Bismuth stabilizer in an electroless Ni plating bath

Straightforward determination over a wide concentration range with the scTRACE Gold

The electroless nickel plating process is known for its superior surface finishing properties with excellent resistance to wear and corrosion. The efficiency of the ENIG (electroless nickel, immersion gold) and ENEPIG (electroless nickel, electroless palladium, immersion gold) processes in manufacturing printed circuit boards strongly depends on the exact composition of the electroless nickel plating bath. Monitoring stabilizer concentrations in Ni baths (e.g., bismuth, Bi) is crucial for high-quality coatings.

Anodic stripping voltammetry (ASV) allows fast and robust monitoring of the bismuth concentration in Ni plating bath samples. This determination is performed on the scTRACE Gold. It is a combined sensor containing working, reference, and auxiliary electrodes integrated on a single ceramic substrate. It does not need extensive maintenance such as mechanical polishing. Measurements can be performed with the 884 Professional VA. This method is suited for manual or automated systems.

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SAMPLE

Electroless Ni plating bath

EXPERIMENTAL

Add water, the electroless Ni plating bath sample, and the supporting electrolyte into the measuring vessel. The determination of bismuth 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 a bismuth standard addition solution.

The scTRACE Gold is electrochemically activated prior to the first determination.

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

Table 1. Parameters

Parameter	Setting
Mode	DP – Differential Pulse
Deposition potential	-0.1 V
Deposition time	30 s
Start potential	0.0 V
End potential	0.3 V
Peak potential Bi	0.15 V

ELECTRODES

- scTRACE Gold

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RESULTS

The typical Bi concentration in nickel plating bath samples is around 1 mg/L. However, samples containing 100 µg/L Bi can be reliably determined with a 30 s deposition time using this method. The scTRACE Gold sensor quickly measures bismuth in Ni baths over a broad concentration range.
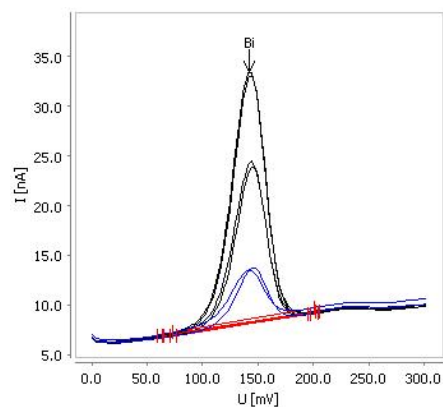
Figure 2. Determination of bismuth in an electroless Ni bath sample containing 1 mg/L Bi (30 s deposition time, sample volume 25 µL in 10 mL water).

Table 2. Result

Sample	Bi (mg/L)
Electroless Ni plating bath containing 1 mg/L Bi	1.07

CONTACT

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CONFIGURATION

884 Professional VA manual for Multi-Mode Electrode (MME)

884 Professional VA manual for Multi-Mode Electrode (MME) is the entry-level instrument for high-end trace analysis with voltammetry and polarography with the Multi-Mode Electrode pro or the scTRACE Gold or the Bismuth drop electrode. The proven Metrohm electrode methods in combination with a high-performance potentiostat/galvanostat and the extremely flexible viva software open up new perspectives for the determination of heavy metals. The potentiostat with a certified calibrator readjusts itself automatically before each measurement, thus guaranteeing maximum precision.

Determinations with rotating disc electrodes can also be performed with the instrument, e.g. determinations of organic additives in electroplating baths with "Cyclic Voltammetric Stripping" (CVS), "Cyclic Pulse Voltammetric Stripping" (CPVS), and chronopotentiometry (CP). The replaceable measuring head enables rapid changes between the various applications with different electrodes.

The **viva** software is required for control, data collection, and evaluation.

The 884 Professional VA manual for MME is supplied with extensive accessories and a measuring head for the Multi-Mode Electrode pro. Electrode set and **viva** license need to be ordered separately.

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