

MAXXI 6

Analysis of nickel coatings

INTRODUCTION

Nickel plate, with or without an underlying copper strike, is one of the oldest protective and decorative electro-deposited metallic coatings for steel, brass, and other base metals. Recently, it has been applied to plastics of various kinds. Electro-deposits of nickel possess a wide variety of properties, depending on composition of the plating bath and operating conditions.

Electroless nickel coatings are frequently applied on aluminium to provide a solder-able surface and are used with molds and dies to improve lubrication and part release. Because of these properties, electroless nickel coatings have found many applications, including those in petroleum, chemicals, plastics, optics, printing, mining, aerospace, nuclear, automotive, electronics, computers, textiles, paper, and food machinery.

Some advantages of electroless nickel coating are good resistance to corrosion and wear, excellent uniformity, solderability and brazability, and relatively low labour costs. Limitations are high chemical cost, brittleness, poor welding characteristics of nickel phosphorus deposits, need to copper strike plate alloys containing significant amounts of lead, tin, cadmium, and zinc before electroless nickel can be applied, slower plating rate compared to electrolytic method.

To guarantee the good functionality of the plated components, platers need to ensure a consistent nickel thickness. The MAXXI 6 offers rapid and accurate, non-destructive analysis of nickel coatings with high degree of confidence, with minimal or no sample preparation needed.

The system is extremely easy to operate by non-technical staff. Its robust and rugged design is well suited for the most challenging industrial conditions.

Hitachi's family of bench-top EDXRF analysers have been employed in the field for over twenty years and have served as the cost effective solution for copper coating thickness measurements.

MAXXI 6

Hitachi's MAXXI 6 is a high performance, compact, rugged and reliable quality control analyser for simple, rapid, coating thickness measurement and composition analysis. Measurements can be made according to international test methods ISO 3497 and ASTM B568. The MAXXI 6 uses the latest generation silicon drift detector (SDD) technology to provide the ultimate resolution and sensitivity.

The MAXXI 6 uses the non-destructive analytical technique of energy dispersive X-ray fluorescence (EDXRF) to generate an X-ray spectrum of the sample. This elemental X-ray spectrum is processed using the supplied Fundamental Parameters (FP) or empirical software to produce coating thickness or composition values.



Analysis is as easy as: load, focus, start



The MAXXI 6 includes as standard features that make it an ideal fit for coatings analysis. The large, slotted sample chamber can fit a wide range of parts. The motorised sample stage makes it easy to automatically measure multiple samples or multiple features on a single sample, or perform scans to get a representative analysis on uneven surfaces. Multiple collimators are included in the instrument to ensure the best fit and performance on parts of all sizes.

INTUITIVE SMARTLINK SOFTWARE MAXIMIZES USER PRODUCTIVITY TO ENSURE CONSISTENT PROCESS AND PRODUCT QUALITY

All instrument functions are driven by Hitachi's SmartLink software program which is a highly intuitive, Microsoft Windows 10 compatible analytical and user interface package. Minimum staff training is required, and the simple user interface enables users at all levels to generate reliable data.

- View the sample and measurement location with clarity.
- Create automatic programs to measure multiple features or samples.
- Configure results to display pass/fail messages for rapid evaluation.
- Get full access to the complete analytical package for thickness, materials and solution analysis at no additional cost.
- Automatically export results to a spreadsheet program.

PERFORMANCE AND RESULTS

Typical performance for common, representative applications is shown in the tables below. The precision was calculated from 30 repeat measurements. Precision is influenced by measurement time, collimator size, elements present and thickness range. In some cases the error can be reduced by optimizing the calibration range for specific applications.

Typical Applications

Top Layer	Substrate
Ni	Cu, CuFe, Brass, Bronze, CuNi, CuNiZn
NiP	Cu, Fe, Al, Brass

Typical performance for a single-layer application, Ni/Cu using a circular collimator with a diameter of 0.3 mm (12 mil)

Analyte	Tested Range	Standard Error	Precision (2σ), 10 repeats
Ni	0.43-15 μm (16.9-590.6 μin)	0.025 μm (1 μin) or 5% relative whichever is greater	0.004 μm @ 1.0 μm 0.032 μm @ 5.14 μm (0.16 μin @ 39.4 μin) (1.3 μin @ 202.4 μin)

Typical performance for a single-layer application, Ni/CuNiZn using a circular collimator with a diameter of 0.3 mm (12 mil)

Analyte	Tested Range	Standard Error	Precision (2σ), 10 repeats
Ni	0.43-15 μm (16.9-590.6 μin)	0.025 μm (1 μin) or 5% relative whichever is greater	0.009 μm @ 1.00 μm 0.042 μm @ 5.14 μm (0.35 μin @ 39.4 μin) (1.7 μin @ 202.4 μin)

Typical performance for an alloy-layer application, NiP/Cu using a circular collimator with a diameter of 0.3 mm (12 mil)

Analyte	Tested Range	Standard Error	Precision (2σ), 10 repeats
NiP	1.27-17.6 μm (50-692.9 μin) 4-12% P	0.025 μm (1 μin) or 5% relative whichever is greater 2% relative for composition	0.10 μm @ 4.97 μm (3.9 μin @ 195.7 μin) 0.62% P @ 4.7% P

SUMMARY

The MAXXI 6 reliably offers precise analysis of nickel coatings. Using Hitachi's traceable calibration standards, routine production samples can be simply and quickly measured by any level of operator. Results appear in seconds, allowing near-instantaneous optimisation of the production process.

Over 1,000 applications have been optimized for Hitachi's coatings analysers. For information about additional applications please contact our experts at contact@hitachi-hightech-as.com.

Where every mil or micron counts, depend on Hitachi's coatings analyzers.

Visit www.hitachi-hightech.com/hha for more information.



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