



CIRCUM-BRITE PPR-2000

Bright Copper Pulse Plating Process

INTRODUCTION

CIRCUM-BRITE PPR-2000 is a form of pulse copper plating, it can provide a uniform fine copper distribution with excellent deposit ductility. CIRCUM-BRITE PPR-2000 can effectively reduce the plating time, as improve the uniformity of the deposit thickness on surface and the via wall. It is especially suitable for the use in high-aspect ratio PCB.

BENEFITS

- Excellent deposit ductility
- Reduces plating time
- Suitable for use in high-aspect ratio PCB

SOLUTION MAKE UP

Components	Standard
Copper Sulphate	75g/l
Sulphuric Acid 96%	120ml/l
Circum-Brite PPR-2000 Make-Up	13ml/l
Circum-Brite PPR-2000 Brightener	0.5ml/l
Circum-Brite RTR-2000 Starter	2.5ml/l

Before makeup, leach the tank with 10% sulphuric acid for 8 hours, then rinse clean with DI water. Copper nuggets must be soaked to pink colour by sulphuric acid or hydrogen peroxide.

1. Fill with DI water to 1/2 volume of the tank.
2. Add copper sulphate and sulphuric acid in order, with air blow and agitation.
3. Fill with DI water to working volume.
4. Analyse the concentration of copper sulphate, sulphuric acid and chloride ion, adjust to working concentration if needed.
5. Add the required amount of hydrochloric acid. (Note: Analyse the current concentration before adding as the water for dilution may contain chloride ion.)
6. Add CIRCUM-BRITE PPR-2000 Makeup, CIRCUM-BRITE PPR-2000 Brightener and CIRCUM-BRITE PPR-2000 Starter.
7. Plate out for 12Ah/L. Add 400ml/1000Ah CIRCUM-BRITE PPR-2000 Wetter and 200ml/1000Ah CIRCUM-BRITE PPR-2000 Brightener during plate out.
8. Electrolyze to 25Ah/L, then analyse the concentration of copper sulphate, sulphuric acid and chloride ion, adjust to working standard if needed.



OPERATING DATA

Bath composition and working parameters	Standard	Range
Copper Sulphate	75 g/l	50-85 g/l
Sulphuric Acid	210 g/l	190-270 g/l
Chloride Ion	80 ppm	60-90 ppm
CIRCUM-BRITE PPR-2000 Wetter	13 ml/l	10-20 ml/l
CIRCUM-BRITE PPR-2000 Brightener	0.35 ml/l	0.25-0.5 ml/l
Pulse Anode Current Density	+ : 3.5 ASD - : 9.0 ASD	+ : 1.5-5.0 ASD - : 1.5-20.0 ASD
Pulse Circulation Time	+ : 20 mins - : 1.0 mins	+ : 4-100 mins - : 0.25-5 mins
Anode Current Density	1.5 ASD	0.5-2.5 ASD
Temperature	26°C	24-28°C
Agitation	Air or mechanical movement	

EQUIPMENT

Tanks	Soft steel tank with liner, PP or authorized synthetic plastic
Heaters	Titanium or tantalum with thermostatic control
Agitation	Air agitation is by low pressure oil-free blower, do not use the compressed air. For every 18" solution depth, requires 1CFM/ft (1 psi).
Filtration	Solution flow rate : 2-3cycles/hr 5-10um cartridge
Anodes	Phosphorus copper contains 0.04-0.06% phosphorus in titanium baskets. PP anode bags are required. The length of anode should be 6" shorter than work parts.

FUNCTIONS OF ADDITIVES

CIRCUM-BRITE PPR-2000 Makeup

Makeup contains wetting function, use together with CIRCUM-BRITE PPR-2000 Brightener. Under normal operation, CIRCUM-BRITE PPR-2000 Makeup is only used at bath makeup or after carbon treatment.

CIRCUM-BRITE PPR-2000 Brightener

Provides fine grained deposit and minimizes the burn at HCD. Consumption rate: 75-200ml/1000Ah.
Note: High temperature (>28°C) will consume more brightener.



