Application Brief

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SFT NO.20 OCT.2001

SFT3000S Measurement of Sn-Cu Coating II

1. Overview

Sn-Cu solder plating has been used recently as a lead free substitute for solders that contain lead. SFT Application Brief No. 19 introduced several points to be aware of when measuring Sn-Cu solder plating with the thin film calibration method and the SFT3000S. As a follow-up, this application brief explains several points to keep in mind when measuring Sn-Cu plating using the *new thin film FP method. This technique is valid for 42 Alloy base. (See Application Brief SFT No.11 for more about the thin film FP method.)

* Software version upgrade is required to use the new thin film FP method

2. Comparison between the conventional and new method

We compared the accuracy of the conventional thin film FP method with the new thin film FP method using 42 Alloy as the base. The results of our comparison are shown in the table below. The #2 standard sample was registered as a known sample and then measured for both the conventional thin film FP method and the new thin film FP method

Sn-Cu (um)	Standard Value (um)	Conventional	New
#1	4.9	5.01	5.05
#2	9.3	9.34	9.40
#3	14.1	11.26	14.24
Cu%	**Standard Value (%)**	**Conventional**	**New**
#1	2.8	5.97	2.81
#2	2.9	3.15	3.09
#3	2.9	2.32	2.89

Results widely differing from the standard value were obtained by the conventional method except when measuring #2 as the known sample. On the other hand, readings that match the standard values were obtained by the new method. The cause of this type of error by the conventional method is in the overlapping correction method with the base element. The new method improves accuracy by improving upon this point.

3. Repeat Evaluation

We compared the repeatability of the new thin film FP method with the thin film calibration method introduced in application brief no. 19. Results are shown in the table below. Results are the statistical readings of 10 repetitions. Both measurements use a 0.1mm collimator and are 60-second measurements.

		New Thin Film FP Method				Special Alloy Calibration Method			
um	**standard**	**ave**	**range**	**1 sigma**	**CV (%)**	**ave**	**range**	**1 sigma**	**CV (%)**
#1	4.90	5.78	0.08	0.03	0.46	4.88	0.23	0.07	1.40
#2	9.30	9.40	0.33	0.11	1.13	9.73	0.31	0.11	1.09
#3	14.10	13.63	2.76	0.84	6.13	14.24	0.62	0.19	1.30
um	**standard**	**ave**	**range**	**1 sigma**	**CV (%)**	**ave**	**range**	**1 sigma**	**CV (%)**
#1	2.8	2.81	0.68	0.18	6.37	2.91	0.47	0.17	6.00
#2	2.9	3.10	0.42	0.13	4.35	3.16	0.41	0.14	4.55
#3	2.9	2.82	0.33	0.10	3.72	3.02	0.31	0.11	3.81

These results show that the thin film FP method obtained results with less dispersion for thinner thicknesses, but the calibration curve method had less dispersion overall.

4. Accuracy Evaluation

We compared the accuracy of measuring samples in which Cu% changed, with the new thin film FP method and special alloy calibration curve method. Differences of trace amounts of Cu% were detected in both cases. The thin film FP method was superior is terms of dispersion for thinner sample thickness, but both methods displayed the same dispersion for Cu%.

		New Thin Film FP Method				Special Alloy Calibration Method			
um	**standard**	**ave**	**range**	**1 sigma**	**CV (%)**	**ave**	**range**	**1 sigma**	**CV (%)**
#1	5.05	5.06	0.05	0.02	0.26	5.52	0.35	0.11	2.02
#2	4.59	4.62	0.06	0.02	0.36	4.87	0.25	0.08	1.56
#3	4.73	4.83	0.08	0.03	0.51	5.03	0.23	0.08	1.65
um	**standard**	**ave**	**range**	**1 sigma**	**CV (%)**	**ave**	**range**	**1 sigma**	**CV (%)**
#1	1.82	1.95	0.51	0.15	7.48	1.96	0.46	0.16	7.98
#2	5.26	5.19	0.28	0.11	2.04	5.38	0.61	0.20	3.72
#3	9.00	8.96	0.58	0.20	2.49	8.78	0.43	0.13	1.43

5. Summary

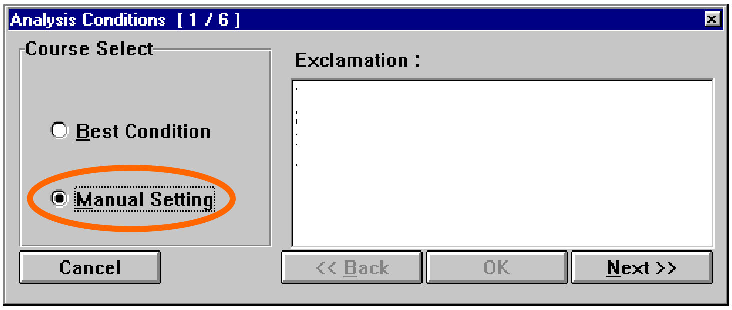
Our results showed both methods to be equal performance in measurement ability. However, advantages and disadvantages of each are summarized below.

