Seacole Specialty Chemical

Technical Data Sheet

Cu/ETCH ME-35

A General Purpose Copper Microetch

Product Description

Cu/ETCH ME-35 (ME-35) is a single component liquid, designed to provide optimum micro-roughening and cleaning of copper surfaces prior to photopolymer lamination, oxide, HASL, most final finish systems (including E-TIN 34 Solderable Immersion Tin), and electroless copper, direct metallization and/or copper electroplating processes. This stabilized formulation produces a uniformly clean and micro-roughened copper surface; promoting excellent post direct metallization dry film to copper adhesion and copper-to-copper adhesion prior to copper electroplating, without attacking palladium catalyst deposits in through holes and/or vias. The product also produces an ideal copper surface improving uniform oxide formation and/or immersion/electroless deposition of tin over copper. ME-35 can be operated in spray or immersion applications, offers a wide operating window, is easy to make-up and maintain, and yields a consistently uniform micro-roughened copper surface. Additionally, ME-35 does not contain ammonium or chromate compounds, chlorides, fluorides, or nitrates, simplifying waste treatment.

Performance Features

- ME-35 was specifically designed to provide superior etch characteristics without undermining direct metallization films.
- ME-35 is a single component liquid suitable for feed/bleed operation.
- ME-35 can be operated within a wide range of temperatures and concentrations, assuring optimum copper micro roughening for most applications including HASL, alternative final finishes, oxide systems, and photopolymer lamination.
- ME-35 will produce a uniform matte copper surface at etch rates as low as 20 micro-inches per minute.
- ME-35 is suitable for use in spray or immersion applications.
- ME-35 does not contain ammonium or chromate compounds, chlorides, fluorides, or nitrates, improving safety and reducing environmental impact.

Physical Specifications

Physical State	Liquid
Appearance	Transparent
Odor	Odorless
Stability	Stable
Freeze/Thaw Stability	Protect From Freezing
Specific Gravity	1.2
pH	4 – 8

Equipment Requirements
Tanks: Constructed Of Polypropylene, Polyethylene, PVC Or CPVC.
Heaters: Quartz Or Teflon Encased Steel.
Racks / Baskets: Constructed of Polyethylene, Polypropylene, Or Plastisol Coated Steel.
Cooling Coils: Constructed Of Polyethylene, Polypropylene, Or Plastisol Coated Steel.
Ventilation: Recommended

Product Make-Up
Use the following recommended procedure when preparing a bath of ME-35.

Procedure
1. Thoroughly rinse the tank and inspect for cleanliness paying special attention to the heaters and heater sheathings, and cooling coils.
2. Fill the tank half full with deionized water.
3. Add the calculated volume of ME-35 (10 – 20% by volume).
4. Fill the tank to the desired working volume with deionized water and thoroughly mix the solution.
5. Turn on heaters and/or cooling coils, and verify temperature with a thermometer.

Operating Parameters

Temperature	20 – 35°C (68 - 95°F)
Time	30 - 180 Seconds
Agitation	Mechanical Solution Or Spray

It is recommended ME-35 be operated at conditions yielding between 20 - 40 micro-inches copper micro-etch. The exact rate will vary depending upon the type and condition of the copper substrate and the age and condition of the ME-35 bath.

Control and Replenishment
The ME-35 bath should be controlled by a combination of visual inspection, determination of copper etch rate (by weight loss technique), and periodic verification of active ME-35 concentrations. Due to chemical breakdown and accumulation of impurities, it is recommended the ME-35 bath be dumped when the copper concentration exceeds 30 g/L copper as metal.

Determination Of ME-35 Etch Rate

The etch rate of ME-35 can be determined by the procedure below.

