

ENVIRO/Etch Make-Up Copper Etchant

Product Description

ENVIRO/Etch (ENVIRO/Etch) is a stabilized formulation designed to provide optimum micro-roughening and cleaning of copper surfaces prior to dry film lamination, oxide treatment, electroless copper deposition, and final finishing processes. ENVIRO/Etch leaves a uniformly clean and micro-roughened copper surface, promoting improved dry film to copper adhesion, copper to copper adhesion, and HAL solder to copper adhesion.

ENVIRO/Etch 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. ENVIRO/Etch is capable (based upon concentrations at make-up) of etching copper at rates from 10 – 800 micro-inches per minute, making it versatile enough to be operated as a continuous spray final etch.

Performance Features

- ENVIRO/Etch exhibits stable, predictable etch rates over a wide range of copper concentrations; making it ideal for many different applications including:
 1. Pre-lamination cleaning
 2. Enhancing topography prior to oxide
 3. Promoting optimum HAL coverage
 4. Promoting copper to copper adhesion
 5. Promoting copper to alternative finish adhesion
- ENVIRO/Etch can be continuously operated employing a “chiller” to precipitate cupric sulfate, minimizing waste treatment costs.

Physical Specifications

Parameter	ENVIRO/Etch Make-Up	ENVIRO/Etch Replenisher
Physical State	Liquid	Liquid
Appearance	Transparent Blue	Transparent to Light Yellow
pH	< 1	< 1
Freeze/Thaw Stability	Stable	Stable
Specific Gravity	1.2	1.2

Technical Data Sheet

Equipment Requirements

Tanks: Constructed Of Polypropylene, Polyethylene, PVC Or CPVC.

Heaters: Quartz Or Teflon Encased Steel.

Racks: Constructed of Polyethylene, Polypropylene, Or Plastisol Coated Steel.

Cooling Coils: Constructed Of Polyethylene, Polypropylene, Or Plastisol Coated Steel.

Ventilation: Required

Product Make-Up

ENVIRO/Etch Make-Up is employed only when preparing new etching baths. ENVIRO/Etch

Replenisher is used when preparing a new bath and as a single component replenisher for maintaining the hydrogen peroxide concentration of the working bath.

To determine the concentration of ENVIRO/Etch to employ, refer to figure 1.0 for micro-etching or figure 2.0 for final etching and select the copper etch rate most suited to your equipment and operating requirements. The majority of micro-etch applications require a minimum of 20, but no more than 40 micro-inches, of copper being etched to provide optimum copper cleanliness and surface topography.

Select the ENVIRO/Etch concentration based upon processing time and temperature of operation, to achieve 20-40 micro-inches copper removal. General make-up ranges for micro-etching and final etching are as follows:

Product Component	Micro-Etch (20 - 60 U" / Minute)	Final Etch (300 - 800 U" / Minute)
Make-Up (% By Volume)	74.5 - 76	76 - 78
Replenisher (% By Volume)	1.5 - 3.0	6.0 - 12
Sulfuric Acid, PC Grade (% By Volume)	None	12
Deionized Water (% By Volume)	22.5	0 - 6%

