



EC-74 Electroless Copper

DESCRIPTION

EC-74 is a versatile electroless copper process that has been engineered for today's sophisticated circuit boards. **EC-74** is formulated to provide a substantial, fine grained structured copper film.

EC-74 is formulated to provide a deposit having uniform physical properties ideal for high performance multilayer manufacturing and processing of all resists.

Advantages

- Wide process latitude
- Enhanced productivity due to exceptional bath stability
- Engineered for multilayer processing
- Increased board process latitude, due to it's low stress
- Engineered to deposit a dense, fine - grained deposit that readily accepts all resist materials
- Highly stable bath that is easy to maintain
- Wide operating range, in both temperature and concentration
- Deposit has excellent hole-wall adhesion, due to its low stress

OPERATING PARAMETERS

Make-Up	84% De-ionized Water 5.2% EC-74A 5.0% EC-72B Mix 5 minutes, then add 5.0% EC-72 C 0.8% ECR
Temperature	90 to 100°F (32 to 38°C)
Immersion Time	20 to 35 minutes
Plating Rate	70 to 80 micro-inches in 35 minutes
Process	Vertical, Batch Tank
Agitation	Continuos Vigorous Air and Work Bar
Filtration	Continuous filtration via overflow is desired.
Ventilation	Advised
Tanks	Polypropylene, Polyethylene, PVC
Racks and Baskets	Stainless Steel



Heater	Teflon Coils
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PHYSICAL PROPERTIES

Specific gravity	1.08 – 1.12
Appearance	Clear liquid
pH(1% solution)	NA
Odor	NA
Flash Point	>200F

CONTROL PROCEDURES

Optimum parameters:

Bath is best run under the following conditions:

Component	Component concentration
EC-74A, Copper	4.8-5.2% by vol (2.2-2.3 g/L cu metal)
EC-72C, NaOH	3.2-5.0% by vol (10-15 g/l NaOH)
ECR, Formaldehyde	6.5-8 mls/liter (2.6-3.2 g/L formaldehyde)

Replenishment additions are based on surface square footage processed or by analysis. The amount of additions will vary depending on the surface condition of the work processed, plating time and plating temperature. The **EC-74** bath should be maintained between 80 to 120% activity (4.2 - 6.2% EC74-A or 1.9 – 2.8 g/L Cu metal) when panels are being plated.

ADDITIONS BASED ON WORK PLATED

Surface Area	Additions of EC-74A	Additions of EC 72-B	Additions of EC-72C	Additions of ECR
1 ssf	22 ml	0.2 ml	12 ml	2.4 ml
1000 ssf	22 liters	200 ml	12 liters	2.4 liters
1000 ssf	5.8 gal.	200 ml	3.2 gal.	0.6 gallons

Shut down

To increase stability of the solution while the bath is inactive; the following procedures should be followed:

1. Skip the last replenishment additions prior to shutdown and make sure EC-72A is below 4.3% or 1.9 g/L Cu metal.
2. Shut heaters off. (allow solution to temperature to drop to ambient)
3. Maintain air agitation.
4. Add EC-72S. Add 10 ml of EC-72S for very gallon of working solution.

Start up

1. Analyze for percent EC-74A, EC-72C and ECR
2. Bail out a volume of solution equivalent to the total quantity of additions to be made.
3. Raise temperature to recommended level.
4. When running the first basket of boards after bath has been inactive for a period of time, you may have to increase plating time an additional 10 minutes. This will only be necessary on the first basket plated.

ANALYSIS

EC-74A bench analysis

Reagents and Equipment Needed

0.1 N Sodium Thiosulfate
50% (weight/weight) Potassium Iodide
Starch Indicator Solution
10% Potassium Thiocyanate (100 grams per liter)
1:1 Sulfuric Acid
25 ml pipet
5 ml pipet
250 ml Erlenmeyer Flask

PROCEDURE

1. Pipet 20 ml. of the working bath into a flask.
2. Add 50 ml of de-ionized water and 10 ml of 1:1 Sulfuric Acid.
3. Add 25 ml of 50% Potassium Iodide, swirl to mix to a clear, dark, brown solution.
4. Add 10 ml. of a 10% solution of potassium thiocyanate.
5. Titrate the solution with 0.1 N Sodium Thiosulfate solution; the color will change from dark brown to yellow.
6. Add 5 ml of the starch indicator solution, then continue to titrate until the color changes to faint pink. Record mls. used.
7. CALCULATION:

