PROCIRC CB6900

ACID COPPER PLATING PROCESS

INTRODUCTION

Procirc 6900 Acid Copper Plating Process produces excellent levelling and throwing power. It is formulated to cope with most types of printed circuit board plating.

BENEFITS

- Exceptional distribution of deposit.
- Low stress ductile deposits.
- Wide current density range.

OPERATING DATA

Copper	17 – 20g/L
Sulphuric Acid	180 – 220g/L
Chloride	40 – 60 ppm
Temperature	25 – 30° C
Cathode CD	0.7 – 3.5 A/dm²
Anode CD	0.3 – 1.8 A/dm²
Anode: Cathode Ratio	2:1 – 1:1
Plating Rate	26µm/hr at 2 A/dm²

EQUIPMENT

All acid copper processes are extremely corrosive to equipment, therefore all vulnerable items such as dosing pumps and electronic controls should be protected in plastic cases or sealed cabinets. Structural frameworks should be coated in plastic or other suitable anti-corrosion finishes.
Cleanliness and regular maintenance are essential.

Tanks	Steel or GRP lined with PVC, polypropylene or hard rubber.
Anodes	0.03 - 0.08% Phosphorised copper with titanium hooks. Copper pieces or slugs of about 50 mm diameter in titanium anode baskets are a recommended alternative. Polypropylene or Terelyene woven anode bags which have been thoroughly leached in hot water should be used. Anode area should be adjusted to provide an anode current density with a minimum of 0.3 A/dm2 and a maximum of 1.8 A/dm2.
Heaters	PTFE or titanium 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 PMD 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

A. From Procirc 9712 Electrolyte Base

Procirc 9712 Electrolyte Base	100%
Sodium Chloride	82mg/L **or**
Hydrochloric acid (SG 1.18)	0.12ml/L
Procirc CB6900 Brightener	7.5ml/L

1. Fill a clean tank with the Procirc 9712 Electrolyte Base.
2. Add sodium chloride.
3. Electrolyse the solution at approximately 1 A/dm² using scrap laminate. Check the anodes to ensure that they have developed a chocolate brown or black film.
4. Add CB6900 Brightener. Mix thoroughly and heat to operating temperature. Electrolyse for a further 30 minutes. Apply vigorous air agitation and start plating.

B. From Procirc 9790 Acid Copper Concentrate

Deionised Water	500 ml/L
Sulphuric Acid (Pure S.G. 1.84)	100 ml/L
Procirc 9790 Acid Copper Concentrate	280 ml/L
Sodium Chloride	82mg/L
Procirc CB6900 Brightener	7.5ml/L
Deionised Water	to volume

1. Clean the tank and half fill with deionised water.
2. Slowly add the sulphuric acid while continuously or using mild air agitation. Wear safety goggles and protective clothing. Solution will get warm; allow to cool to 25°C.
3. Add the Procirc 9790 Concentrate and mix thoroughly.
4. Add the sodium chloride.
5. Clean the anodes by scrubbing or wash in detergent. Rinse thoroughly. Place in clean, leached anode bags and place in tank.
6. Electrolyse the solution as described in Paragraph A(3). Check the anodes to ensure that they have developed a chocolate-brown or black film.
7. Add the Procirc CB6900 Brightener and continue to electrolyse for a further 30 minutes.
8. Make up to working volume with deionised water.

MAINTENANCE AND CONTROL

The solution should be analysed regularly, and replenished as necessary (see analysis method)
The Procirc CB6900 Brightener is maintained on an ampere hour basis.
This will vary depending on the operating conditions e.g. anodic area, temperature etc, but as a general guide 250-350ml/1000 Ahr recommended.

NOTES

ANODE C.D.

Excessive anode area will result in high CB6900 Brightener consumption and reduced throwing power (board to board). Baskets should be of narrow section (e.g. 30 x 150 mm) and copper pieces should be 50 mm diameter minimum.

CHLORIDE

The optimum chloride concentration is 40 – 60 ppm. . Above 80 ppm polarisation of the anodes may occur. Below 30 ppm may cause step plating

CB6900 BRIGHTENER

Excess brightener gives reduced throwing power. Low brightener will give semi bright deposits.

ANALYSIS METHOD

1. Determination of Free Sulphuric Acid

Reagents

1.0N sodium hydroxide (Standard Volumetric solution)

Method

1. Pipette 10 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 are apparent in the liquid.
4. Record titre = t mls

Calculation

t x 4.9 = 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)
0.5% Alizarin Complexone in 1% ammonium acetate.
Sodium acetate/acetic acid buffer solution - pH 4.3 (105 g and 100 ml respectively in 1 litre).

Method

1. Pippette 2 ml of the plating solution into a 250 ml conical flask.
2. Add 100 ml D.I. water
3. Add sufficient buffer to turn the solution to a light bluish-green colour.
4. Add 8 drops of the Alizarin indicator and titrate with 0.1M EDTA to a green end point.

Calculation

t x 3.177 = g/L copper

Replenishment

For every 1 g/L of copper required add 16 mls/L Procirc 9790 Copper concentrate or 3.9 g/l copper sulphate.

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 x 7.1 = ppm chloride ion.

Replenishment

For every 10 ppm chloride required add 0.024ml/L conc (SG 1.18) hydrochloric acid.

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 9712 Electrolyte Base	977013
Procirc 9790 Acid Copper Concentrate	977009
Procirc CB6900 Brightener	977006

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