



Application Note AN-V-231

Cadmium and lead in drinking water

Simultaneous determination on Metrohm DropSens Screen-Printed Carbon Electrodes

The provisional guideline values in the World Health Organization's (WHO) «Guidelines for Drinking-water Quality» are set to 3 µg/L for cadmium and 10 µg/L for lead.

The anodic stripping voltammetry (ASV) technique performed on the ex-situ mercury film modified Metrohm DropSens screen-printed electrode (SPE) can be used to simultaneously detect concentrations as low as 0.3 µg/L for both elements. This is suitable to monitor the WHO guideline values.

The main advantage of this method lies in the

innovative and cost-effective screen-printed electrode. 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 need 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, sea water

EXPERIMENTAL

Prior to the first determination, the ex-situ mercury film is deposited in a separate step on the screenprinted electrode. 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 or with the 946 Portable VA Analyzer 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.



Figure 1. 946 Portable VA Analyzer (SPE)



Figure 2. 884 Professional VA, semiautomated system

Table 1. Parameters

Parameter	Setting
Mode	SQW – Square wave
Deposition potential	-1.3 V
Deposition time	60 s
Start potential	-1.0 V
End potential	-0.4 V
Peak potential Cd	-0.72 V
Peak potential Pb	-0.52 V

ELECTRODES

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

RESULTS

With a 30 s deposition time, the limit of detection is around 1 µg/L, and the linear working range is up to

20 µg/L in the measuring solution for both elements.

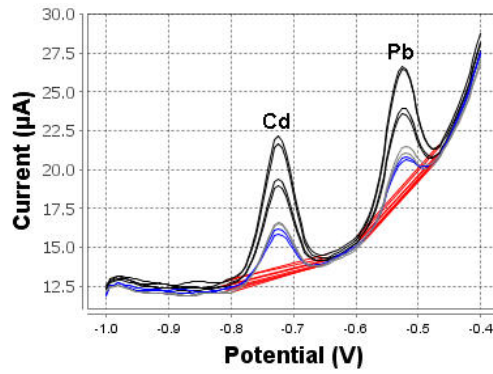


Figure 3. Determination in mineral water spiked with 2 µg/L cadmium and lead

Table 2. Result

Sample	Cd (µg/L)	Pb (µg/L)
Mineral water spiked with 2 µg/L Cd and Pb	2.04	1.81

Internal references: AW VA CH4-0593-042020; AW

VA CH4-0594-042020

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Gamme d'accessoires VA avec tige d'électrode SPE pour les appareils Professional VA

Gamme d'accessoires à utiliser avec les électrodes à film épais (*Screen-Printed Electrodes, SPE*). Comprend une tige pour électrodes à film épais, un agitateur et un bécher de mesure. Sans électrodes.



946 Portable VA Analyzer (SPE)

Analyseur de métaux portable pour déterminer les métaux lourds. Version de l'appareil pour électrodes à film épais (*Screen-Printed Electrodes, SPE*). Le système comprend un potentiostat et un banc de mesure séparé avec agitateur intégré et électrode interchangeable. L'appareil fonctionne avec le logiciel du Portable VA Analyzer. L'alimentation se fait par le connecteur USB et par la batterie rechargeable intégrée. L'appareil est livré dans une mallette contenant tous les accessoires nécessaires. Les électrodes à film épais ne sont pas fournies.



Électrode à film épais en carbone (aux. : C ; réf. : Ag/AgCl)

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