

# ENTHONE<sup>®</sup> PC-7077

## Non-Fluoride Chromate Film Remover/Microetch

### DESCRIPTION

PC-7077 is an aqueous copper conditioner formulated to remove chromate conversion film and provide uniform micro etch topography. This versatile product can also be used as a micro etch prior to AlphaPREP, oxide coating, hot air leveling (HAL), dry film lamination and solder mask over bare copper. In addition, PC-7077 can be used as the second step of a two-part solder stripper to remove the diffused intermetallic layer.

### FEATURES & ADVANTAGES

#### Features

- Non-fluoride
- Non-chelating
- High loading capacity
- Minimal heat of reaction

#### Advantages

- Minimal copper attack
- Bright, shiny copper surfaces
- Excellent, uniform micro etch topography
- Varied applications
- Simple waste treatment

### PROPERTIES

Appearance .....	Clear to light amber colorless liquid
Solubility in water.....	Complete
Specific gravity .....	1.3 ± .01
pH.....	<1.0
Flash point.....	None
Shelf life .....	Two months

### EQUIPMENT COMPATIBILITY

Material of construction.....	Use in acid resistant equipment made of polyethylene, PVC, or polycarbonate.
Heating or cooling.....	Teflon or quartz is preferred. Titanium or 316 stainless steel is also compatible.

### METHOD OF USE

#### Operating Parameters

#### *One-Step Micro Etch prior to Dry Film Lamination, SMOBC/Intermetallic Tin Removal*

<u>Bath Make-Up</u>	<u>Spray</u>	<u>Immersion</u>
PC-7077	50 to 60% by volume	60 to 70% by volume
Water	Balance	Balance
Operating temperature	80 to 90°F	80 to 90°F
Dwell time	30 to 45 seconds	45 to 60 seconds

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### Etch Rate:

Micro inches/minute	40 to 80	30 to 60
Copper metal in spent solution	3.0 to 3.5 oz./gal.	3.5 to 4.0 oz./gal.

### ***Microetch prior to direct metallization***

<u>Bath Make-Up</u>	<u>Spray</u>	<u>Immersion</u>
PC-7077	10 to 20% by volume	10 to 20% by volume
Water	Balance	Balance
Operating temperature	70 to 80°F	70 to 80°F
Dwell Time	10 to 15 seconds	30 to 90 seconds

### Etch Rate:

Micro inches/minute	15 to 25	15 to 25
Copper metal in spent solution	1.5 to 2.0 oz./gal.	1.5 to 2.0 oz./gal.

### ***Microetch in AlphaPREP process line***

<u>Bath Make-Up</u>	<u>Spray</u>	<u>Immersion</u>
PC-7077	5 to 15% by volume	10 to 20% by volume
Water	Balance	Balance
Operating temperature	80 to 100°F	80 to 100°F
Dwell Time	10 to 60 seconds	20 to 90 seconds
Copper metal in spent solution	0.8 to 1.5 oz./gal.	1.0 to 1.5 oz./gal.

### ***Micro Etch prior to Black Oxide, Hot Air Leveling, Pre-plate***

<u>Bath Make-Up</u>	<u>Spray</u>	<u>Immersion</u>
PC-7077	20 to 30% by volume	30 to 40% by volume
Water	Balance	Balance
Operating temperature	80 to 100°F	80 to 100°F
Dwell time	30 to 60 seconds	1 1/2 to 2 minutes

### Etch Rate:

Micro inches/minute	25 to 35	20 to 30
Copper metal in spent solution	1.5 to 2.0 oz./gal.	2 to 2.5 oz./gal.

### **Solution Maintenance**

Maintain solution level with same concentration as initial bath make-up. Bath should be changed when copper metal reaches the specified concentration.

### Micro Etch Test for PC-7077

1. Cut out a 3" x 3" copper coupon. Avoid fingerprints or any source of contamination on surface.
2. Record the weight of the copper coupon in grams. (Use an analytical balance that can measure decimal places.)
3. For dip applications, immerse test coupon in micro etch for one minute.
4. For conveyORIZED applications, attach coupon to leader panel and pass through spray chamber.
5. Rinse specimen in free-flowing tap water.
6. Thoroughly blow-dry specimen.
7. Cool specimen and record final weight.

### Calculations

#### *Dip Applications*

microinches etch/minute\* = (weight before - weight after) x 377

\*Note - one minute dwell

#### *Conveyorized Applications*

microinches etch = (weight before - weight after) x 377

The Etch Rate on any size test coupon for any desired dwell time can be measured using the following formula:

microinches/minute =  $\frac{\text{weight before} - \text{weight after (gr)}}{0.0212 \times \text{minutes} \times \text{sq. feet}}$

### **Analysis for copper metal in PC-7077 (Titrametric Method)**

#### Reagents

1. PAN Indicator - Dissolve 0.1 g of Pan Indicator, 1 - (2 pyridylazo) - 2 - naphthol in 100 ml alcohol.
2. Standard EDTA Solution (0.116M) - Dissolve 43.0 g EDTA, Disodium Salt Dihydrate in 500 ml distilled or deionized water and dilute to 1 liter.
3. Ammonium hydroxide - concentrated, reagent grade.
4. Ammonium persulfate - crystals, reagent grade.

