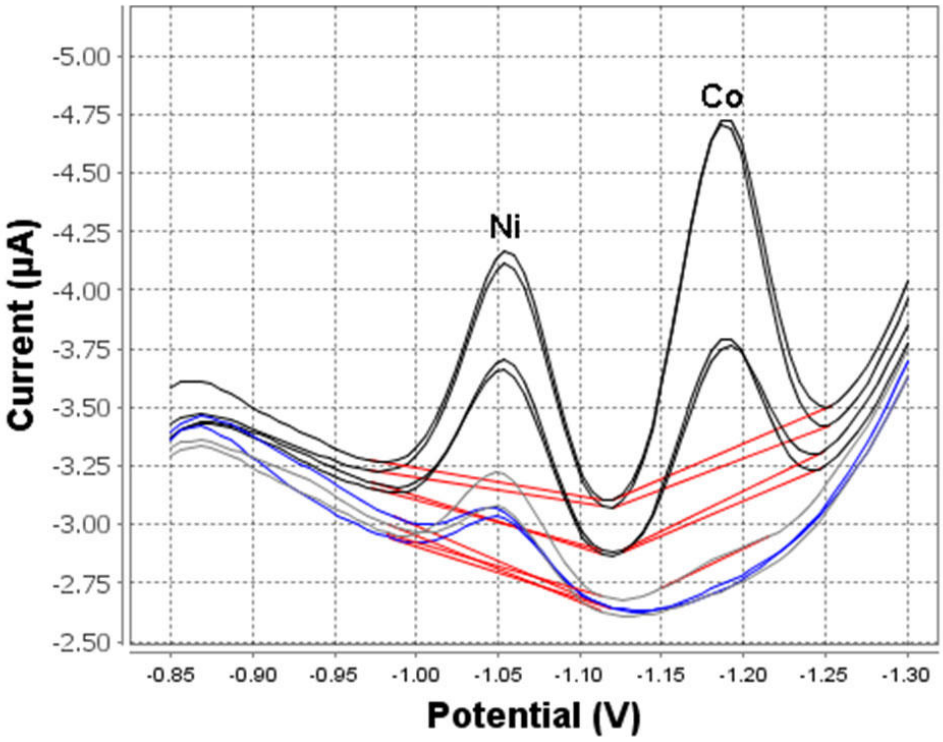

Figure 3. Determination of nickel and cobalt in tap water (946 Portable VA Analyzer; 30 s deposition time)

Table 2. Result

Sample	Ni (µg/L)	Co (µg/L)
Tap water	1.15	<LOD

Internal references: AW VA CH4-0597-062020; AW VA CH4-0599-082020

CONTACT

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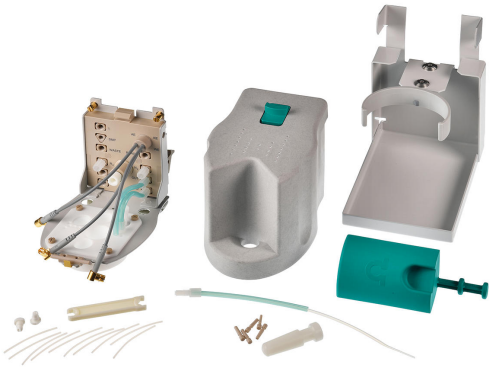
CONFIGURATION

884 Professional VA

884 Professional VA 是 Professional VA/CVS 仪器系列的通用入门级设备。与合适的测量头和电极组联用,可使用伏安测量和极谱法借助多模式电极 pro、scTRACE Gold、铋液滴电极进行痕量分析测定,或通过 «循环伏安溶出法»(CVS)、«循环脉冲伏安溶出法»(CPVS)和计时电位法(CP)在电镀池中对有机添加剂进行测定。此项已经证实的瑞士万通电极技术与恒电位/恒电位仪以及外接的灵活 viva 软件联用,展现了新的前景。带有经认证的校准器的恒电位仪在每次测量之前均自动冲洗进行校准,确保精度。借助可更换的测量头,可在使用不同电极的各种应用之间实现快速切换。

使用 viva 软件进行控制、数据采集和评估。

884 Professional VA 供货时减少了附件,没有测量头和电极。电极组和 viva 许可证则须单独订购。



SPE Professional VA

带厚膜电极(*丝网印刷电极*,SPE)或 scTRACE Gold 运行所需的测量头。

VA Professional-VA- SPE

使用厚膜电极(*丝网印刷电极*,SPE)所需的附件配备。可购买厚膜电极的电极杆、搅拌器和量杯。无电极。

946 Portable VA Analyzer (SPE)

用于测定重金属的便携式金属分析器。厚膜电极(*丝网印刷电极*,SPE)的仪器版本。该系统由恒电位仪和集成了搅拌器与可更换式电极的独立测量台构成。该设备用 Portable VA Analyzer 软件驱动。电源由 USB 接口和内置的可充电电池提供。仪器装在手提箱内交付,包含了所有必需的附件。厚膜电极不在标准配置范围内。