Application Brief

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Alloy Composition Ratio Measurement Using the FP Method

1. Overview

SFT series machines have, up to now, used the Calibration Method as the main method of quantitative analysis. By using the calibration method in alloy composition ratio measurements the SFT could measure binary system alloys but not the alloy composition ratios of ternary system alloys.

Employing the FP Method as a new quantitative method has made possible composition ratio measurements of ternary system (and greater) multi element alloys while requiring the minimum number of standard samples.

In this experiment, identical samples were analyzed with the SEA5120 Micro XRF Element Monitor and SFT3300S Fluorescent X-ray Coating Analyzer and the results compared.

2. Measurement

As the number of elements increase as quantitative targets, for quantitative analysis based on the Calibration Method, the number of standard samples required in creating the calibration curve also increases. A minimum of 10 types of standard sample is required for measuring the composition ratio of three element alloys.

The FP Method performs semi-quantitative analysis by measuring the infinite thickness of each element. In other words, to measure a Sn-Ag-Cu ternary alloy, infinite thickness measurements of at least Sn, Ag, and Cu are required.

This time, measurements were performed based only on infinite thickness sample measurements. Accuracy can be improved by measuring a minimum one-point known density standard sample (One Standard Correction).

3. Sn-Ag-Cu Alloy Measurement

3-1 Measurement Conditions

Table 1 list measurement conditions and Figure 1 shows a comparison of spectra.

Table 1 Measurement Conditions

Instrument	SFT3300S	SEA5120
Measurement Time (sec)	10	300
Effective Time (sec)	9	271
Collimator	0.1 mm	0.1 mm
Excitation Voltage (kV)	45	50
Tube Current (uA)	1000	1000

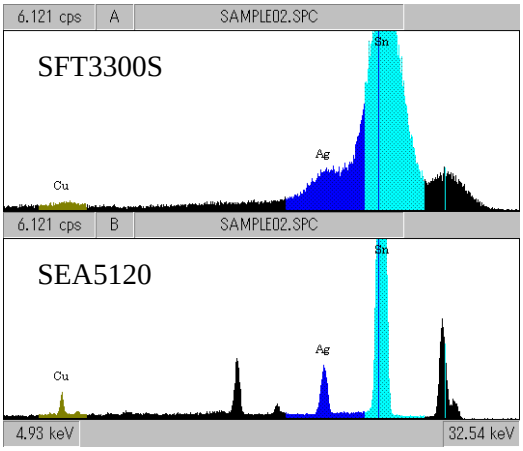

Figure 1 Comparison of Spectra

3-2 Measurement Results

Measurement results are shown in Table 2

Table 2 Comparison of Results

	SEA5120	Ave	Range	SD	Max	Min	CV (%)
Sn (%)	95.31	95.75	0.95	0.23	96.39	95.44	0.24
Ag (%)	3.62	3.51	0.64	0.19	3.77	3.13	5.32
Cu (%)	1.07	0.74	0.65	0.17	1.09	0.44	23.16

3-3. Remarks

Nearly the same results as the SEA5120 were obtained by the SFT3300S. The X-ray intensity of Cu is small therefore dispersion is large; however, measurement dispersion can be reduced 10% by performing 60 second measurements.

4. Sn-Pb-Ag Alloy Measurement

4-1 Measurement Conditions

Table 3 lists measurement conditions and Figure 2 shows a comparison of spectra.

Table 3 Measurement Conditions

Instrument	SFT3300S	SEA5120
Measurement Time (sec)	10	300
Effective Time (sec)	9	266
Collimator	0.1 mm	0.1 mm
Excitation Voltage (kV)	45	50
Tube Current (uA)	1000	1000

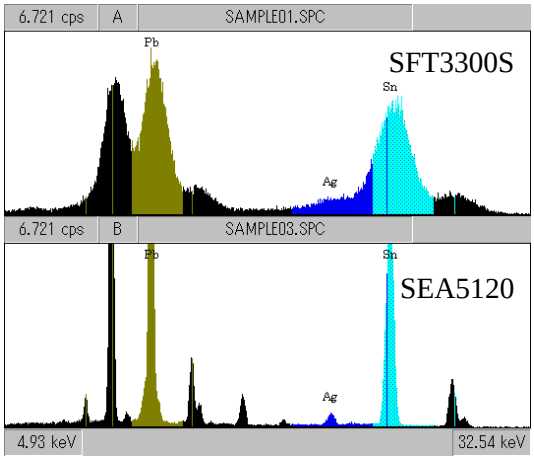

Figure 2 Comparison of Spectra

4-2 Measurement Results

Measurement results are shown in Table 4

Table 4 Comparison of Results

	SEA5120	Ave	Range	SD	Max	Min	CV (%)
Sn (%)	60.62	61.51	5.12	1.45	63.75	58.63	2.35
Ag (%)	1.75	2.18	1.13	0.33	2.81	1.68	14.99
Pb (%)	37.63	36.31	4.53	1.37	38.61	34.08	3.78

4-3. Remarks

Nearly the same results as the SEA5120 were obtained by the SFT3300S. The X-ray intensity of Ag is small therefore dispersion is large; however, measurement dispersion can be reduced 10% by performing 60 second measurements.