CIRCUM-BRITE PPR-2000 Wetter

Provides wetting function, use together with CIRCUM-BRITE PPR-2000 Brightener. Consumption rate: 150-200ml/1000Ah.

CIRCUM-BRITE PPR-2000 Starter

To minimize the oxidation of additives, only used at makeup or guided by technician.

*For new bath makeup, the consumption rate of CIRCUM-BRITE PPR-2000 Brightener and CIRCUM-BRITE PPR-2000 Wetter maybe higher.

TROUBLE SHOOTING

Anode

The colour for a normal anode film is uniform black, and light black or dark grey at the back

Problems	Reasons
Grey Colour	High chloride ion concentration Low solution temperature
Red Colour	Incorrect anode grade.
Brown Colour	Low copper concentration or high sulphuric acid concentration Low solution temperature High anode current density or small anode area Excessive brightener

Deposit Status

Problems	Reasons
Forms stripes or steps	Low chloride ion concentration Organic impurities
Brunt plate at HCD area	Not enough PPR-2000 Brightener Too high +/- current density Low solution temperature Low copper concentration
Voltage too high or polarisation of the anode	High copper concentration Low sulphuric acid concentration Low anode area Anode bag clogged Poor wire contact High chloride ion concentration



SOLUTION PURIFICATION

Strong activated carbon treatment

This method will remove most of the impurities and all the brightener:

1. Pump the bath solution into a treatment tank, add 1.25ml/L 30% hydrogen peroxide (without stabiliser), heat up to 60°C, agitate for 2 hours.
2. Add in at least 5g/L activated carbon powder and agitate for 2 hrs.
3. Add in 5g/L filter-aid powder (not contain fibrin), agitate for 20 mins.
4. Let the solution stay still for 1 hr.
5. Cover the filtration pump with filter-aid powder, then pump the solution into the plating tank, pay attention not to bring in the activated carbon powder into the tank.
6. Let the solution cool down to room temperature, analyse the concentration and adjust if necessary.

ANALYSIS METHODS

Copper sulphate

Reagents

15% Potassium iodide solution
0.1N Sodium thiosulphate
Iodine indicator

Method

1. Pipette 5 ml solution into a 250 ml conical flask
2. Add 20 ml DI water
3. Add 20 ml 15% potassium iodide solution.
4. Titrate to light brown with 0.1N sodium thiosulphate.
5. Add 5 ml iodine indicator and continue titrating from blue to colourless endpoint.
6. Record titre = t mls

Calculation

Copper sulphate (g/l) = $t \times 5$



Sulphuric acid

Reagents

Methyl orange indicator (0.1% liquor)
0.5N sodium hydroxide

Method:

1. Pipette 5 ml solution into a 250 ml conical flask
2. Add 20 ml DI water
3. Add 5 drops of Methyl orange indicator
4. Titrate with 0.5N sodium hydroxide from red to orange end point.
5. Record titre = t mls

Calculation

Sulphuric acid (g/l) = $t \times 4.9$

Chloride Ion

Reagent

50%v/v nitric acid
0.1N silver nitrate
0.01N mercury nitrate (dissolve 0.1083g mercury oxide into 5ml 50% nitric acid solution and dilute to 1L)

Method

1. Pipette 50 ml solution into a 250 ml conical flask
2. Add in 30 ml DI water and 20 ml 50% nitric acid solution
3. Add sufficient 0.1N silver nitrate until solution turns turbid, usually in 3 drops
4. Titrate with 0.01N mercury nitrate until the turbidity just disappeared.
5. Record titre = t mls

Calculation

Chloride (ppm) = $t \times 7.1$



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
CIRCUM-BRITE PPR 2000 MAKE-UP	
CIRCUM-BRITE PPR 2000 BRIGHTENER	
CIRCUM-BRITE PPR 2000 STARTER	
CIRCUM-BRITE PPR 2000 WETTER	

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