



CUBRITE HT250

ACID COPPER PLATING PROCESS

INTRODUCTION

Cubrite HT250 Acid Copper Plating Process is a non-dye, high throw system designed for both decorative and functional applications. The three additive system ensures excellent throwing power and levelling properties, HT 250 can also be used for PCB applications where high throw and high aspect ratio functions are required.

BENEFITS

- Exceptional distribution and throwing power
- Low stress ductile deposits.
- Wide current density range
- Excellent levelling properties

OPERATING DATA

Copper sulphate (g/L)	58 - 62
Sulphuric acid (g/L)	240 - 280
Chloride (ppm)	48 - 52
Cubrite HT250 Brightener (ml/L)	0.5 – 0.9
Cubrite HT250 Leveller (ml/L)	1.5 – 1.9
Cubrite HT250 Wetter (ml/L)	5.0 – 15.0
Cathode current density ASD (ASF)	1.0 – 2.0(10 – 20)
Anode current density ASD (ASF)	0.5 – 2.5 (5 – 25)
Temperature (°C)	20 – 27 (optimum 24)

EQUIPMENT

Tanks	Steel or GRP lined with PVC, polypropylene or hard rubber.
Anodes	0.03 - 0.08% Phosphorised copper with titanium hooks. Copper slugs of about 50 mm diameter in titanium anode baskets are a recommended alternative. Polypropylene woven anode bags which have been thoroughly leached in hot water should be used.
Heaters	PTFE or titanium clad electric immersion heaters.
Cooling	May be required in high throughput tanks. Use chilled water running through titanium tubes or wide-bore PTFE coils. Under no circumstances should cooling coils be attached to mains water supplies.



Filtration	Continuous filtration with a flow rate of two complete volume turnovers per hour. Plate or cartridge filters can be used with 1 to 5 micron filter papers or wound polypropylene cartridges providing they are guaranteed free of winding lubricant and thoroughly leached before use.
Agitation	Use an air blower to supply oil free air, distributed via plastic agitation pipes. Cathode bar movement, stroke length 20-40mm at 10 Strokes/min For high aspect ratio boards with small holes flight bar vibration is recommended to avoid air bubbles.
Extraction	Required.

INSTALLATION

1. Clean the tank and half fill with deionised water.
2. Slowly add the sulphuric acid while stirring continuously or using mild air agitation. Wear safety goggles and protective clothing. Solution will get warm; allow to cool to 25 deg C.
3. Add the required volume of Procirc 9790 Copper Concentrate and mix thoroughly. (9790 contains 250g/L Copper sulphate).
4. Add either 0.12ml/L 36% hydrochloric acid or 82mg/L sodium chloride.
5. Make up to volume with deionised water.
6. Clean anodes and lightly microetch before placing in bath.
7. Electrolyse the solution at 1ASD until the anodes are coated in a uniform black film.
8. Add 3ml/L Cubrite HT250 Leveller, 2ml/L Cubrite HT250 Brightener and 5ml/L Cubrite HT250 Wetter.
9. Electrolyse for a further 1 hour at 1ASD and then 2ASD to 2Ahr/L
10. Check additives by hull cell tests.
11. Start production.



MAINTENANCE AND CONTROL

The solution should be analysed regularly, and replenished as necessary (see analysis method)

The Cubrite HT250 Brightener, Leveller and Wetter are maintained on an ampere hour basis. This will vary depending on the operating conditions e.g. anode area, temperature etc, as a general guide replenishment will be as follows:

Cubrite HT250 Brightener	200 – 400ml/1000Ah
Cubrite HT250 Leveller	200 – 400ml/1000Ah
Cubrite HT250 Wetter	80 – 100ml/1000Ah

Leveller and Brightener must not be mixed together.

Brightener controls grain refinement and brightness in the mid to high CD range.

Leveller controls grain refinement and brightness in the mid to low CD range.

Wetter controls burning in the high CD region and increases the throwing power.

ANALYSIS METHODS

1. Determination of Free Sulphuric Acid

Reagents

1.0N sodium hydroxide (Standard Volumetric Solution)

Method

1. Pipette 5 ml of plating solution into a 450 ml Conical flask
2. Add 150 ml of deionised water.
3. Titrate with 1N sodium hydroxide solution until the first signs of permanent turbidity.
4. Record titre = t mls

Calculation

$t \times 9.8 = \text{g/L sulphuric acid.}$

Replenishment

For every 1g/L sulphuric acid required add 0.57 ml/L conc sulphuric acid.



2. Determination of Copper Content

Reagents

0.1M (0.2N) EDTA (Standard Volumetric Solution)
Ammonium chloride / ammonia buffer solution (54g/L ammonium chloride, 350ml/L ammonium hydroxide).
PAR indicator

Method

1. Pipette 5 ml of the plating solution into a 250 ml conical flask.
2. Add 100 ml D.I. water
3. Add 20ml buffer.
4. Add 2-3 drops of PAR indicator and titrate with 0.1M EDTA to a green end point.
5. Record titre = t mls

Calculation

$t \times 1.27 = \text{g/L Copper}$
 $t \times 4.98 = \text{g/L Copper sulphate}$

Replenishment

For every 5 g/L of copper sulphate required add 20mls/L Procirc 9790 Copper concentrate.

3. Determination of Chloride Ion Concentration

Reagents

50% v/v nitric acid.
0.1N Silver Nitrate (Standard Volumetric solution)
0.01N Mercuric nitrate. (Dissolve exactly 1.083 g mercuric oxide in 5 ml of 50% nitric acid and dilute to 1 litre. This solution need not be standardised.

Method

1. Pipette 50 ml of plating solution into a 250 ml beaker.
2. Add 30 ml of DI water and 20ml of 50% nitric acid.
3. Add enough 0.1N silver nitrate to produce turbidity (usually 3 drops).
4. Immediately titrate with 0.01N mercuric nitrate by dropwise additions with constant stirring until the turbidity just clears.
5. Record titre = t mls

Calculation

$t \times 7.1 = \text{ppm chloride ion.}$



Replenishment

For every 10 ppm chloride required add 0.024ml/L 36% (SG 1.18) hydrochloric acid or 16mg/L sodium chloride.

TROUBLE SHOOTING

Problem	Cause
Anodes grey	High chloride. Low temperature
Anodes red	Incorrect anode material
Anodes brown	Low copper in solution. High acid. Low temperature. High anode CD. High additive concentration
Step plating Tails around holes Treeing Shadows around holes	Low chloride High wetter
Patchy deposit Step plate Brittleness Tails around holes	Organic contamination
Hazy deposit in LCD Poor brightness Poor levelling Grainy deposit	High chloride Low Brightener
Excessive HCD burning with bright LCD	Low copper level High acid Excessive cathodic CD Low temperature High Brightener Low Wetter
Hazy deposit in LCD High voltage	High copper level Low acid Low anode area Blocked anode bags Poor electrical contact
Overall hazy deposit	High temperature

DISPOSAL

Dispose of in accordance with local authority requirements.

PRODUCT FAMILIES

The following products are referred to in this data sheet.

PRODUCT NAME	PRODUCT NUMBER
Procirc 9790 acid copper Concentrate	977009
Cubrite HT250 Brightener	567033
Cubrite HT250 Leveller	567034
Cubrite HT250 Wetter	567035

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