Figure 1.0

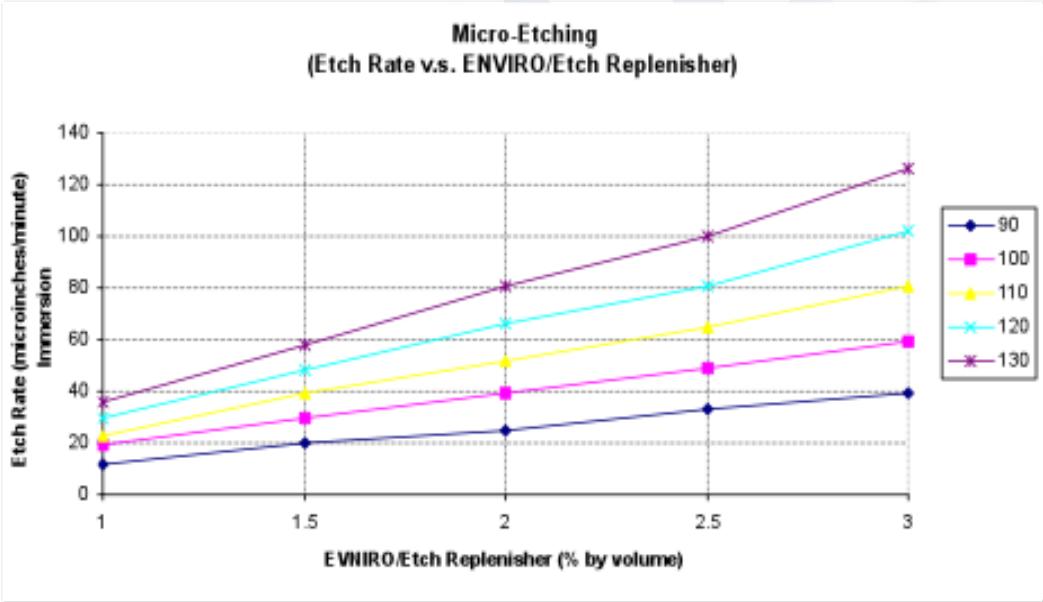
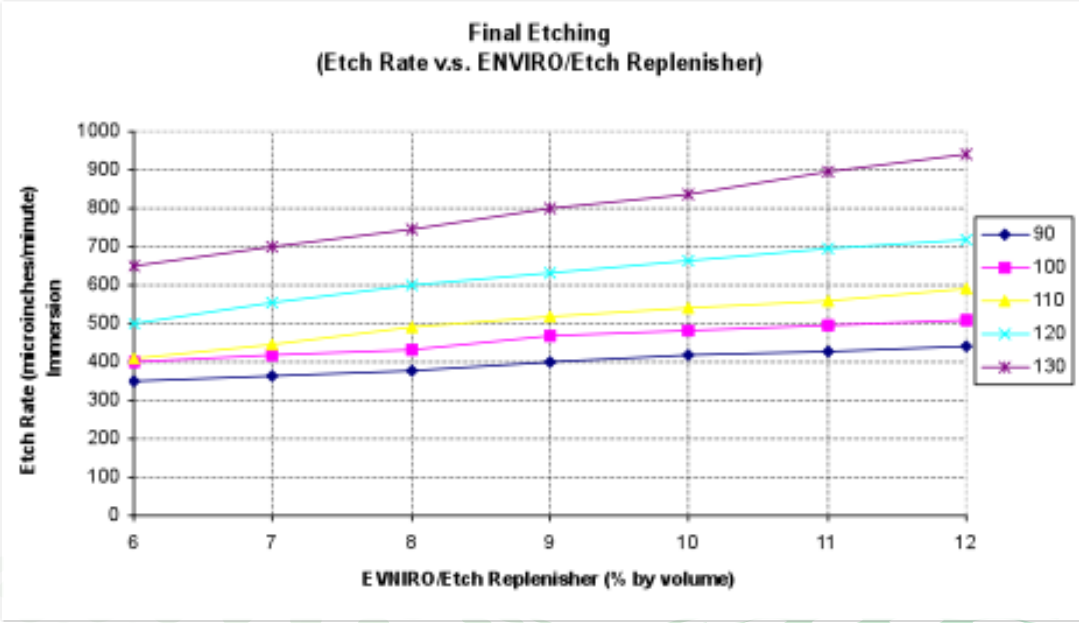


Figure 2.0



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It is recommended ENVIRO/Etch be prepared using only deionized or distilled water. Chlorides, fluorides, and/or carbonates present in some tap waters will reduce the performance and longevity of ENVIRO/Etch. Use the following recommended procedure when preparing a bath of ENVIRO/Etch.

