HIRANUMA APPLICATION DATA	Automatic Titrator	Data No.	E7	Nov. 28, 2018
PLATING & ETCHING SOLUTION	**Determination of Tin (Sn^{2+}) in solder plating solution**			

1. Abstract

Tin (Sn^{2+}) in solder plating solution is determined by redox titration with iodine. Solder plating solution contains Sn (II) ions, Sn (IV) ions, and acids etc. Iodine works as oxidizing agent for stannous ion. Sn (II) ions are readily oxidized by oxygen in the air to be Sn (IV) ions. The measurement environment under carbon dioxide or nitrogen gas could provide reliable results.

$$Sn^{2+} + I_2 \rightarrow Sn^{4+} + 2I^-$$

This report introduces a measurement example that sample is added to solution under carbon dioxide gas generated by the decomposition of sodium hydrogen carbonate, and titrated with iodine titrant.

2. Configuration of instruments and reagents

(1) Configuration of instruments

Main unit : Hiranuma Automatic Titrator COM series

Electrodes : Platinum electrode PT-301

Reference electrode RE-201Z

*The following electrodes are also useable instead of the above electrode.

・PR-701BZ (Platinum reference electrode)

・Combination of PT-301 (Platinum electrode) and GR-501BZ (Glass-reference electrode)

(2) Reagent

Titrant : 0.05 mol/L Iodine standard solution

Additive solution : Diluted sulfuric acid

50 mL of sulfuric acid is gently added to 100 mL of DI water.

: 5 % Sodium hydrogen carbonate solution

Dissolve 25 g of sodium hydrogen carbonate in DI water and diluted to 500 mL.

3. Measurement procedure

(1) Take 30 mL of DI water into a 100 mL beaker.

(2) Add 5 mL of diluted sulfuric acid

(3) Carefully add 20 mL of 5 % sodium hydrogen carbonate solution because it foams vigorously.

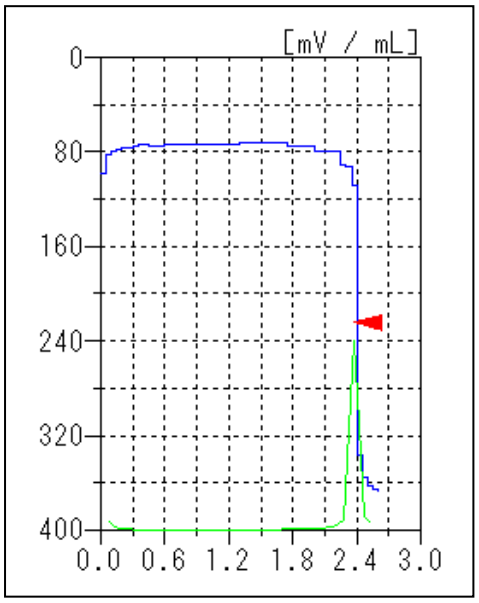
(4) Add 1 mL of sample into the beaker with volumetric pipette.

(5) Immerse electrodes to start titration with 0.05 mol/L iodine standard solution.

4. Measurement conditions and results

Example of titration condition

Cndt No.	1							
Method	Auto		ConstantNo.	1		Mode No.	5	
Buret No.	1		Size	1.0000	mL	Pre Int	0	sec
Amp No.	2		Blank	0.0000	mL	Del K	5	
D. Unit	mV		Molarity	0.05	mol/L	Del Sens	0	mV
S-Timer	5	sec	Factor	1.007		Int Time	3	sec
C.P. mL	0	mL	K	118.7		Int Sens	3	mV
D.P. mL	0.1	mL	L	0.000		Brt Speed	2	
End Sens	300		Unit	g/L		Pulse	40	
Over mL	0.3	mL	Formula				0.05	mL
Max.Vol.	20	mL		(D-B)*K*F*M/S				
			Digits	3				
			Auto In Pram.	None				



Example of titration curve

Measurement results

Number of Measurement	Size (mL)	Titrant Volume (mL)	Sn (II) ion Concentration (g/L)
1	1	2.376	14.200
2	1	2.405	14.374
3	1	2.376	14.200
Statistic calculation		Avg.	**14.3 g/L**
		SD	0.1005 g/L
		RSD	0.70 %

5. Note

The following tips could improve measurement accuracy.

(1) Influence on air oxidation of Sn (II) ion

This titration should be performed under anaerobic environment because Sn (II) ions are readily oxidized by oxygen in the air and its concentration is decreased. The carbon dioxide generated by the decomposition of sodium hydrogen carbonate prevented the oxidation of Sn (II) ions in this report.

(2) Influence of interfering component

Solder plating solution contains Sn (IV) ions and acids etc. These components don't interfere the measurement of Sn (II) ion. However, the reducing agents such as sodium thiosulfate and sodium sulfite react with iodine, it causes positive error.

Keywords: Solder plating solution, Sn (II) ion, Iodine, Redox titration

Some measurement would not be possible depending on optional configuration of system.

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