



## Product Data Sheet

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**PRODUCT #:** N9120

# *CuBrite PC-525*

Acidic Copper Brightener

### **DESCRIPTION:**

A copper plating additive for acid sulfate plating baths designed specifically for high throwing power through-hole plating of printed circuit boards. *CuBrite PC-525* produces bright copper deposits that provide consistent thermal stress performance. *CuBrite PC-525* is a single, clear addition agent, added on an ampere hour basis, which is used to control the brightness and physical properties of the deposit. The extreme stability of this additive greatly reduces the need for routine solution purification.

### **BENEFITS:**

- **High throwing power for 1:1 surface to hole wall copper thickness**
- **Extremely stable additive**
- **Fine-grained deposit with low internal stress**
- **Easy to control**

### **BATH COMPOSITION:**

	<u>Optimum</u>	<u>Range</u>
Copper Sulfate (CuSO <sub>4</sub> ·5H <sub>2</sub> O)	10 oz/gal	8 - 16 oz/gal
Sulfuric Acid	25 oz/gal	20 - 30 oz/gal
Chloride	10% by volume	8 - 12%
<i>CuBrite PC-525</i>	50 ppm	40 - 60 ppm
<i>CuBrite PC-525</i>	0.5% by vol	0.4% -1% by vol
Maintenance Additions	0.25 ml/amp hour	0.1 - 0.3 ml/amp hour

### **OPERATING CONDITIONS:**

Temperature	70°F – 85°F (75°F optimum)
Agitation	Solution, air and cathode rod (avoid compressed air)
Cathode Current Density	10 – 45 ASF
Anode Current Density	10 – 20 ASF
Filtration	Continuous (1 - 5 micron filter recommended)
Anodes	Phosphorized copper (0.03% - 0.08% phosphorous). Slab or slug anodes bagged in Dynel or polypropylene. (Do not use cotton or cellulose bags)
Anode Hooks & Baskets	Titanium
Anode to Cathode Ratio	1:1 - 2:1 (2:1 ratio is optimum)

**MAKE-UP OF PLATING SOLUTION:**

		<u>For 100 Gallons</u>
Copper Sulfate (CuSO <sub>4</sub> ·5H <sub>2</sub> O)	10 oz/gal	63 lbs. CuSO <sub>4</sub> ·5H <sub>2</sub> O crystal or 28.6 gals. liquid copper sulfate
Sulfuric Acid	25 oz/gal	10 gals.
Hydrochloric Acid	50 ppm	50 mls.
<b>CuBrite PC-525</b>	0.5% by volume	½ gal.

**MAINTENANCE AND CONTROL:**

**General:** The copper, sulfuric acid and chloride content of the acid copper plating solution are maintained by analysis according to the procedures in this data sheet.

**CuBrite PC-525** is maintained at an addition rate of 0.25 ml/ampere hour.

In addition to routine analysis, plating distribution and surface-to-hole ratio are important factors that must be controlled. Temperature, copper content, and acid content have a direct influence on throwing power, surface-to-hole ratio, and overall thickness distribution. High temperature, low acid content, and high copper content favor high current densities. Lack of leveling and poor thickness distribution are noted with higher than optimum temperatures and higher copper content. When plating at current densities of 40 ASF and above, a higher copper metal content must be used. Air agitation can also be increased to allow for higher current densities.

The limiting current densities for pattern plating are often determined by circuit configuration, circuit line width, and thickness of the plating photoresist.

**Filtration:** Continuous filtration through a one, three, or five micron filter is recommended. **Cellulose type filters must not be used.**

Capacity of the pump and filter should be sufficient to turn over the complete solution volume at least once per hour. Two or more turnovers, however, are recommended.

Pipes, pumps, fittings, and valves should be acid resistant. All parts should be constructed of PVC or polypropylene. Hard rubber is also acceptable.

**EQUIPMENT REQUIREMENTS:**

**General:** Acid copper sulfate solutions are extremely corrosive. It is important to protect the floors, tanks, plumbing, and any other equipment that may come in contact with the plating solution. Vinyl coatings, asphalt, or several coats of rubber based paint will provide adequate protection.

**Tanks:** Steel tanks should be lined with PVC, polypropylene, or flexible PVC. All tanks should be leached with 5 – 10% sulfuric acid prior to use.

**Racks:** Plating racks should be coated with material that will not contaminate the bath. The preferred rack materials are copper and copper alloys. The rack area immersed in the plating solution should be coated with a non-conductive material (Plastisol, Koroseal).

This product should be used only for its intended purpose. The information stated above is based on our laboratory tests and experience, and is accurate to the best of our knowledge. Since actual use is beyond our control, the recommendations or suggestions are made without warranty, expressed or implied.