Equipment Required	Reagents Required
Analytical Balance	None
Beaker, 250 ml	
Stir/Hot Plate	
Thermometer	

Procedure

1. Transfer 200 ml of working bath into a 250 ml beaker and place on the stir/hot plate. Measure the temperature of the solution. If necessary, adjust the temperature of the sample to reflect the temperature of the working bath.
2. Completely immerse a representative copper coupon for five minutes. Remove the coupon and thoroughly rinse with deionized water followed by an ethanol rinse. Use forced air to dry the sample if necessary.
3. Once dry, record the weight of the coupon to the nearest 0.0001 grams and record as “A”.
4. Immerse the sample completely into solution a second time for five minutes, rinsing, drying, and reweighing to the nearest 0.0001 grams as before. Record the weight after etching a second time as “B”.

Use the calculation below to measure the copper etch rate in micro-inches per minute.

Calculation

$$\frac{(A - B) \times C}{D \times E} = \text{micro-inches copper removed/minute}$$

Where
- A = weight of the sample before etching in grams
- B = weight of the sample after etching in grams
- C = 6841
- D = copper surface area of sample in square inches
- E = time of immersion in minutes

Determination Of ME-35 Concentration

The concentration of ME-35 can be measure employing the oxidation/reduction titration below.

Equipment Required	Reagents Required
Buret, 50 ml	Ceric Sulfate, Standardized, 0.10 N
Erlenmeyer Flasks, 2 x 250 ml	Ferrous Ammonium Sulfate, Standardized, 0.20 N
Pipettes, 5 and 20 ml	Ferroin Indicator
	Sulfuric Acid, 20% v/v in Water

Procedure

1. Pipet 5.0 ml of ME-35 bath into a 250 ml Erlenmeyer flask labeled flask labeled as “ME-35”. Label a second 250 ml Erlenmeyer flask as “B” for “Blank”.
2. Each flask add approximately 25 ml of deionized water and 10 ml of dilute sulfuric acid and mix.
3. To each flask add exactly (using a pipette), 20 ml of 0.20 N ferrous ammonium sulfate and mix for 1 minute.
4. Add 3-5 drops of ferroin indicator and titrate with 0.10 N ceric sulfate to a ferroin endpoint. Record the number of ml required.

Calculation

$$\frac{(A - B) \times C \times 100}{D \times 2.35} = \%\text{ by volume ME-35}$$

Where
A = ml of ceric sulfate required for the “Blank” solution
B = ml of ceric sulfate required for the sample
C = N of the ceric sulfate
D = sample volume in ml

Adjust to the ME-35 to the desired % by volume concentration by direct addition of ME-35 (formulated for feed/bleed applications) using the calculation below.

Additions

$$\frac{(E - F) \times G}{(100 - E)} = \text{volume of ME-35 to add}$$

Where
E = Desired % by volume ME-35
F = Actual % by volume ME-35
G = Volume of bath

Determination Of Copper Concentration

The copper concentration in the ME-35 working bath is measured. If the concentration exceeds 30 g/L, the bath should be replaced.

Equipment Required	Reagents Required
Buret, 50 ml	Ammonium Hydroxide / Ammonium Chloride
Erlenmeyer Flask, 250 ml	Buffer Solution
Pipet, 10 ml	EDTA - Standardized 0.10 M
	Methanol - ACS grade
	PAN Indicator

Procedure

1. Pipet a 10.0 mls sample of the bath into a 250 ml Erlenmeyer flask containing 50 ml of ammonium hydroxide/ammonium chloride buffer.
2. Add approximately 20 ml of methanol and mix.
3. Add 4-5 drops of PAN indicator and titrate with standardized EDTA from blue to the first stable light green endpoint. Record the number of ml of titrant required.

Calculations

$$\frac{A \times B \times C}{D} = \text{g/L copper}$$

Where
A = Ml of titrant required
B = M of titrant (0.1)
C = M.W. of copper (63.54)
D = Sample volume in ml (10.0)

The bath should be replaced when the copper concentration reaches 30 g/L.

Safety and Handling

Read and understand this products MSDS before handling.

Waste Treatment

Individual users should verify the nature of spent solutions to assure compliance with local, state, and federal regulations. Contact Seacole for specific details and/or further waste treatment recommendations.

Ordering Information

ME-35 is available in 5-gallon pails, 55-gallon drums, and returnable 330-gallon totes.