	Advantage	**Disadvantage**
New Thin Film FP Method	Small number of standards (minimum of 5)	Upgrade is required
Special Alloy Calibration	Standard Function	Large number of standard samples (minimum of 9)

Supplement

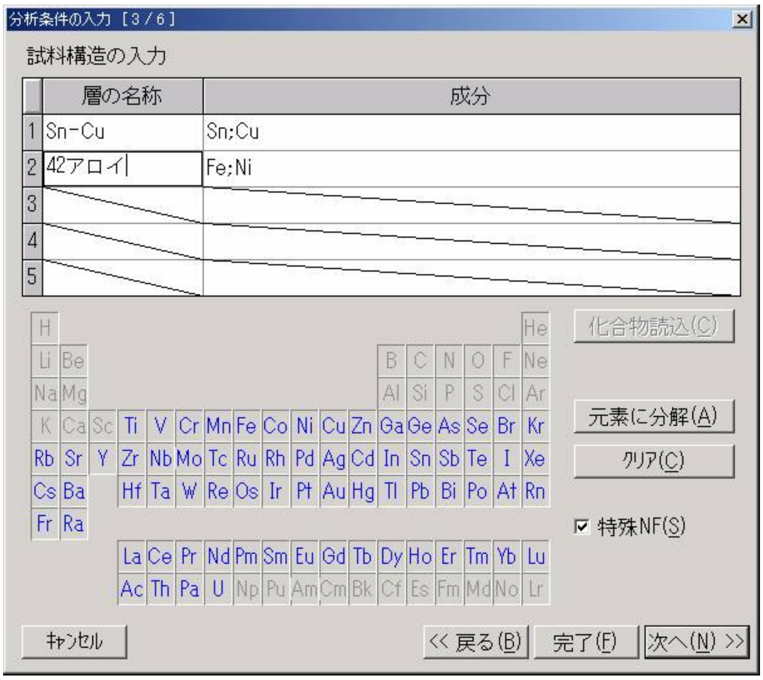
Procedure for creating analytical conditions with the new thin film FP method.
This shows the procedure for Sn-Cu plating measurements when the base is 42Alloy.

1. Click on the Analysis Conditions icon. In the first analysis conditions input screen select Manual then click on Next.

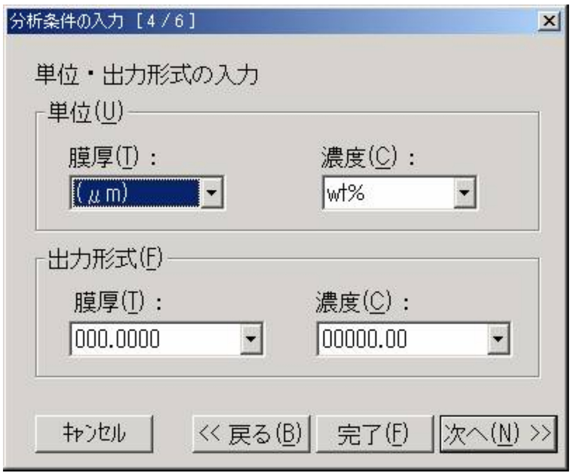


2. Select 2 layers and click on Next.

3. Input as shown below and select the special NF box then click on Next.

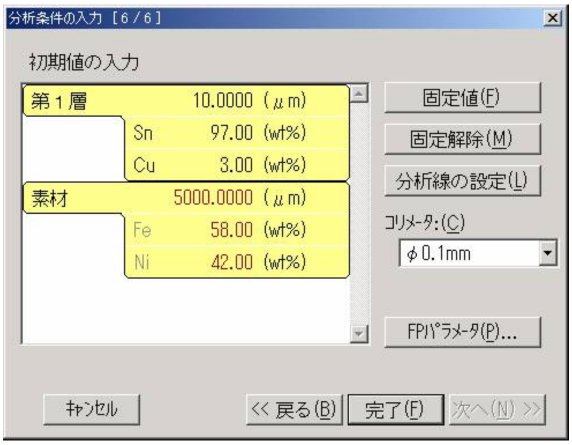


4. Select the units then click on Nest



5. Click on Next

6. First, input the target value (the thickness and Cu% that will actually be measured), then select the collimator. Click on Sn, and if it is highlighted click on the "Line" button, shown below in the red circle.



7. Input as shown in the window below and click on Next.

8. Input as shown in the window below and click on Next.

9. Input as shown in the window below and click on Next. Input as shown on the left when the thickness is less than 10 um and as on the right when the thickness is 10 um or greater.

10. Input as shown below, click on OK then click on End.

11. Select the standard sample input icon and input the standard samples to be registered in the window below. There are 4 default standards. New standard samples are input from standard no. 5. Registering too many standard samples can result in measurement error. One standard centered near the target or two standards near the upper limit and lower limit are enough. After inputting click on OK.

12. Including the items you just registered, numbers of the standard sample that should be measured are displayed as shown in the figure below. Exit after you have measured the concerned standards samples. Save the conditions. Default is Sn infinite in no. 1, Cu infinite in no. 2, Fe infinite in no. 3, Ni infinite in no. 4, and newly registered standard samples in and after no. 5.