



Application Note AN-V-225

使用玻璃碳电极检测饮用水中的镉和铅含量

Simultaneous determination on a mercury film modified glassy carbon electrode

To reduce the toxic effects of cadmium on the kidneys, skeleton, and the respiratory system, as well as the neurotoxic effects of lead, the provisional guideline values in the World Health Organization's (WHO) «Guidelines for Drinking-water Quality» are set to a maximum concentration of 3 µg/L for cadmium and 10 µg/L for lead.

The powerful anodic stripping voltammetry (ASV) technique on the ex-situ mercury film modified glassy carbon electrode is more than sufficient to monitor the proposed WHO guidelines for Cd and Pb in drinking water. The

main advantage lies in the ultrahigh sensitivity of this method. With a deposition time of 30 s, a limit of detection for $\beta(\text{Cd}) = 0.02 \text{ µg/L}$ and $\beta(\text{Pb}) = 0.05 \text{ µg/L}$ can be reached. The linear range for both elements goes up to approximately 50 µg/L using the same deposition time. The ability to re-plate the mercury film allows a quick and easy regeneration of the sensor. This method is best suited for both manual and automated systems, allowing the determination in a sample series comprised of a low to medium number of samples.

SAMPLE

Drinking water, mineral water, sea water

EXPERIMENTAL

Prior to the first determination, the ex-situ mercury film is deposited on the freshly polished glassy carbon electrode. In the next step, the electrodes are cleaned with ultrapure water and the measuring vessel is emptied. Then the water sample and the supporting electrolyte are pipetted into the measuring vessel. The

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



Figure 1. 884 Professional VA, fully automated for VA analysis

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-1.0 V
Deposition time	90 s
Start potential	-0.85 V
End potential	-0.25 V
Peak potential Cd	-0.65 V
Peak potential Pb	-0.48 V

ELECTRODES

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

RESULTS

The method is suitable for the determination of cadmium and lead in concentrations up to 25 µg/L. The limit of detection for 30 s deposition

time is approximately 0.02 µg/L for cadmium and 0.05 µg/L for lead.

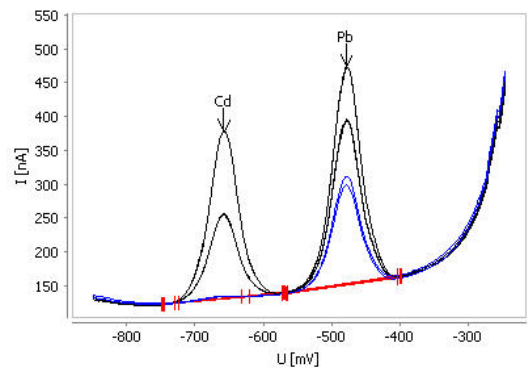


Figure 2. Determination of cadmium and lead in tap water

Table 2. Result

Sample	Cd (µg/L)	Pb (µg/L)
Tap water	0.02	1.76

REFERENCES

Application Bulletin 241: [Determination of cadmium and lead by anodic stripping voltammetry at a mercury film electrode](#)

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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。