APPLICATION NOTE – 016A

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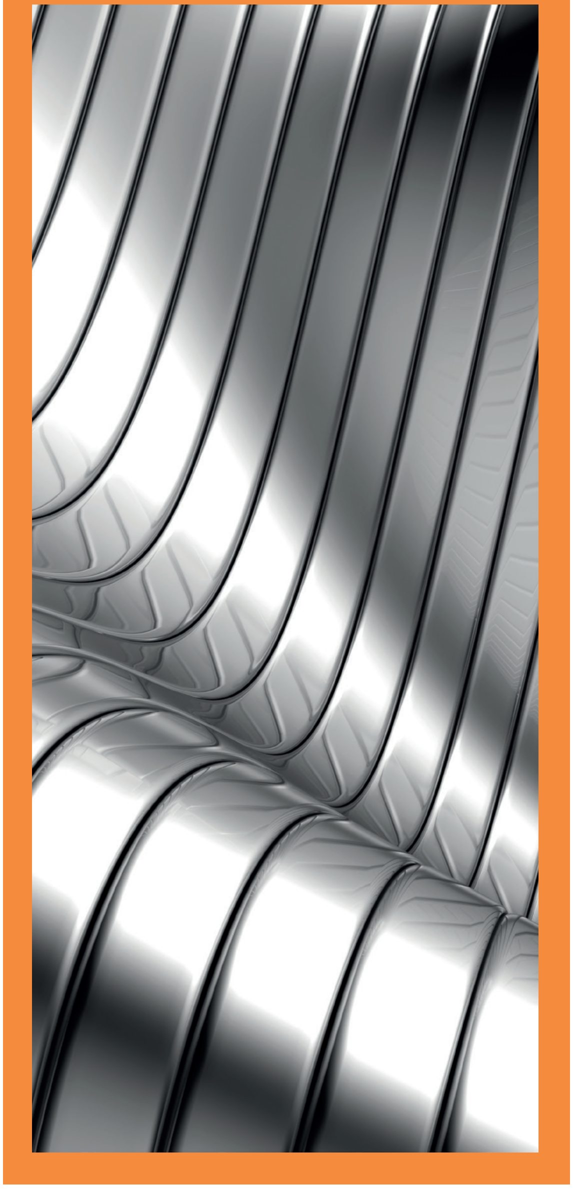
X-STRATA920 AN-SDD016A



Analysis of silver coatings

INTRODUCTION

Electrodeposited silver onto base metal alloys is gaining popularity over the traditional stainless steel and pewter tableware. This decorative application established the largest usage of silver coating. The unique corrosion-resistance characteristics and appeal of silver make it the appropriate choice of coating for storage container for specific chemicals. Notably, the non-toxic property of silver also makes it applicable as a coating for medical instrument applications.

Also, silver is added as a key ingredient of low-karat gold and various jewelleries. With the steady rise of gold price, the electronics industry has incrementally adopted the usage of silver/immersion silver coatings in various applications where its tendency to migrate, tarnish or destabilize electrically poses no performance issues.

To guarantee the good functionality of the plated components, platers need to ensure a consistent silver thickness. The X-Strata920 offers rapid and accurate, non-destructive analysis of silver 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 forty years and have served as the choice solution for silver coating thickness measurements.

X-STRATA920

Hitachi's X-Strata920 fitted with a high-resolution silicon drift detector (SDD) is a high performance, compact, rugged and reliable quality control analyser for simple, rapid coating thickness and composition analysis. Measurements can be made according to international test methods ISO 3497 and ASTM B568.

The X-Strata920 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.

The X-Strata920 comes in a range of chamber and base configurations to accommodate samples of different shapes and sizes. All chamber configurations are slotted for quick loading of flat or thin samples such as circuit boards and wire. A laser focus ensures reproducible sample placement to get consistent results from any operator. The optional 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. Collimators are user-selectable 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.
- Configure results to display high/low indicators for rapid evaluation.
- Export results to a spreadsheet program.
- Create automatic programs to measure multiple features or samples.
- Add versatility to the instrument by selecting materials and solution analysis software options.

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	Second Layer	Substrate
Ag		Cu, CuZn
Ag	Cu	Fe, CuZn
Ag	Ni	Cu, Fe

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

Analyte	Tested range	Standard error	Precision (2σ)
Ag	1.09-30 µm (44-1194 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.29 um @ 19 µm (11.7 µin @ 745 µin)

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

Analyte	Tested range	Standard error	Precision (2σ)
Ag	0.57 - 5.2 µm (22 - 206 µin)	0.025 µm (1 µin) or 5% relative whichever is greater	0.02 um @ 0.57 µm (0.7 µin @ 24 µin)

Note: Use parameters optimized for thin silver plating, for example when measuring immersion silver for IPC-4553A

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

Analyte	Tested range	Standard error	Precision (2σ)
Ag	1.07-8.2 µm (43-329 µin)w	0.025 µm (1 µin) or 5% relative whichever is greater	0.13 µm @ 8.2 um (5.3 µin @ 329 µin)
Cu	0.94-8.9 µm (38-355 µin)	10% relative	0.05 µm @ 0.94 µm (2.2 µin @ 38 µin)

SUMMARY

The X-Strata920 reliably offers precise analysis of silver 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.

When a single micron can make the difference, depend on Hitachi's coatings analysers

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

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