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## COL-COPPER ND 300

TECHNICAL DATA  
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### COL-COPPER ND 300

#### *HIGH PERFORMANCE SYSTEM FOR BRIGHT ACID COPPER PLATING*

- COL-COPPER ND 300 offers unparalleled leveling, yet deposits are ductile, low stressed, and readily accept subsequent coatings.
- COL-COPPER ND 300 exhibits excellent brightness and leveling across all normal current density ranges, giving consistently high-quality plating on normally difficult to plate geometric forms.
- COL-COPPER ND 300 is an ultra-high performance, dye-free addition agent system for bright acid copper plating on metal or plastic substrates.
- COL-COPPER ND 300 is mainly used for rack plating applications to obtain mirror bright and highly leveled copper deposits within short plating time.
- COL-COPPER ND 300 is fully consumed by electrolysis (providing consistent results) and is free of tricyclic derivatives or dyes. It is also less sensitive to higher temperatures, both of which minimize the need for frequent carbon purifications.

### OPERATING PARAMETERS

	<u>OPTIMUM</u>	<u>RANGE</u>
Copper Sulfate	24 oz/gallon	22 - 27 oz/gallon
Sulfuric Acid	10 oz/gallon	9 - 12 oz/gallon
Chloride Ion	90 ppm	50 - 150 ppm
COL-COPPER ND CARRIER 301	0.60 % by vol	0.40 - 0.70 % by vol
COL-COPPER ND BRIGHTENER 302	0.10 % by vol	0.05 - 0.15 % by vol
COL-COPPER ND LCD 303	0.20 % by vol	0.05 - 0.30 % by vol
Temperature	70 - 80° F	68 - 100° F
Current Density	20 - 100 ASF	
Anode/Cathode Ratio	2:1	

## SOLUTION MAKEUP

1. Fill mixing tank with water to approximately  $\frac{3}{4}$  of the final working volume of the plating tank.
2. Agitate the water mechanically or with air agitation while slowly and carefully adding 66 degree Be sulfuric acid at concentration of 0.625 pounds per gallon of final tank working volume.
3. While mixing, slowly add and dissolve 1.5 pound of copper sulfate pentahydrate per gallon of final tank working volume.
4. Add 80 mL of reagent grade hydrochloric acid per 100 gal of tank volume.
5. Once all the copper sulfate is dissolved, the solution is treated with carbon at a rate of 0.03 pounds of activated carbon per gallon of solution. The solution is mixed by air agitation for 1 to 2 hours and then allowed to settle and cool for at least 1 to 2 hours before it is pumped through a filter into the clean plating tank.
6. Add water to adjust to the final working volume and mix well with air agitation. Analyze the solution for copper sulfate, sulfuric acid, and chloride ion and make additions if required.
7. Purify the solution by using pre-plated dummy cathodes at 10 to 30 ASF for 1 to 2 hours followed by 5 to 10 ASF for 2 hours.
8. Add COL-COPPER ND 300 addition agents:
  - COL-COPPER ND CARRIER 301      0.6% by volume
  - COL-COPPER ND BRIGHTENER 302   0.1% by volume
  - COL-COPPER ND LCD 303            0.2% by volume

## EQUIPMENT

<b>TANKS</b>	Acid resistant
<b>AGITATION</b>	Mechanical or Air
<b>ANODES</b>	Phosphorized copper
<b>FILTRATION</b>	Continuous: Diatomaceous earth with no or little carbon
<b>ANODE BAGS</b>	Acid Resistant, such as polypropylene

## MAINTENANCE ADDITIONS

### FUNCTION OF SOLUTION COMPONENTS

<b>Copper Sulfate</b>	is normally added only during make-up because the source for the copper ions required for plating after the bath is made up will be furnished by electrolytic and chemical dissolution of the copper anodes.
<b>Sulfuric Acid</b>	provides conductivity to the solution and dissolution of the anodes.
<b>Chloride Ion</b>	concentrations higher than 150 ppm can produce grainy deposits, reduced leveling, and can contribute to passivation of the anodes (white appearance).

Concentrations lower than 50 ppm can produce rough or striated deposits and cause step plating in the high current density area.

### **FUNCTION OF ADDITION AGENTS**

COL-COPPER ND CARRIER 301 is the carrier component. COL-COPPER ND CARRIER 301 helps to reduce burning or treeing in the high current density area. Normal anode color should be black. High concentrations of COL-COPPER ND CARRIER 301 will turn the anode color reddish in color, if this occurs simply quit adding carrier and dummy plate to remove excess. Make additions at 3.8 liters per 10,000 amp-hrs.

COL-COPPER ND BRIGHTENER 302 is the primary brightener component used at approximately 0.9 liter per 10,000 amp-hrs. COL-COPPER ND BRIGHTENER 302 is used to maintain brightness and leveling.

COL-COPPER ND LCD 303 is the low current density additive. LCD dullness or poor metal throw is corrected by additions of the COL-COPPER ND LCD 303. COL-COPPER LCD 303 is added at 1.5 liters per 10,000 amp-hrs.

COL-COPPER ND MAINTENANCE 304 is a single component blend of the COL-COPPER ND CARRIER 301, COL-COPPER ND BRIGHTENER 302, and COL-COPPER ND LCD 303. Make the additions at 4.2 liters per 10,000 amp-hrs.

## **HELPFUL HINTS**

### **TROUBLESHOOTING**

- Dullness at the LCD area is corrected by adding 0.2 mL/L of the COL-COPPER ND 302 BRIGHTENER.
- Treeing or burning at the HCD area results from lack of chloride or COL-COPPER ND CARRIER 301. It is recommended to adjust chloride content to 100 mg/L and if the defect persists to add 0.5 mL/L of the COL-COPPER ND CARRIER 301.
- The anode surface always has to turn black during operation. If the surface becomes reddish, high overloading of COL-COPPER ND CARRIER 301 has happened. In this case, dummy plating will be necessary.
- Poor metal throw and brightness in the LCD area is caused by lack of COL-COPPER ND LCD 303. Add 0.2 mL/L to make corrections.
- The COL-COPPER ND BRIGHTENER 302 is removed by carbon. Never add peroxide because it will decrease the brightness and leveling as long as peroxide is staying in the solution.
- A step in the HCD area is caused by a lack of chloride. Analysis and adjustment are required.
- An overdosing of chloride shows a white anode surface and is causing passivation of the anodes.
- Overdosing of COL-COPPER ND CARRIER 301 or COL-COPPER ND LCD 303 may cause hydrophobic deposits. Reduce dosage of both additives for correction.

## *HANDLING & STORAGE*

Columbia Chemical recommends referring to the specific product Safety Data Sheets for safety, handling, and storage precautions.

## *NON-WARRANTY*

The data contained in this bulletin is believed by Columbia Chemical Corp. to be accurate, true, and complete. Since, however, final methods of use of this product are in the hands of the customer and beyond our control, we cannot guarantee that the customer will obtain the results described in this bulletin, nor can we assume responsibility of the use of this product by the customer in any process which may infringe the patents of third parties.

