



Application Note AN-V-224

饮用水镍钴双金属玻碳电极分析平台

Simultaneous determination in low ng/L range on the GC-RDE modified with a bismuth film

Due to the toxicity and the detrimental effects of nickel and cobalt on human health, their concentrations in drinking water must be controlled. Therefore, EU the 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. To monitor the concentrations of Ni and Co with the 884 Professional VA, a method for simultaneous determination on the glassy carbon electrode (GC-RDE) modified with a Bi

film is used.

The simplicity of the bismuth film preparation step allows quick and easy regeneration of the sensing layer. The determination is based on adsorptive stripping voltammetry of both elements using dimethylglyoxime (DMG) as a complexing agent. This method results in excellent performance in terms of sensitivity, reaching a limit of detection of 0.05 µg/L for Ni and 0.03 µg/L for Co. This non-toxic method is best suited for both manual and automated systems, allowing the determination in sample series with low to medium number of samples.

SAMPLE

Drinking water, mineral water, sea water

EXPERIMENTAL

Prior to the first determination, an ex-situ bismuth film is deposited from a bismuth 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. Ammonium buffer together with the complexing agent (DMG) are

added, and the simultaneous determination of nickel and cobalt is carried out with the 884 Professional VA using the parameters specified in **Table 1**. The concentration is determined by two additions of a nickel and cobalt standard addition solution.



Figure 1. 884 Professional VA fully automated for VA

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.8 V
Deposition time	30 s
Start potential	-0.85 V
End potential	-1.25 V
Peak potential Ni	-0.97 V
Peak potential Co	-1.12 V

ELECTRODES

- Working electrode: Glassy carbon (GC-RDE)
- Reference electrode: Ag/AgCl/KCl (3 mol/L)
- Auxiliary electrode: Glassy carbon rod

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 $\beta(\text{Ni}) = 0.2\text{--}8\text{ }\mu\text{g/L}$ and $\beta(\text{Co}) = 0.1\text{--}10\text{ }\mu\text{g/L}$.

Using a 90 s deposition time, the limit of detection can be lowered to approximately $0.05\text{ }\mu\text{g/L}$ for nickel and $0.03\text{ }\mu\text{g/L}$ for cobalt.

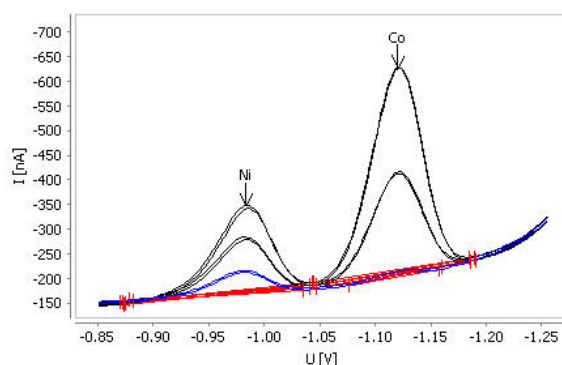
**Figure 2.** Determination of nickel and cobalt in tap water (30 s deposition time)

Table 2. Result

Sample	Ni (µg/L)	Co (µg/L)
Tap water	0.34	<LOD

Internal reference: AW VA CH4-0589-122019

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CONFIGURATION



CVS 884 Professional VA manual

用于 CVS 应用的 884 Professional VA manual 是借助 «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或采用旋转圆盘电极进行伏安法重金属测定的入门仪器。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 CVS 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。集成的温度测量输入端可在测量过程中监控溶液温度。

通过此仪器也可以进行伏安法测定。借助可更换的测量头,可在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。

用于 CVS(伏安测量)应用的 884 Professional VA manual 供货时带有大量附件,以及用于旋转圆盘电极的测量头。电极组和 **viva** 许可证则须单独订购。



VA Glassy Carbon RDE Professional

VA

整套电极组,用于伏安测定,例如采用汞膜电极技术。
包含旋转圆盘电极驱动、玻碳电极头、参比电极、玻
碳辅助电极、量杯和电解质溶液。