ROHM AND HAAS

ELECTRONIC MATERIALS
PACKAGING AND FINISHING TECHNOLOGIES

COPPER GLEAM™ RG 11

ACID COPPER PLATING PROCESS

For Industrial Finishing Applications

Regional Product Availability

N. America	Japan/Korea	Asia	Europe
✓			

DESCRIPTION

Copper Gleam RG 11 Acid Copper Plating Process is designed for rack, barrel, and reel-to-reel applications. The deposits obtained are very bright, uniform and ductile, and the hardness can readily be controlled to the desired value. Because of exceptional brightener stability, the RG 11 process is distinguished by ease and economy of operation.

ADVANTAGES

- Ease of operation
- Bright, ductile deposit
- Single Additive system

BATH MAKE-UP—METRIC

Chemicals Required	Rack/Barrel	Reel-to-Reel
Copper Sulfate:	112.5–187.5 g/l	187.5–240.0 g/l
Sulfuric Acid:	75–150 g/l	37.5–60.0 g/l
Chloride Ion:	50–100 ppm	50–100 ppm
Copper Gleam RG 11:	5–10 ml/l	5–10 ml/l
D.I. Water:	Dilute to volume	

BATH MAKE-UP—U.S.

Chemicals Required	Rack/Barrel	Reel-to-Reel
Copper Sulfate:	15–25 oz./gal.	25–32 oz./gal.
Sulfuric Acid:	10–20 oz./gal.	5–8 oz./gal.
Chloride Ion:	50–100 ppm	50–100 ppm
Copper Gleam RG 11:	0.5–1.0% v/v	0.5–1.0% v/v
D.I. Water:	Dilute to volume	

BATH MAKE-UP PROCEDURE

1. In storage tank, dissolve copper sulfate in clear hot water.
2. At 54–60°C (130–140°F) mix with 0.5% of 20 vol. (6%) hydrogen peroxide and 2.4 g/l (0.32 oz./gal.) powdered activated carbon for 2–3 hours.
3. Filter into plating tank.
4. Cool solution to below 29°C (85°F).
5. Add sulfuric acid SLOWLY with constant stirring.
6. Dummy solution at 1.0 ASD (10 ASF) for 8 hours.
7. Add chloride: 2.6 ml hydrochloric acid (37%) per 100 liter solution raises chloride level by 12 ppm. Consider chloride level already present in make-up water.
8. Add Copper Gleam RG 11 and mix thoroughly.
9. Dilute to final volume.

Operating Parameters—Metric

Parameter	Rack/Barrel	Reel-to-Reel
Copper Sulfate	112.5–187.5 g/l	187.5–240.0 g/l
Sulfuric Acid	75–150 g/l	37.5–60.0 g/l
Chloride Ion	50–100 ppm	50–100 ppm
Temperature	24–35°C	24–35°C
Cathode Current Density	0.5–3.0 ASD	3.0–10 ASD

Operating Parameters—U.S.

Parameter	Rack/Barrel	Reel-to-Reel
Copper Sulfate	15–25 oz./gal.	25–32 oz./gal.
Sulfuric Acid	10–20 oz./gal.	5–8 oz./gal.
Chloride Ion	50–100 ppm	50–100 ppm
Temperature	75–95°F	75–95°F
Cathode Current Density	5–30 ASF	30–100 ASF

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BATH MAINTENANCE—ANALYTICAL PROCEDURES

Determination of Copper Sulfate-5-Hydrate

I. Equipment

a) 250 ml Erlenmeyer Flask

b) 50 ml Burette

c) 5 ml Graduated pipette

d) 100 ml Graduated cylinder

II. Reagents

a) Ammonium hydroxide, reagent grade

b) Acetic acid, reagent grade

c) Potassium iodine, granular

d) Starch indicator

III. Titrant

Sodium thiosulfate, 0.1N

IV. Procedure

a) Pipette a 5 ml sample into a 250 ml Erlenmeyer flask.

b) Add approximately 100 ml of D.I.

c) Under hood, add approximately 5 ml of ammonium hydroxide; solution will turn royal blue in color.

d) Under hood, add approximately 5 ml of acetic acid; solution will turn pale blue/green in color.

e) Under hood, allow solution to cool to room temperature.

f) Add 15–30 grams of potassium iodide.

g) Add approximately 2–4 ml of starch indicator.

h) Titrate with 0.1N of sodium thiosulfate until a clear/white endpoint persists for 30 seconds.

