

Electroless Nickel Plating Thickness Measurement and Phosphorus Analysis using FT150

2015. 2

The properties of electroless nickel (nickel-phosphorus alloy) plating depend on the phosphorus content. It is therefore important to determine the phosphorus content in addition to the plating thickness.

A combination of optical system x-ray collecting optical system and a semiconductor detector is required to detect X-ray fluorescence from phosphorus in a microscopic region with high sensitivity in air. We developed the FT9500/FT9500X series to meet this demand. However, the FT150 series equipped with a new x-ray collecting m and an improved Vortex detector is capable of even higher-accuracy measurements.

Using the FT150, simultaneous measurements were performed of the plating thickness of electroless nickel on iron and on Cu, in addition to determination of the phosphorus content. The results were then compared with those for the FT9500X.



FT150 series

Measurement of the Plating Thickness of Electroless Nickel on Iron and on Cu, and the Phosphorus Content

Measurement Conditions

Table 1 FT150 measurement conditions

Tube voltage	45 kV
Primary filter	No
Measurement time	100 s
Measurement method	Thin Film FP
Analysis line	P K α , Ni K α , Cu K α

Samples and Method

1. Ni-P 11.29 μm (P: 9.1 wt%)/Cu standard material
2. Ni-P 10.96 μm (P: 9.8 wt%)/Fe standard material

Note: The above two samples are made by Hitachi High-Tech Science Corporation

The samples are registered as reference materials. Measurements are repeated 10 times.

Measurement results *

Measurements were repeated 10 times and the results for the Ni plating thickness and the phosphorus content obtained by the FT150 and the FT9500X were compared.

Table 2 Comparison of Ni plating thickness and P content

	Ni-P/Cu				Ni-P/Fe			
	FT150		FT9500X		FT150		FT9500X	
Element	Ni-P (μm)	P (wt%)	Ni-P (μm)	P (wt%)	Ni-P (μm)	P (wt%)	Ni-P (μm)	P (wt%)
Average	11.28	9.3	11.14	9.0	10.91	9.9	10.92	9.7
SD	0.09	0.21	0.14	0.37	0.05	0.17	0.082	0.28
RSD	0.8 %	2.3 %	1.3 %	4.1 %	0.4 %	1.8 %	0.8 %	2.9 %

The FT150 exhibited better sensitivity and higher repeatability than the FT9500X.

Spectra comparison

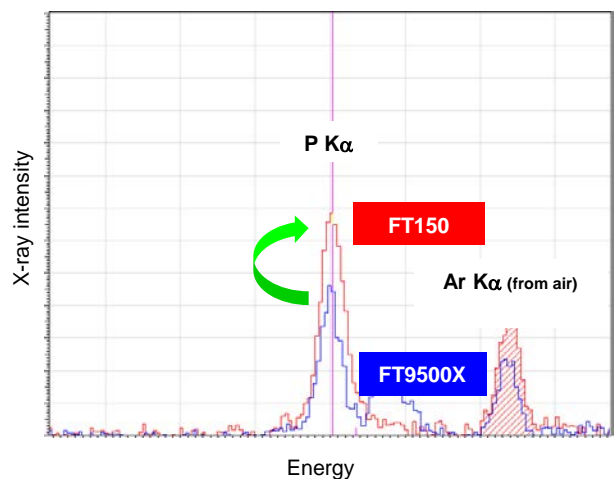


Figure 1 P K α line spectra for electroless nickel layer (superimposed after subtraction of background noise)

The FT150 obtained a higher X-ray intensity for the P K α line due to the improved X-ray detection mechanism.

It is therefore capable of highly accurate measurement of the phosphorus content.

* These are example measurements and do not guarantee the performance of the instrument.