### ***CARBON TREATMENT (BATCH):***

Over a period of time the ***CuBrite PC-525*** acid copper plating bath will require a batch carbon treatment according to the following procedure. This should be done on a preventive basis at least once per year. However, the plating bath may become contaminated with organics from rack coatings, resist breakdown, drag-in chemicals, and even the water supply. When this happens, more frequent carbon treatment will be necessary.

1. Transfer entire plating solution into a properly leached treatment tank.
2. Raise temperature to approximately 110°F.
3. Add, with stirring, one quart of 30% hydrogen peroxide per one hundred gallons of solution. Agitate solution well for two hours at 110°F.
4. Raise temperature to 140°F and continue agitation for two more hours.
5. With the temperature at 140°F, add 4 pounds of finely powdered activated carbon per 100 gallons of solution. Continue to mix well for two hours. At the end of two hours, turn off heat and agitation and allow solution to settle.
6. Pump the treated plating solution through the filter packed with diatomaceous earth and into the regular plating tank. Be careful that the powdered carbon does not pass from the treatment tank into the plating tank.
7. Once the solution has been filtered back into the work tank, add normal make-up additions of ***CuBrite PC-525*** brightener and dummy plate at 10 - 15 ASF for 1 - 2 hours.
8. Resume plating.

**Note:** If a carbolator is available, a thorough carbon treatment can be done without the need of a separate treatment tank.

## **ANALYSIS:**

### **Copper Sulfate Content:**

#### **Reagents:**

0.1M EDTA disodium salt standard solution

PAN Indicator - Dissolve 0.1 g of 1-(2-Pyridylazo)-2-Naphthol in 100 ml of methanol

Ammonium chloride buffer: dissolve 70 g ammonium chloride in 900 ml of distilled water. Add ammonium hydroxide to adjust pH to pH 9.5. Dilute to 1 liter with distilled water.

#### **Procedure:**

1. Pipette a 2 ml sample of plating solution into a 200 ml of distilled water in a 500 ml Erlenmeyer flask.
2. Add 5 ml of buffer solution, and dilute to 400 ml with distilled water.
3. Add 4 – 6 drops of PAN indicator.
4. Titrate with 0.1M EDTA until color changes from purple to a green end point. Record mls used.

#### **Calculation:**

mls of EDTA X M of EDTA X 16.6 = oz/gal  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

mls of EDTA X M of EDTA X 4.25 = oz/gal copper metal

### **Sulfuric Acid:**

#### **Reagents:**

1.0N Sodium Hydroxide Solution - Dissolve 40.0 g of sodium hydroxide C.P. into 500 mls of deionized water and dilute to 1 liter.

Methyl Orange Indicator - Dissolve 100 mg of methyl orange in distilled water and dilute to 100 ml.

#### **Procedure:**

1. Pipette 10 mls of plating solution into a 250 ml flask.
2. Add 25 mls of distilled water, and 5 drops of methyl orange indicator.
3. Titrate with 1.0N sodium hydroxide solution until color changes from pink to yellow. Record mls used.

#### **Calculation:**

mls of 1.0N Sodium Hydroxide solution X 0.66 = oz/gal sulfuric acid

**OR**

mls of 1.0N Sodium Hydroxide solution X 0.28 = % by volume sulfuric acid

**Chloride:**

<b>Materials:</b>	Concentrated HNO <sub>3</sub>	Ethylene Glycol
	0.1N Silver Nitrate	Distilled water
	Two 25 ml graduated cylinders, stoppered	5 ml pipet
	10 ml graduated cylinder	1 ml pipet
	Bausch & Lomb Spectronic 20 spectrometer	1 cuvet for Spectronic 20

**Procedure:**

1. To each of two stoppered 25 ml graduated cylinders, add 5 ml of concentrated HNO<sub>3</sub> and 5 ml sample of the plating bath. Stopper and mix well.
2. Add 10 ml of ethylene glycol to each cylinder.
3. Dilute one cylinder to 25 ml (A) and the other to 24 ml (B) with distilled water. Stopper and mix well.
4. Add 1 ml of 0.1N silver nitrate to sample B and mix well. Allow to stand in a dark place for at least 30 minutes.
5. Transfer each sample to a Spectronic 20 cuvet and read the absorbance at 440 nm.

**Calculation:**

$$(\text{Absorbance B} - \text{Absorbance A}) \times 152.21 = \text{ppm chloride}$$

Calculation for adding HCl:

$$\frac{(\text{ppm chloride needed})(3.785)(\text{gal. in tank})}{413.75} = \text{mls of concentrated HCl needed}^*$$

\*Dilute concentrated HCl in 1 liter of DI water to add to plating bath.