

Product Data Sheet

Date: 01/03/06

Supersedes: 08/13/02

Product #: N5113, N5107, N5104 & N7108

CIRCUTEK EC-1050

Conventional Speed Electroless Copper Process

DESCRIPTION: A room temperature, conventional speed, electroless copper process which will deposit a dense, adherent copper film on catalyzed surfaces for the production of printed circuit boards.

CIRCUTEK EC-1050 is easy to control, and has a broad range of operating temperature and bath loading tolerance. The copper produced is a bright pink, fine-grained deposit which is readily receptive to subsequent copper electrodeposition.

BENEFITS:

- Stable, simple to operate
- Predictable, consistent deposition rate
- Room temperature operation with wide operating parameters
- Fine-grain copper deposit with excellent adhesion

INSTRUCTIONS:**Bath Make-Up:**

	<u>Percent</u>	<u>For a 100 Gallon Tank</u>
<i>CIRCUTEK EC-1050A</i>	10% by volume	10 gallons
<i>CIRCUTEK EC-1050B</i>	10% by volume	10 gallons
<i>CIRCUTEK EC-1050M*</i>	5% by volume	5 gallons

**CIRCUTEK EC-1050 M* is used only when making up a new bath.

1. Fill tank ½ full with deionized water.
2. While mixing add required amount of *EC-1050M*.
3. Add the required amount of *EC-1050A*.
4. Add the required amount of *EC-1050B*.
5. Dilute to final volume with deionized water.

Operating Conditions:

Temperature:	70 - 80°F
Plating Speed:	30 microns in 30 minutes at 75°F
Agitation:	Mechanical and air agitation are recommended.
Filtration:	To remove particles over 5 microns. A weir overflow bag is preferred.
Bath Loading	0.5 - 2.0 ft ² /gallon

BATH MAINTENANCE:

Maintenance can be based on square feet of work processed or by analytical control. To achieve optimum results the bath should be maintained at the following concentrations:

CIRCUTEK EC-1050A	90 - 110% (2.25-2.75 g/L)
CIRCUTEK EC-1050B	90 - 100% (8-10 g/L)
CIRCUTEK EC REDUCER (Formaldehyde)	90 - 100% (10-12 ml/L)

The bath should be analyzed and adjusted daily.

To maintain the solution level, remove a volume of bath equal to the volume of **CIRCUTEK EC-1050A** and **CIRCUTEK EC-1050B** to be added.

During the course of the day, extra formaldehyde may be needed in addition to that which is available in the **CIRCUTEK EC-1050A**.

CIRCUTEK EC-1050M is not consumed in the deposition of copper, it is lost by drag-out only.

Inactive Period:

1. Make no further replenishment after the final plating period. Working baths should be stored at 80% or less of make-up concentration overnight or on weekends.
2. The bath should be filtered into a clean tank periodically, to maintain bath life and stability.
3. To start the bath, analyze and adjust all components back to optimum conditions.

EQUIPMENT:

Tank should be made of PVC, polypropylene, high density polyethylene or glass. An overflow weir is preferred.

Racks should be constructed of type 316 stainless steel, polypropylene, polyethylene or PVC. Boards should be racked vertically and angled 5 - 10 degrees to permit solution flow through the holes.

Heaters should be made of quartz or Teflon.

Work bar agitation of the rack during the plating cycle is recommended. A 3 - 5 inch stroke agitating at 15 - 25 cycles/minute is adequate. A solution sparger aimed at the tank bottom can also be utilized for agitation.

Constant air agitation is required. The air must be supplied by a blower. **Do not use compressed air.**

Continuous filtration is recommended to prevent particles from settling on the work and causing roughness. The solution should be turned over 5 - 8 times per hour through a 3 - 10 micron wound polypropylene filter. A weir overflow with a bag is also recommended.

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.

DISPOSAL:

Add 1% by volume formaldehyde, 2 oz/gallon sodium hydroxide, 1 g/l ferrous sulfate, and heat to 160°F (71°C) until the solution is decomposed and the copper precipitated.

Neutralize the clear, colorless liquid for disposal as required by local authorities.

SAFETY:

CIRCUTEK EC-1050A contains copper salts and reducing agents and should not be mixed with oxidizing agents. Avoid breathing vapor and contact with skin and eyes. In case of contact, immediately flush skin and eyes with copious amounts of water for at least 15 minutes. For eyes, get immediate medical attention. Do not store near heat or in direct sunlight. Flush all spills with water. Do not take internally.

CIRCUTEK EC-1050M is slightly alkaline. **CIRCUTEK EC-1050B** is strongly alkaline and toxic. Avoid eye, skin and oral contact. Wear goggles, rubber gloves, and protective clothing. In case of contact, immediately flush skin and eyes with copious amounts of water for at least 15 minutes. For eyes, get immediate medical attention.

CIRCUTEK EC-1050

Copper Analysis

Materials Required: 25 ml Graduated Cylinder 0.1M EDTA Solution
10 ml pipet Ammoniacal Buffer: dissolve 70 g NH₄Cl in
250 Erlenmeyer Flask` 900 ml water; add NH₄OH to pH 9.5, and
PAN Indicator Solution dilute to 1 liter with water.

