

Sheet No.

**GT200-PS018**

## Sn<sup>2+</sup> Analysis of Tin Plating Solution 1/3

Method : Oxidation-reduction titration  
 Apparatus : Automatic Titrator GT-200  
           Electrode: Double junction reference electrode, platinum detection electrode  
           Reference electrode inner solution: 1 mol/L potassium chloride solution  
           Reference electrode outer solution: 1 mol/L potassium nitrate solution  
 Titration mode : INF, Detection: mV  
 Related standard : Plating Textbook, Nikkan Kogyo Shimbun, Ltd.  
                   Quantitative analysis: experiments and calculations, Kyoritsu Shuppan Co., Ltd.

\*This sheet is provided as information. It is not to guarantee the analysis values. Please use under the ideal conditions considering external factors including the analysis environment and properties of the sample.

### Outline

For its low toxicity and resistance to various organic acids, tin is used for plating tablewares, pots, clothing buttons, etc. Good quality tin plating requires controlling the Sn<sup>2+</sup> concentration in the bath. Sn<sup>2+</sup> of tin plating solution is measured by oxidation-reduction titration using platinum detection electrode.

### Reagents

[Titrant]

■0.05 mol/L iodine solution (for volumetric analysis)

[Reagents]

■Hydrochloric acid (1+1): Add 250 ml of hydrochloric acid to 250 ml of pure water little by little (prepare inside a draft chamber)

■Sodium hydrogen carbonate (special grade)

### Analytical Procedure

- (1) Place 50 ml of pure water into a 100-ml beaker.
- (2) Add 10 ml of hydrochloric acid (1+1) into the beaker using a Komagome pipette.
- (3) Add 5g of sodium hydrogen carbonate little by little using spatula etc. (Add carefully as bubbling occurs.)
- (4) Add 2 ml of sample into the beaker using a volumetric pipette. (Add carefully as bubbling occurs.)
- (5) Titrate using 0.05 mol/L iodine solution.

[Equation]

**Sn<sup>2+</sup> ( g / L ) = ( A1 – BL ) × M × E × f × FW / S × R (using fixed equation)**

A1 : Titer of 0.05 mol/L iodine solution to the end point (ml)

BL : 0

M : Molarity of 0.05 mol/L iodine solution

E : Valence of 0.05 mol/L iodine solution (2)

f : Factor of 0.05 mol/L iodine solution (0.997)

FW : Atomic weight of Sn (118.710)

R : Dilution rate (1)

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### Other Requirements

- Handle measurement reagents with care after reading through and understanding their labels and safety data sheets.
- Wear personal protective equipment such as protective goggles and gloves when handling the reagents.

### Measurement Results

	Sample amount	Titer (ml)	Measurement value (g/L)
1	2	5.2256	30.9
2		5.2030	30.8
3		5.2010	30.8

Number of data	(n)	3
Average		30.8
Standard deviation	(SD)	0.0809
Relative standard deviation	(RSD%)	0.2622

Sn<sup>2+</sup> of tin plating solution was measured using GT-200. Average over 3 measurements was 30.8 g/L. Relative standard deviation (RSD%) was 0.26%, exhibiting measurement with relatively high reproducibility.

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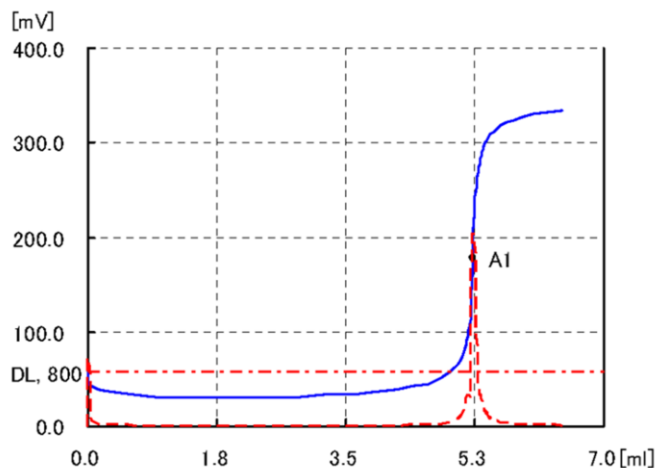
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ID No.: 92

Measurement date: 2013/10/03 15:48  
 Sample name : Sn plating solution

Measurement type : Sample Titr  
 Sample size (S) : 2 [ml]



C1: 30.924 [g/l]

A1: 5.2256 [ml] 178 [mV]

Pi : 65.9 [mV]  
 Start : 0 [ml] 65.9 [mV]  
 End : 6.442 [ml] 335 [mV] Time: 9' 12"

Run File No. : 21  
 Titration File No.: 9 Tin plating/Sn2+  
 Mode : INF End1 End1 Width: 200 [mV] ± 500 [mV]  
 Detect : mV1  
 BRT No. : 1  
 Reagent : 13  
 WTint : 0 [sec]  
 Vup : 200 [ul]  
 Vlow : 10 [ul]  
 dE : 3 [mV]  
 dT : 5 [sec]  
 DL : 800 [mV/ml]  
 DetCnt : 6 C1: (A1-BL)\*M\*E\*\*FW/S\*R  
 Vmax : 30 [ml]  
 Vover : 1 [ml] [g/l]

Reag : I2 E : 2 M : 0.05 [Mol/l]  
 f : 0.997  
 FW : 118.71 R : 1

Buret Injection Speed: 500 [ul/sec]