Seacole Specialty Chemical

Technical Data Sheet

Cu/ETCH ME-40A

A General Purpose Copper Micro-Etch

Product Description

Cu/ETCH ME-40 (ME-40) is a two component liquid, designed to provide optimum micro-roughening and cleaning of copper surfaces prior to photopolymer lamination, oxide, HASL, and most final finish systems (including E-TIN 34 Solderable Immersion Tin) and electroless copper, direct metallization and/or copper electroplating processes. This unique 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 direct metallization deposits. The product also produces an ideal copper surface improving uniform oxide formation and/or immersion/electroless deposition of tin over copper. ME-40 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-40 does not contain ammonium or chromate compounds, chlorides, fluorides, or nitrates, simplifying waste treatment.

Performance Features

- ME-40 was specifically designed to provide superior etch characteristics without undermining direct metallization films.
- ME-40 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-40 will produce a uniform matte copper surface at etch rates as low as 20 micro-inches per minute.
- ME-40 is suitable for use in spray or immersion applications.
- ME-40 does not contain ammonium or chromate compounds, chlorides, fluorides, or nitrates, improving safety and reducing environmental impact.
- ME-40 exhibits consistent etch rates at concentrations between 1- 30 g/L copper.

Physical Specifications

Parameter	Cu/ETCH ME-40A	Cu/ETCH ME-40B
Physical State	Liquid	Liquid
Appearance	Transparent	Blue
Odor	Odorless	Odorless
Stability	Stable	Stable
Freeze/Thaw Stability	Protect from Freezing	Protect from Freezing
Specific Gravity	1.2	1.3
pH	4 – 8	< 1

Equipment Requirements

Tanks: Constructed Of Polypropylene, Polyethylene, PVC Or CPVC.
Heaters: Quartz Or Teflon Encased Steel.
Racks: Should Be Polyethylene, Polypropylene, Or Plastisol Coated Steel.
Cooling Coils: Constructed Of Polyethylene, Polypropylene, Or Plastisol Coated Steel.
Ventilation: Recommended

Product Make-Up

To determine the concentration of ME-40A to employ, refer to figures 1.0 and 2.0 and select the copper etch rate most suited to your equipment and operating requirements. The majority of applications require a minimum of 20, but no more than 40 micro-inches, of copper be etched to provide optimum copper cleanliness and surface topography. Select the ME-40A concentration based upon processing time and temperature of operation, to achieve 20-40 micro-inches copper removal. The concentration of ME-40B employed will be identical for all applications. Chlorides, fluorides, and/or carbonates present in some tap waters will reduce the performance and longevity of the working ME-40 bath. Use the following recommended procedure when preparing a bath of ME-40.

Figure 1.0

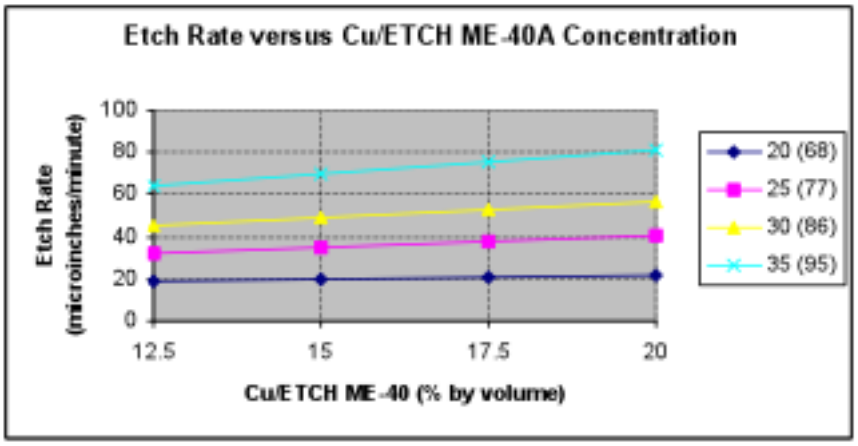

Figure 2.0

	Desired Etch Rate (Micro-inches / minute)				
Temp. C (°F)	**20**	**30**	**40**	**50**	**60**
20 (68)	15%	N/A	N/A	N/A	N/A
25 (77)	N/A	12%	20%	N/A	N/A
30 (86)	N/A	N/A	10%	15%	N/A
35 (95)	N/A	N/A	N/A	N/A	12%

Use the following recommended procedure when preparing a bath of ME-40.