Procedure:

1. Pipet 10 ml of the working bath into a 250 ml Erlenmeyer flask.
2. Add 100 ml of DI water.
3. Add 10 ml of ammoniacal buffer.
4. Add 6 drops of PAN indicator, swirl to mix.
5. Titrate with 0.1M EDTA Solution until the color turns from a blue to apple green.

Calculation for EC-1050A Copper:

$$(\text{ml of EDTA}) (\text{M of EDTA}) (250) = \% \text{ Copper}$$

$$(\text{ml of EDTA}) (\text{M of EDTA}) (6.36) = \text{g/L Copper}$$

$$\left[\frac{(\text{100\% Copper}) - (\% \text{ Copper})}{(\text{from analysis})} \right] (0.00443) (\text{Tank Volume}) = \text{liters of EC-1050A to add}$$

(in gallons)

Alternate Copper Analysis

Reagents: 0.1N Sodium thiosulfate Sulfuric Acid, 20% by volume
Potassium thiocyanate, 10% Potassium iodide, 10%
Starch indicator

- Procedure:**
1. Pipette a 20 ml sample of the bath into a 250 ml Erlenmeyer flask.
 2. Add 50 ml deionized water.
 3. Add 10 ml of 10% potassium iodide
 4. Add 15 ml of 20% sulfuric acid.
 5. Add 20 ml of 10% potassium thiocyanate.
 6. Add 2 – 3 ml of starch indicator.
 7. Titrate with 0.1N sodium thiosulfate to a white end point.

Calculation: mls of sodium thiosulfate X N of sodium thiosulfate X 3.18 = g/l of copper
mls of sodium thiosulfate X N of sodium thiosulfate X 127 = % copper

Premix Additions based on copper analysis (for 55 gallons):

	<u>Bail Out</u>	<u>Add EC-1050A</u>	<u>Add EC-1050B</u>
100%	-----	-----	-----
90%	5 liters	2.5 liters	2.5 liters
80%	10 liters	5 liters	5 liters
70%	14.6 liters	7.3 liters	7.3 liters
60%	19 liters	9.5 liters	9.5 liters
50%	23.2 liters	11.6 liters	11.6 liters

Sodium Hydroxide and Formaldehyde

Reagents: 0.1N Hydrochloric Acid
1M Sodium Sulfite - Dissolve 126.04 g of sodium sulfite in 1 liter of DI water.

Procedure:

1. Pipette 5 ml of the copper bath into a 150 ml beaker.
2. Add 50 ml of D.I. water.
3. Titrate with 0.1N hydrochloric acid to a pH of 10.0 using a pH meter.
4. Record the milliliters of HCl used for the sodium hydroxide calculation.
5. Add 25 ml of 1M sodium sulfite solution.
6. Mix well.
7. Titrate with 0.1N HCl to a pH of 10.0.
8. Record this second titration for the formaldehyde calculation.

Calculation for sodium hydroxide (from Step 3):

$$\text{ml of HCl} \times \text{N of HCl} \times 8 = \text{g/l sodium hydroxide}$$

$$\left[\begin{array}{l} (10 \text{ g/l hydroxide}) - (\text{g/l hydroxide}) \\ \text{(from analysis)} \end{array} \right] (0.027) \begin{array}{l} \text{(Tank Volume)} \\ \text{(in gallons)} \end{array} = \begin{array}{l} \text{liters of } \mathbf{EC-1050B} \\ \text{to add} \end{array}$$

Make additions of *EC-1050B* based on the following table (for 55 Gallon Bath)

Sodium Hydroxide Analyzed

EC-1050B Addition

10 g/L	-----
9 g/L	1.5 Liters
8 g/L	3.0 Liters
7 g/L	4.5 Liters
6 g/L	6.0 Liters

Calculation for Formaldehyde: Make additions of EC-1050A and EC-1050B to bath. Mix, and obtain a new sample for analysis of formaldehyde, then add CIRCUTEK EC REDUCER if necessary to increase the formaldehyde content.

(From Step 7)

$$\text{ml of HCl} \times \text{N of HCl} \times 15 = \text{ml/L Formaldehyde}$$

(From Step 7)

$$\text{ml of HCl} \times \text{N of HCl} \times 6 = \text{g/L Formaldehyde}$$

$$\left[\begin{array}{l} (11 \text{ ml/l formaldehyde}) - (\text{ml/l formaldehyde}) \\ \text{(from analysis)} \end{array} \right] (3.6364) \begin{array}{l} \text{(Tank Volume)} \\ \text{(in gallons)} \end{array} = \begin{array}{l} \text{mls of } \mathbf{EC REDUCER} \\ \text{to add} \end{array}$$

Make additions of *EC REDUCER* based on the following table (for 55 Gallon Bath).

Formaldehyde (ml/L) Analyzed

CIRCUTEK EC REDUCER Addition

11 ml/L	-----
10 ml/L	208 mls
9 ml/L	416 mls
8 ml/L	624 mls
7 ml/L	832 mls