% EC-74A by vol. = (ml of 0.1N Sodium Thiosulfate) x 0.65 g/L Cu metal = (% EC-74A by vol.) x 0.45

Maintain **EC-74A** above 4.3% or 1.9g/L Cu metal to ensure plating thickness

Additions needed per gallon of bath

EC-74A	BAIL OUT	EC-74A	EC-72B*	EC-72C	ECR
5.2%	----	----	----	----	----
4.6%	34.1 mls	19.3 mls	0.2 ml	11.3 mls	3.3 mls
4.0%	68.3 mls	38.7 mls	0.4 ml	22.6 mls	6.6 mls
3.4%	102.4 mls	58.0 mls	0.6 ml	33.9 mls	9.9 mls
2.8%	136.5 mls	77.4 mls	0.8 ml	45.2 mls	13.1 mls

* 72B additions are optional. Do this only on recommendation from Florida After making additions of EC-74A and EC-72C perform both free caustic and formaldehyde analysis and make corrections as needed.

Free Caustic Analysis

Reagents and Equipment Needed

0.1 N acid
1 M Sodium Sulfite Solution (126 grams per liter)
pH meter calibrated with a pH 10.00 buffer
25 ml graduated cylinder
5 ml pipet, 25 ml buret, 100 ml beaker

PROCEDURE

1. Pipet 5 ml of the working bath into the 100-ml beaker. Dilute sample with 100 mls of de-ionized water.
2. Titrate with 0.1 N acid to a pH of 10.0; record ml of acid used.
3. Save the titrated sample for the formaldehyde analysis.

CALCULATION: Concentration of EC72C (g/L) = (ml of acid used) x (Normality of Acid) x 8

Adjustments for free caustic content

Concentration	EC72C additions (per gallon)
14 grams/liter	----
12 grams/liter	26.5 mls
10 grams/liter	53.0 mls
8 grams/liter	79.5 mls

To raise the caustic content 1-gram per liter, add 3.5 ml of EC-72C per liter of working solution, or 13.2 ml per gallon.

Formaldehyde analysis (continuing from the free caustic analysis)

4. Add 25 ml of 1M solution of Sodium Sulfite to the pH adjusted sample. Allow the pH of the solution to rise above 10.0. After about 2 minutes, titrate with 0.1 N Acid to a pH of 10.0; record mls of acid used.

CALCULATION:

Concentration of Formaldehyde (ml/L) = (ml of acid) x (Normality of Acid) x 15
Formaldehyde (g/L) = (Formaldehyde in ml/L) x 0.4

Adjustments for Formaldehyde

Formaldehyde	ECR reducer additions (per gallon)
8ml/L (3.2g/L)	----
7ml/L (2.8g/L)	3.8 mls
6ml/L (2.4g/L)	7.6 mls
5ml/L (2.0g/L)	11.4 mls

To raise the Formaldehyde content 1.0 ml per liter or 0.4 g/L, add 1.0 ml of ECR Reducer per liter of working solution, or 3.8 ml per gallon.

SAFETY AND STORAGE

EC-74 working electroless copper bath is an alkaline solution containing formaldehyde and sodium hydroxide. Avoid breathing vapors. Use in a well-ventilated area. When handling concentrate or working solution, wear protective clothing, gloves and chemical safety goggles. In case of skin contact, remove contaminated clothing and flush affected area with plenty of cold water. In case of eye contact, immediately flush with plenty of cold water and seek medical attention immediately.

Store **EC-74** premixes in their original containers. Keep away from direct sunlight and temperature extremes. Protect from freezing.

EC-74A is corrosive and contains cupric salts and stabilizer package. **EC-72B** is corrosive and contains sodium hydroxide. **EC-72C** is corrosive and contains sodium hydroxide. ECR Reducer contains formaldehyde and methanol.

WASTE TREATMENT

The **EC-74** bath contains chelated copper metal, formaldehyde and sodium hydroxide. The pH of the spent solution is above 12.5. Consult with local officials for waste disposal regulations. Please ask a Florida CirTech technical sales rep. for more information regarding waste treatment of this chemistry and our complete line of waste treatment line if additional help or information is desired.

MISCELLANEOUS

Available in 5-gallon pails and 55 gallon drums. Consult MSDS for additional information.