Procedure

1. Thoroughly rinse the tank and inspect for cleanliness paying special attention to the heaters, heater sheathings, and cooling coils.
2. Fill the tank half full with deionized water. Add the calculated volume of ME-40B (6% by volume) and mix thoroughly.
3. Add the calculated volume of ME-40A (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 – 35C (68 - 95°F)
Time	30 - 180 Seconds
Agitation	Mechanical Solution Or Spray

Figures 1.0 and 2.0 above provide an approximate guideline for selecting the immersion time, concentration, and temperature at which to employ ME-40A to obtain the desired etch rate. It is recommended ME-40 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-40 bath.

The ME-40 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-40A and ME-40B concentrations. Due to chemical breakdown and accumulation of impurities, it is recommended the ME-40 bath be dumped when the copper concentration exceeds 30 g/L copper as metal.

Control and Replenishment

Determination Of ME-40 Etch Rate

The etch rate of ME-40 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

Refer to Figure 1.0 and adjust the temperature, and/or concentration, and/or immersion time accordingly to achieve the desired etch rate.

Determination Of ME-40A Concentration

The concentration of ME-40 can be measure employing the oxidation/reduction titration below.

Equipment Required	Reagents Required
Buret, 50 ml	Ceric Sulfate Standardized .10N
Erlenmeyer Flasks, 2 x 250 ml	Ferrous Ammonium Sulfate Standardized .20N
Pipettes, 5 & 20 ml	Ferroin Indicator
	Sulfuric Acid, 20% v/v in water

Procedure

1. Pipet 5.0 ml of ME-40 bath into a 250 ml Erlenmeyer flask labeled flask labeled as “ME-40”. Label a second 250 ml Erlenmeyer flask as “B” for “Blank”.
2. To each flask add approximately 25 ml of deionized water and 10 ml of the 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

$$\frac{(A - B) \times C \times 100}{D \times 2.35} = \% \text{ by volume ME-40A}$$

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-40A to the desired % by volume concentration by direct addition using the calculation below.

Additions

$$\frac{(E - F) \times G}{(100 - E)} = \text{volume of ME-40A to add}$$

Where	E	=	Desired % by volume ME-40A
	F	=	Actual % by volume ME-40A
	G	=	volume of bath

Determination Of ME-40B Concentration

The concentration of ME-40B is determined via acid/base titration.

Equipment Required	Reagents Required
Buret, 50 ml	Methyl Orange Indicator
Erlenmeyer Flasks, 2 x 250 ml	Sodium Hydroxide, Standardized .10 N
Pipet, 5 ml	

Procedure

1. Pipet a 5 mls sample of the bath into a 250 ml Erlenmeyer flask containing 50 ml of deionized water.
2. Add approximately 10 drops of methyl orange indicator and titrate with standardized sodium hydroxide from red/orange to the first stable yellow endpoint. Record the number of ml of titrant required.

Calculations

$$\frac{A \times B \times 9.4}{C \times 2} = \text{\% by volume ME-40B}$$

Where A = ml of titrant required
B = N of titrant
C = sample volume (in ml)

Additions

$$\frac{(6 - D) \times E}{(100 - 6)} = \text{Volume of ME-40B to add}$$

Where D = measured % by volume ME-40B
E = volume of bath

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-40A is available in 5-gallon pails, 55-gallon drums, and returnable 330-gallon totes.

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