Application Brief

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SFT no.28 Measuring lead in electroless nickel plating using the SFT9500 and SEA1200VX

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1. Introduction

Electroless nickel plating can be deposited on to conductive materials and even non-conductive materials such as plastics and ceramics. While nickel-boron and other types of plating are available, nickel-phosphorus plating is the most frequently used because of it superior functionality. However, the stabilizer for plating contains heavy metals such as lead and the Restriction of Hazardous Substances Directive (RoHS) has created a demand to treat these items as controlled substances in recent years. Moreover, there has also been a demand to measure the concentration of phosphorous in the nickel-phosphorus alloy layer.

This brief introduces how to use fluorescent X-ray analysis to meet these product management demands.

2. Measurement

The SEA1200VX and SFT9500 measured the samples using the fundamental parameter method (FP method) for thin film. The following chart lists the measurement conditions.

Because phosphorous and minute amounts of lead were to be measured, the following analyzer requirements were necessary.

・A semiconductor detector with greater sensitivity and resolution than current detectors
・A high sensitivity for light elements
・A primary filter compliant with the RoHS directive

To meet these requirements, the abovementioned analyzers were equipped with a new type of detector called Vortex.

When measuring phosphorous, it is possible to improve sensitivity by measuring in a vacuum. However, the measurements performed here where performed in air because the phosphorous concentration of the electroless nickel plating was approximately 6 to 10 %, which can be measured in air.

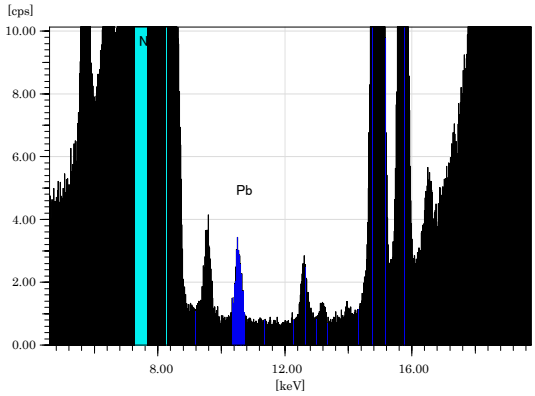
	SEA1200VX		SFT9500	
	Measurement condition 1	Measurement condition 2	Measurement condition 1	Measurement condition 2
Measurement time (seconds)	100	30	600	50
Collimator	φ8.0mm	φ8.0mm	φ0.1mm	φ0.1mm
Tube voltage (kv)	50	15	50	30
Tube current (μA)	580	108	1000	1000
Filter	For Pb	OFF	For Pb	OFF
Atmosphere	Air	Air	Air	Air

3. Results

The lead in the electroless nickel on iron and aluminum was repeatedly measured.

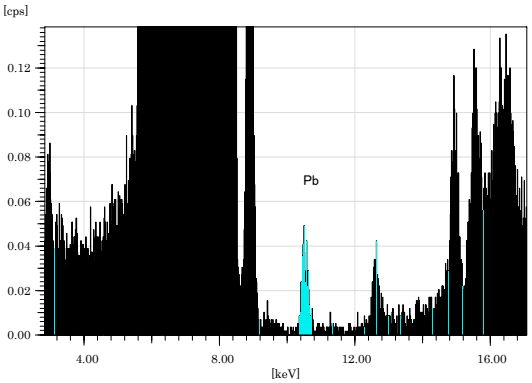
1) SEA1200VX

Lead in electroless nickel on aluminum

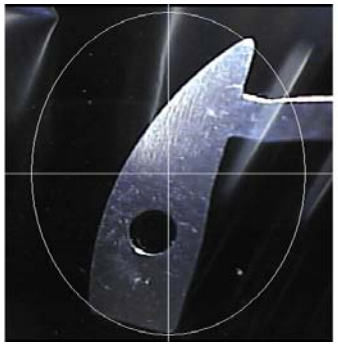


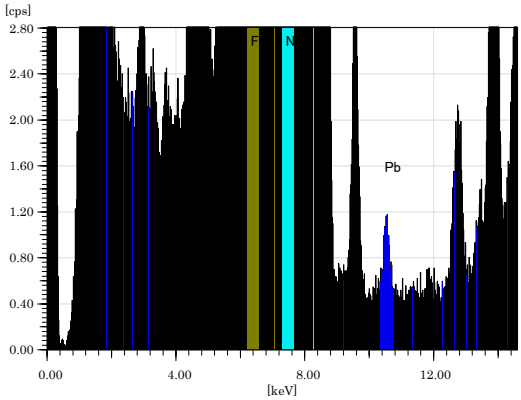
SEA1200VX		Avg.	Standard deviation	CV value (%)
Ni-P/Al	Thickness (μm)	11.5	0.083	0.72
	P (wt %)	10.3	0.247	2.4
	Pb (ppm)	290	19	6.7
Ni-P/Fe	Thickness (μm)	7.19	0.0036	0.50
	P (wt %)	13.5	0.128	0.94
	Pb (ppm)	269	3	1.23

2) SFT9500



Lead in electroless Ni on iron





SFT9500		Avg.	Standard deviation	CV value (%)
Ni-P/Al	Thickness (μm)	8.5	0.25	0.72
	P (wt %)	10.2	0.54	5.3
	Pb (ppm)	546	56	10.3.

4. Conclusion

Electroless nickel (nickel-phosphorus) plating is used as functional plating in many products. The SEA1200VX can quickly determine whether the plating is compliant with the RoHS directive. Furthermore, the SFT9500 can effectively measure the concentration of controlled substances in plating, as well as the thickness of the plating.