



Application Note AN-V-221

# Cadmium and lead in drinking water

## Simultaneous determination by voltammetry using a Bi drop electrode

To reduce the toxic effects of cadmium on the kidneys, the skeleton, and the respiratory system, as well as to limit the neurotoxic effects of lead, the provisional guideline values in the World Health Organization's «Guidelines for Drinking-water Quality» are set to a maximum concentration of 3  $\mu\text{g/L}$  for cadmium and 10  $\mu\text{g/L}$  for lead in drinking water.

The completely mercury-free Bi drop electrode takes the next step towards converting

voltammetric analysis into a non-toxic approach for heavy metal detection. Using this environmentally friendly sensor for anodic stripping voltammetry (ASV) allows the simultaneous determination of cadmium and lead in drinking water. With a 60 s deposition time, a limit of detection (LOD) of 0.1  $\mu\text{g/L}$  for Cd and 0.5  $\mu\text{g/L}$  for Pb can be reached. This outstanding sensitivity is more than sufficient to monitor the provisional WHO guideline values.

This method is best suited for automated systems or process analyzers, allowing the fully

automatic determination of cadmium and lead in large sample series.

## SAMPLE

Drinking water, mineral water

## EXPERIMENTAL

The water sample and the supporting electrolyte are pipetted into the measuring vessel. The simultaneous determination of cadmium and lead is carried out with a 884 Professional VA using the parameters specified in **Table 1**. The concentration of both elements is determined

by two additions of a cadmium and lead standard addition solution.

The Bi drop electrode is electrochemically activated prior to the first determination of cadmium and lead.



**Figure 1.** 884 Professional VA fully automated for VA

**Table 1.** Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-1.1 V
Deposition time	60 s
Start potential	-1 V
End potential	-0.35 V
Peak potential Cd	-0.7 V
Peak potential Pb	-0.5 V

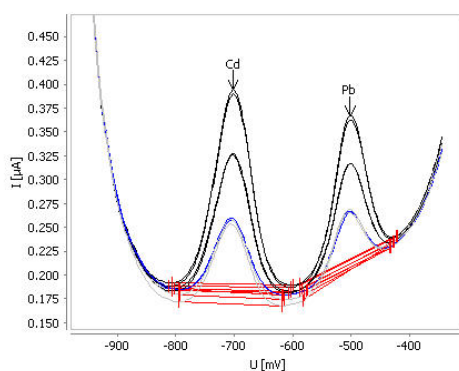
## ELECTRODES

- Working electrode: Bi drop
- 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 water samples in concentrations up to 15  $\mu\text{g/L}$ . The limit of

detection of the method is 0.1  $\mu\text{g/L}$  for approximately cadmium and 0.5  $\mu\text{g/L}$  for lead.



**Figure 2.** Determination of cadmium and lead in tap water spiked with  $\beta(\text{Cd}) = 2 \mu\text{g/L}$  and  $\beta(\text{Pb}) = 2 \mu\text{g/L}$

**Table 2.** Results

Sample	Cd (µg/L)	Pb (µg/L)
Tap water spiked with $\beta$ (Cd) = 2 µg/L and $\beta$ (Pb) = 2 µg/L	2.0	2.3

## REFERENCES

Application Bulletin 438: Determination of cadmium and lead in water samples by anodic stripping voltammetry with a Bi drop electrode

## CONTACT

Metrohm AG  
Ionenstrasse  
9100 Herisau

[info@metrohm.com](mailto:info@metrohm.com)

## CONFIGURATION



### (MME) 884 Professional VA manual

用于多模式 (MME) 的 884 Professional VA manual 是借助多模式 pro 或 scTRACE Gold 或液滴使用伏安法和法行痕量分析的入器。此已的瑞士万通技与恒位/恒位以及外接的活 viva 件用,在重金属定域中展了新的前景。有的校准器的恒位在每次量之前均自冲洗行校准,保可能的高精度。

通此器也可使用旋行定,例如借助«循伏安溶出法»(CVS)、«循脉冲伏安溶出法»(CPVS)和位法(CP)定池中的有机添加。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。

用于 MME(多模式)的 884 Professional VA manual 供配大量附件,包括用于多模式 pro 的量。和 viva 可独。



## VA Professional VA

完整的套件,用于伏安法定重金属。包含滴、参比、玻璃助、量杯、拌器,解液和其他附件。