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Procedure

1. Pipette a 5 ml sample of PC-7077 solution into a 250 ml Erlenmeyer flask.
2. Add 4 to 5 grams ammonium persulfate and agitate.
3. Let stand for several minutes until reaction is complete.
4. Add 12 ml ammonium hydroxide. (Solution turns blue.)
5. Add 100 ml of D.I. water.
6. Add 5 drops of PAN indicator.
7. Slowly titrate with standard EDTA until color changes from blue-purple to clear green.

Calculation

Copper metal (oz/gal)= ml of standard EDTA x 0.20

**Analysis for Copper (AA Method)**

Reagents/Apparatus

1. Atomic Absorption Instrument
2. 100 ml volumetric flask, 1ml & 10 ml pipettes
3. Concentrated reagent grade Nitric Acid
4. DI water
5. Copper standard solution (1000 ppm)

**Procedure**

1. Prepare copper standards at 5 ppm, 15 ppm and 30 ppm, along with a 2% Nitric blank sample.
2. Shake Prep sample well. Pipette 1 ml of product into 100 ml volumetric flask. Add 2 ml of Nitric Acid to dissolve metal complex. Warm up sample if needed to fully dissolve any precipitate. Add DI water up to 100 ml and mix well. Filter out any remaining particles if necessary.
3. If expected copper level is greater than 1 oz./gal, do a second dilution of the sample made in step 2. Above by taking 10 ml of it and again add DI water up to 100 ml in volumetric flask ( 1:1000 dilution total).
4. Run Calibration Curve using prepared standards.
5. Run the 2% Nitric Blank. Run a reference standard check. Run the 2% Nitric Blank again.

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6. Run diluted sample on AA assuring reading is within the working range of the standards. Run a duplicate.

Be sure to calculate result using appropriate dilution factor

### **Analysis for Activity in PC-7077**

#### Reagents

1. 0.2 N Ferrous Ammonium Sulfate - Dissolve 19.6 grams of Ferrous Ammonium Sulfate in 150 mls. of DI water. Then add 1.2 mls. of concentrated Sulfuric Acid. Dilute to 250 mls. in a volumetric flask. Shelf life of the solution is approximately 7 days.
2. 0.1 N Ceric Ammonium Sulfate - With constant stirring, slowly add 30 mls. of concentrated Sulfuric Acid to 500 mls. of DI water. Then add 63.25 grams of Ceric Ammonium Sulfate Dihydrate and stir until solids are dissolved. Cool to room temperature; filter if turbid. Dilute 1 liter in a volumetric flask.

#### Procedure

1. Pipette 50 mls. sample into a 100 ml volumetric flask and dilute with DI water.
2. Pipette 1 ml of the above solution into a 250 ml beaker and add 50 mls. of DI water.
3. Add 10 mls. of 20% Sulfuric acid.
4. Pipette 10 ml of 0.2 N Ferrous Ammonium Sulfate solution into the beaker. Mix well and allow to stand for about 2 minutes.
5. 3 drops of Ferroin Indicator and titrate slowly with 0.1 N Standard Ceric Ammonium Sulfate solution until the orange color begins to fade and then titrate until a permanent pale bluish green color exists. Record the volume of Standard Ceric Ammonium Sulfate solution used. **A**
6. Prepare a blank by adding 50 mls. of DI water in a 250 ml beaker and repeat steps #3-5 above. Record the volume of Ceric Ammonium Sulfate solution used for the blank. **B**

#### Calculation

$$\% \text{ Activity} = (B - A) \times 7.693$$

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### **WASTE TREATMENT**

1. Dilute the spent PC-7077 solution 1:1 with water.
2. Neutralize to pH of 8 to 9 with sodium hydroxide or lime slurry with agitation and then allow heavy metal hydroxides to settle.
3. Decant the clear solution and discharge as per local and state regulations.
4. Heavy metal sludge should be disposed of as per local and state regulations.

### **SAFETY**

Read the Material Safety Data Sheet before using PC-7077.

### **STORAGE**

Keep containers cool and dry, out of direct sunlight, and away from ignition sources.

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For more detailed information on the toxicological properties of the products described herein, reference can be made to the Material Safety Data Sheet (MSDS) for each product. If you do not have the proper MSDS, it can be requested from: Enthone Inc., attention: Regulatory Affairs Department, P.O. Box 1900, New Haven, CT 06508. For emergency assistance call CHEMTREC (800) 424-9300.

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	Londonderry, New Hampshire	Fax (603) 645-4402
CANADA	(Phone: 8AM-6PM, M-F, East Coast time)	(800) 496-8326
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MEXICO	Mississauga, Ontario	(800) 387-3766; (905) 507-9949
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