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 with the appropriate volume of ENVIRO/Etch make-up.
3. If sulfuric acid is required (final etch baths only!), slowly add the appropriate volume. The addition of sulfuric acid will generate heat and may cause spattering if added too quickly.
4. Add the appropriate volume of ENVIRO/Etch Replenisher, based upon the desired micro-etch rate and temperature of the operating bath. See figures 1.0 and 2.0 on the previous page. Immediately upon the addition of ENVIRO/Etch Replenisher, the bath will turn from blue to emerald green.
5. Dilute to the appropriate volume with deionized water.
6. Turn on heaters and/or cooling coils and verify temperature with a thermometer.

Operating Parameters

Temperature	70 - 130°F
Time	Suited to Individual Applications
Agitation	Mechanical Solution or Spray
Ventilation	Required
Cooling Coils	Required

NOTE: ENVIRO/Etch is stabilized to minimize the rate of peroxide decomposition. Iron and chloride contamination will accelerate peroxide decomposition, thus the working bath should be isolated from sources of iron and chloride contamination. Because ENVIRO/Etch contains hydrogen peroxide, exotherm (the catalyzed rapid decomposition of hydrogen peroxide generating heat and noxious fumes) can occur in uncontrolled situations. To minimize the potential for exotherm, review the following guidelines:

1. Minimize sources of iron and chloride contamination.
2. Make sure the cooling coil is in good working order.
3. Regulate the surface area of copper being etched if the temperatures rises more than 10°F when etching by either reducing the surface area being etched or employing a larger cooling coil capacity.
4. Always store ENVIRO/Etch Replenisher and working baths of ENVIRO/Etch in containers with suitable VENTED BUNG APERTURES.

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Control and Replenishment

The ENVIRO/Etch bath should be controlled by a combination of visual inspection, determination of copper etch rate (by weight loss technique), and periodic verification of active ENVIRO/Etch Replenisher concentration. The volume of ENVIRO/Etch Replenisher and sulfuric acid required for replenishment may be estimated by the mass of copper etched. Typically, 650 ml of ENVIRO/Etch Replenisher and 380 ml of sulfuric acid, 94.5% PC Grade will be consumed for every 450 grams (1 pound) of copper etched.

Determination Of ENVIRO/Etch Etch Rate

The etch rate of ENVIRO/Etch can be determined by the procedure below.

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

Procedure

1. Transfer 200 ml of working bath into a 250 ml beaker and measure and adjust the temperature of the solution accordingly.
2. Completely immerse a representative copper coupon for five minutes. Remove the coupon and thoroughly rinse with deionized water followed by an ethanol rinse.
3. Once dry, record the weight of the copper 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, 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	=	7.010
	D	=	copper surface area of sample in square inches
	E	=	time of immersion

Refer to figures 1.0 and 2.0, and adjust the temperature, and/or concentration, and/or immersion time accordingly to achieve the desired etch rate.

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Determination Of ENVIRO/Etch Replenisher Concentration

Equipment Required	Reagents Required
Buret, 50 ml	Ceric Sulfate Standardized 0.10 N
Erlenmeyer Flask, 250 ml	Ferrouin Indicator
Pipet, 1 ml	Sulfuric Acid 50% V/V In Water

Procedure

1. Pipet 1.0 ml of an ENVIRO/Etch working bath into a 250 ml Erlenmeyer flask containing about 50 ml of deionized water.
2. Add about 10 ml of sulfuric acid, 50% v/v and mix well.
3. Add 5-10 drops of ferrouin indicator and titrate with 0.10 N ceric sulfate to a ferrouin endpoint (orange to a pale blue-green). Record the number of ml required.

Calculation

$$A \times B \times 3.16 = \% \text{ v/v ENVIRO/Etch Replenisher}$$

Where A = ml of ceric sulfate solution
 B = N of the ceric sulfate

Adjust the ENVIRO/Etch Replenisher to the desired concentration directly by % v/v using the calculation below.

$$\frac{(A - B) \times C}{100} = \text{gallons of ENVIRO/Etch Replenisher to add}$$

Where A = Desired % by volume ENVIRO/Etch Replenisher
 B = Actual % by volume ENVIRO/Etch Replenisher
 C = Bath volume in gallons

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

ENVIRO/Etch Make-Up is available in 55-gallon drums and 330-gallon totes.

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