



Analysis of thallium in gold plating solution (flame method)

Because of its excellent corrosion resistance, conductivity and other properties, gold plating is frequently used in electronics and mobile telephones, as well as in jewelry, etc. Thallium (TI) is sometimes added to gold plating solution as a crystal regulator to obtain stable precipitates in the solution for bonding use. Stable quality can be maintained by controlling the TI concentration in the plating solution. ZA3000, which features the polarized Zeeman background correction method, can make precise quantitative determinations that correct for background without being affected by materials coexisting in the plating solution.



Model ZA3000 Atomic Absorption Spectrophotometer

Analysis of TI in gold plating solution

- ✓ Plating solution was measured.
- ✓ A reference solution was prepared by diluting a standard solution made by Kanto Chemical Co., Inc. with 0.1% nitric acid.
- ✓ 1 mg/L thallium was added to the plating solution. Good results of 104% and 105% were obtained from recovery testing.

Measurement conditions

Table 1 - TI equipment conditions

| Element | TI | Atomizer | STD Burner |
|--------------|----------|---------------------------------------|-------------------------------------|
| Instrument | ZA3000 | Flame | Air - C ₂ H ₂ |
| Atomization | Flame | Fuel (C ₂ H ₂) | 2.0 L/min |
| Wavelength | 276.8 nm | Oxidant (Air) | 160 kPa |
| Lamp Current | 6.0 mA | | 15.0 L/min |
| Slit Width | 1.3 nm | Burner Height | 7.5 mm |

Table 2 - TI measurement conditions

| Meas. Mode | Working Curve |
|------------------|---------------|
| Signal Mode | BKG Corrected |
| Curve Order | Linear |
| Calculation | Integration |
| Time Constant | 5.0 s |
| Calculation Time | 5.0 s |
| Delay Time | 5 s |

Measurement results

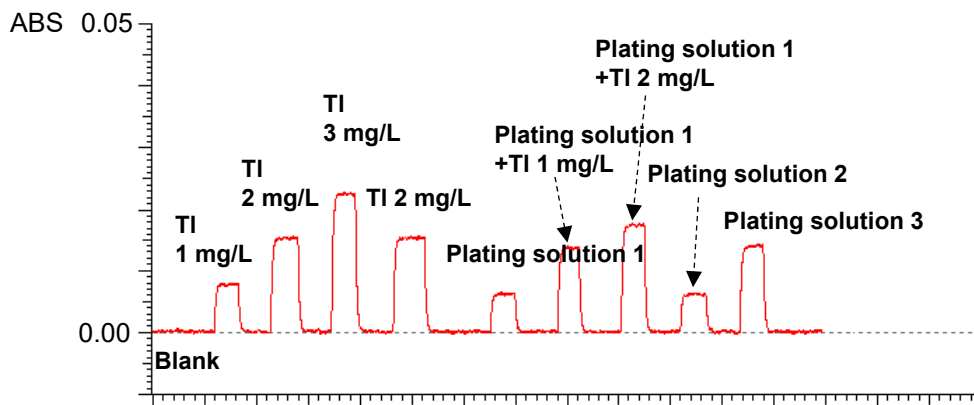


Figure 1 - TI atomic absorption signal profile

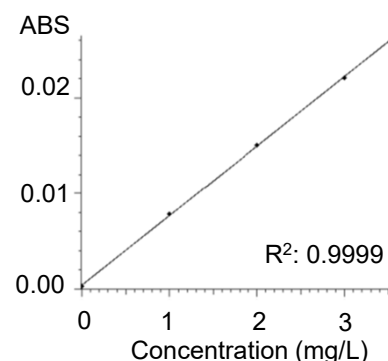


Figure 2 - TI calibration curve

Table 3 - Concentration and absorbance of each sample

| ID | Sample name | Concentration (mg/L) | Absorbance |
|-------|--------------------------------|----------------------|------------|
| STD 1 | Blank | 0.00 | 0.0003 |
| STD 2 | TI 1 mg/L | 1.00 | 0.0078 |
| STD 3 | TI 2 mg/L | 2.00 | 0.0151 |
| STD 4 | TI 3 mg/L | 3.00 | 0.0221 |
| UNK 1 | TI 2 mg/L | 2.01 | 0.0150 |
| UNK 2 | Plating solution 1 | 0.82 | 0.0064 |
| UNK 3 | Plating solution 1 + TI 1 mg/L | 1.87 | 0.0140 |
| UNK 4 | Plating solution 1 + TI 2 mg/L | 2.89 | 0.0214 |
| UNK 5 | Plating solution 2 | 0.82 | 0.0064 |
| UNK 6 | Plating solution 3 | 1.91 | 0.0143 |

Table 4 - Measurement results of TI in plating solution

| Sample name | Measurement result (mg/L) | Recovery rate |
|--------------------------------|---------------------------|---------------|
| TI 2 mg/L | 2.01 | — |
| Plating solution 1 | 0.82 | — |
| Plating solution 1 + TI 1 mg/L | 1.87 | 105% |
| Plating solution 1 + TI 2 mg/L | 2.89 | 104% |
| Plating solution 2 | 0.82 | — |
| Plating solution 3 | 1.91 | — |

[KEY WORDS]

material/fabricated material, industrial chemicals, plating solution, thallium, TI, AA, ZA3000, flame, material