V. Calculation

g/l Copper Sulfate • $5H_2O$ = ml Titrant × N × 4.99

OR

oz./gal. Copper Sulfate • $5H_2O$ = ml Titrant × N × 0.66

Determination of Sulfuric Acid

I. Equipment

a) 5 ml Pipette

b) 250 ml Erlenmeyer flask

c) 50 ml Burette

d) 100 ml Measuring cylinder

II. Reagents

Methyl Orange Indicator; dissolve 0.1g methyl orange with 100 ml D.I. water

III. Titrant

1.0N Sodium Hydroxide Solution

IV. Procedure

a) Pipette 5.0 ml of sample into a 250 ml Erlenmeyer flask.

b) Add 100 ml of D.I. water and 2 drops of methyl orange indicator.

c) Titrate with 1.0N NaOH to pale-green end-point.

V. Calculation

Conc. of H_2SO_4 (g/l) = ml of NaOH × 5.32

OR

Conc. of H_2SO_4 (oz./gal.) = ml of NaOH × 1.31

Determination of Chloride

I. Equipment

a) pH/ion Meter

b) Ag/AgCl Electrode

c) 25 ml Pipette

d) 250 ml Beaker

e) 50 ml Burette

II. Reagent

0.01N Silver Nitrate ($AgNO_3$)

III. Procedure

a) Insert Ag/AgCl electrode to pH/Ion meter.

b) Set select button to MV and function to MV ±1,400.

c) Rinse Ag/AgCl electrode with D.I. water.

d) Dip the electrode into distilled water and set to zero.

e) Pipette 25.0 ml sample into 250 ml beaker and add 25 ml D.I. water, and put the electrode in the beaker.

f) Titrate the sample against 0.01N $AgNO_3$ with stirring. Record down the volume of the 0.01N $AgNO_3$ added for every 10 unit MV change.

g) The end point would be reached when 1–2 drops 0.01N $AgNO_3$ change 2.0 mV unit.

IV. Calculation

Conc. of Cl^- (ppm) = ml of $AgNO_3$ × 14.2

COPPER GLEAM RG 11 ACID COPPER PLATING PROCESS

Copper Gleam RG 11

Copper Gleam RG 11 contributes to the brightness and ductility of the deposit and is replenished at the rate of 1–2 liters per 10,500 ampere hours (1–2 quarts per 10,000 ampere hours).

EQUIPMENT

Tanks:	Semi-hard PVC, polypropylene or Koroseal lined
Anodes:	Phosphorus deoxidized copper (0.04–0.08% P); slabs with titanium hooks or nuggets in titanium baskets
Anode Bags:	Unnapped Terylene, polypropylene or Dynel Anode to Cathode
Distance:	15–30 cm (6–12 inches)
Anode Current Density:	0.75–1.5 A/dm^2 (7.5–15 A/ft^2)
Heaters:	PTFE-coated panel heaters, silica or aluminous porcelain immersion heaters
Filtration:	1–5 micron polypropylene filter cartridges; filter continuously at a rate of 5 tank volume turnovers per hour
Power Supply:	4–6 volt rectifier with a maximum of 5% ripple is required; for optimum plating distribution, split rectification is recommended
Agitation:	Oil-free air plus mechanical cathode reciprocation, normal to the anodes, to produce flowing action of the solution through the holes
Air Pressure:	0.035 kg/cm^2 (2 psi) for every meter (foot) of solution depth
Air Flow:	0.09–0.18 m^3/minute (1–2 cfm) for every meter (foot) length of sparger
Stroke Length:	5–10 cm (2–4 in.) total excursion
Strokes/Minute:	4–5

EQUIPMENT PREPARATION

Prior to make-up, the process tanks and ancillary equipment should be thoroughly cleaned and leached.

This procedure is particularly important for new equipment or previously used for other processes.

Cleaning Solution

Trisodium Phosphate:	15–30 g/l	(2–4 oz./gal.)
OR		
Sodium Hydroxide:	30 g/l	(4 oz./gal.)

Leaching Solution

Sulfuric Acid:	100 ml/l	(10% v/v)

PROCEDURE—TANKS

1. Thoroughly spray rinse the tank and ancillary equipment with clean water.
2. Discard water.
3. Add cleaning solution to the tank, using hot water (130–140°F) if possible to fully dissolve the salts. Recirculate through the complete system for a minimum of 4 hours. Turn off recirculation and allow to stand in tank an additional 4 hours.
4. Discard cleaning solution(or transfer to the next tank if the cleaning solution had only been used once).
5. Fill the tank with clean water and recirculate through the complete system for a minimum of 2 hours.
6. Discard water.
7. Place cleaned bagged anodes into process tank.

   Note: The anode bags should be new cleaned/leached. The anode baskets should be thoroughly washed down and filled with new or cleaned tin anodes.
8. Add the leaching solution to the tank and recirculate for 4 hours.
9. Leave the leaching solution in the tank for a minimum of 4 hours.
10. Discard the leaching solution (or transfer to the next tank if the leaching solution had only been used once).
11. Thoroughly spray rinse the tank and ancillary equipment with clean water.
12. Discard water.

PRODUCT DATA

For the specific Product Data values, please refer to the Certificate of Analysis provided with the shipment of the product(s).

HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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