



Application Note AN-V-237

无电解镍镀液中的铅稳定剂

Direct lead determination over a wide concentration range with the Bi drop electrode

Electroless nickel plating processes are a low-cost solution for resistance against wear and corrosion. These processes offer the ability to plate on large and complex substrates with a uniform thickness. When manufacturing printed circuit boards, the efficiency of the ENIG (electroless nickel, immersion gold) and ENEPIG (electroless nickel, electroless palladium, immersion gold) processes strongly depends on the exact composition of electroless nickel plating bath. Monitoring the concentration of

bath stabilizers such as lead is crucial to ensure high-quality coatings that meet specified standards. The typical concentration of lead stabilizer in an electroless Ni bath is around 1 mg/L Pb.

The mercury-free Bi drop electrode offers a non-toxic approach for voltammetric analysis of heavy metals. This environmentally friendly sensor allows the determination of lead in an electroless Ni plating bath with anodic stripping voltammetry (ASV).

SAMPLE

Electroless Ni plating solution

EXPERIMENTAL

Add water, the Ni plating bath sample, and the supporting electrolyte into the measuring vessel. The determination of lead is carried out with the 884 Professional VA (Figure 1) using the parameters specified in Table 1. The concentration is determined by two additions of lead standard addition solution. Activate the Bi drop electrode electrochemically prior to the first determination.



Figure 1. 884 Professional VA fully automated for VA.

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.65 V
Deposition time	60 s
Start potential	-0.65 V
End potential	-0.3 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 limit of detection (LOD) for a 60 s deposition time is 0.1 mg/L Pb. This outstanding sensitivity is more than sufficient to monitor the typical concentrations of lead stabilizer in electroless Ni plating baths.

This method is best suited for automated systems or process analyzers, allowing the fully automatic determination of lead in large sample series.

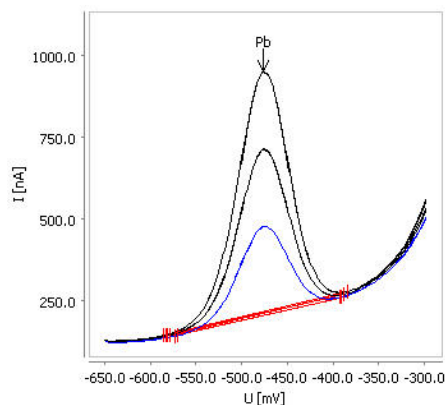


Figure 2. Determination of lead in an electroless Ni bath sample containing $\beta(\text{Pb}) = 1.2 \text{ mg/L}$ (sample volume: 50 μL).

Table 2. Result

Sample	Pb (mg/L)
Ni plating bath containing $\beta(\text{Pb}) = 1.2 \text{ mg/L}$	1.16

REFERENCES

1. [Application Bulletin 438](#): Determination of cadmium and lead in water samples by anodic stripping voltammetry with a Bi drop electrode.

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CONFIGURATION



(MME) 884 Professional VA manual

用于多模式电极 (MME) 的 884 Professional VA manual 是借助多模式电极 pro 或 scTRACE Gold 或 铋液滴电极使用伏安法和极谱法进行痕量分析的入门仪器。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,在重金属测定领域中展现了新的前景。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,确保可能的高精度。

通过此仪器也可使用旋转圆盘电极进行测定,例如借助«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)测定电镀池中的有机添加剂。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。

用于 MME(多模式电极)的 884 Professional VA manual 供货时配备大量附件,包括用于多模式电极 pro 的测量头。电极组和 **viva** 许可证则须单独订购。