

Sheet No.

**GT200-PS016**

## Chloride Analysis of Nickel Plating Solution — 2/3

Method : Precipitation titration  
 Apparatus : Automatic Titrator GT-200  
           Electrode: Double junction reference electrode, silver 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.

\*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

Nickel plating solution is used for various products mainly as first plating. Since the concentration of bath components constantly varies, chlorides in nickel plating solution needs to be analyzed at least once per week to maintain within the appropriate concentration ranges. Measurement of chlorides in nickel plating solution is carried out by precipitation titration using silver detection electrode.

### Reagents

[ Titrant ]

■0.1 mol/L silver nitrate solution ( for volumetric analysis )

[ Reagents ]

■Sodium hydrogen carbonate (special grade)

### Analytical Procedure

- (1) Place 5 ml of sample into a 100-ml beaker using a volumetric pipette.
- (2) Add about 50 ml of pure water.
- (3) Add 2g of sodium hydrogen carbonate little by little using spatula etc.  
(Add carefully as bubbling occurs.)
- (4) Titrate using 0.1 mol/L silver nitrate solution.

[Equation]

**Chlorinity ( g/L ) = ( A1 - BL ) × M × E × f × FW / S × R (using fixed equation)**

A1 : Titer of 0.1 mol/L silver nitrate solution to the end point (ml)

BL : 0

M : Molarity of 0.1 mol/L silver nitrate solution

E : Valence of 0.1 mol/L silver nitrate solution (1)

f : Factor of 0.1 mol/L silver nitrate solution (0.999)

FW : Atomic weight of chlorine (35.453)

R : Dilution rate (1)

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### Other Requirements

- Set the initial buret suction position to 50%.
- Carry out replacement of inner/outer solutions of the reference electrode and polishing of the silver detection electrode prior to measurement.
- 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	5	20.2579	14.4
2		20.2397	14.3
3		20.2437	14.3

Number of data (n) 3  
 Average 14.3  
 Standard deviation (SD) 0.0068  
 Relative standard deviation (RSD%) 0.0472

Chlorides of nickel plating solution was measured using GT-200. Average over 3 measurements was 14.3 g/L. Relative standard deviation (RSD%) was 0.05%, exhibiting measurement with relatively high reproducibility.

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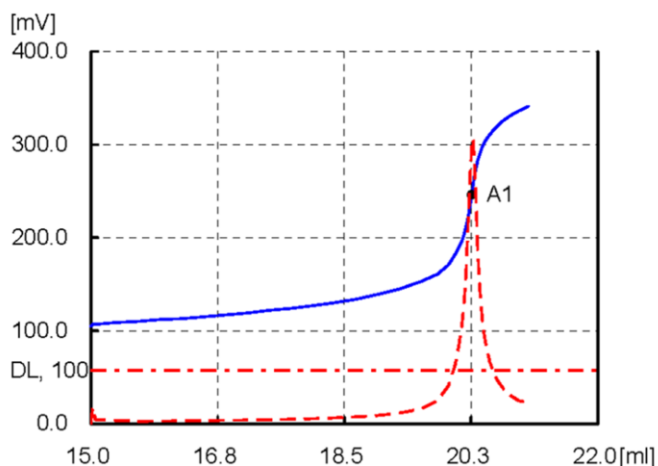
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ID No.: 43

Measurement date : 2013/09/12 10:40  
 Sample name : Ni plating solution

Measurement type : Sample Titr  
 Sample size (S) : 5 [ml]



C1: 14.35 [g/l]

A1: 20.2579 [ml] 246 [mV]

Pi : 74.4 [mV]  
 Start : 15 [ml] 105 [mV]  
 End : 21.038 [ml] 341 [mV] Time: 5' 54"

Run File No.: 21

Titration File No.: 6 Ni plating/chloride

Mode : INF End1 End1 Width: 350 [mV] ± 200 [mV]

Detect : mV1

BRT No. : 1 Preset 1 Mode: V BRT: 1

Reagent : 5 Vol: 15 [ml]

WTint : 0 [sec]

Vup : 300 [ul]

Vlow : 20 [ul]

dE : 2 [mV]

dT : 3 [sec]

DL : 100 [mV/ml]

DetCnt : 10

Vmax : 30 [ml] C1: (A1-BL)\*M\*E\*\*FW/S\*R

Vover : 0.5 [ml] [g/l]

Reag : 0.1M AgNO3 E : 1 M : 0.1 [Mol/l]

f : 0.999 K1 :

FW : a35.453 R : 1

Buret Injection Speed: 500 [ul/sec]