EB-613 Multilayer Desmear

DESCRIPTION

EB-613 is an epoxy etch compound that is used to clear multilayer printed circuit broads of drilling residue prior to electroless copper coverage. It will promote good adhesion of electroless copper and direct metallization coating to the epoxy. It is part of a three part cleaning cycle; EB-610, **EB-613** and EB-660. If properly used, it can produce etch back depths of 0.2 to 0.4 mil.

EB-613 will remove and etch back both tetra functional and normal epoxy material. It will also remove and etch polyimide material from the hole wall of multilayer boards.

OPERATING PARAMETERS

Make-Up	94% by volume DI water **EB-613A** 55 grams per liter **EB-613B** 6% by volume
Temperature	165 to 180°F (74 to 82°C)- depending upon resin type
Immersion Time	10-20 minutes- depending upon resin type
Process	Batch Tank
Agitation	Will speed activity and help to eliminate thermal stratification
Ventilation	Advised
Tanks	Titanium, Stainless Steel, Supported Polyethylene, Polypropylene
Racks/Baskets	Stainless Steel
Heaters	Teflon Coils, Titanium

PHYSICAL PROPERTIES

	EB-613A	EB-613B
Specific gravity	2.7	1.50-1.54
Appearance	Dark Purple Solid	Clear liquid
pH(1% solution	NA	>12
Odor	None	None
Flash Point	>200F	>200F

CONTROL PROCEDURES

Replenishment additions should be made to **EB-613.** The preferred method of analysis is a simple bench analysis. An active **EB-613** bath should be maintained in order to produce a reliable de-smear or etch-back results. The **EB613** should be replaced when the total additions made to the bath reaches the normal makeup quantity.

The dwell time and temperature of **EB 613** depends upon the type of resin. See the table below for specific recommendations. The expected etch depth is also shown below.

Resin Type	Solution Temperature (°F)	Dwell Time (min)	Etch Depth (mils)
FR4 140-150 Tg	170-180	10	0.1-0.2
FR4 155-175 Tg	170-180	15	0.2-0.3
Tetra functional	175-180	15	0.1-0.25
Polyimide	180	15-20	0.1-0.20
Di-epoxy	165-175	15	0.1-0.3

Note: the expected etch depths also depend upon the solvent swell parameters. See the EB610 technical bulletin for details.

Regeneration of **EB 613** can be done in two different ways. These two methods are described below. The preferred method is to use an electrolytic regeneration cell.

REGENERATION OF EB-613 - Electrolytically

1. Set up the electrolytic regeneration cell per manufacturers instructions.
2. During bath operation, set the current to 100 Amps.
3. When the bath is not in use, increase the current to 150 Amps.
4. Run the regeneration cell frequently enough to maintain the By-products below 10 grams/liter, as determined by analysis. See the procedure below.

REGENERATION OF EB-613 - Chemically

1. Adjust temperature to 100F (38C).
2. Make up solution of EB-200 at a concentration of 200 grams/liter or 1.7 pounds per gallon.
3. For every 10 grams per liter of break down product add a 5% volume of EB-200. Add this in 5% addition stages with mixing.
4. Let stand 1 hour.

5. Repeat with another 5% solution if by-products are over 20 grams per liter.
6. Analyze for **EB-613B**, and adjust concentration.
7. Bring temperature to 140 F (60 C) and mix for one hour.
8. Material is ready for use.

ANALYSIS

EB-613A Concentration and By-Products (BY UV-VIS)

Reagents and equipment needed

UV-Vis Spectrophotometer or Spectronic 20
Two cuvettes with 1.0 cm path length
0.1 N sodium hydroxide
0.1 mL pipet
100 mL volumetric flask

PROCEDURE

1. Pipet 0.1 mL of the working solution into a 100 mL volumetric flask.

2. Bring the flask to volume with 0.1 N sodium hydroxide and mix well.

3. Fill one cuvette with the dilute working solution and fill another cuvette with 0.1 N sodium hydroxide.

4. Measure the absorbance of the dilute working solution at 526 nm and 603 nm, using 0.1 N sodium hydroxide as a blank.

5. Calculations:

EB613A (g/L) = (69.70 x Abs526) - (18.96 x Abs603)

By-Products (g/L) = (114.3 x Abs603) - (10.19 x Abs526)

Maintain concentration of EB-613A between 45 to 65 grams/liter.
Maintain the by-products concentration below 10 grams/liter, through regular regeneration.

EB-613A Concentration and By-Products (Alternate method - by titration)

Reagents and equipment needed

Saturated Barium Hydroxide Solution (32 g/L anhydrous barium hydroxide)
20% Nitric Acid (v/v)
10% Potassium Iodide
0.1 N Sodium Thiosulfate Solution
Starch Indicator Solution
2 ml pipet
10 ml pipet & 50 ml burette
50 ml graduated cylinder
50 ml beaker
250 ml beaker glass filter paper
Suction filter

PROCEDURE:

1. Pipet 2 ml of the working solution into a 50-ml beaker and add 10 ml of saturated Barium Hydroxide solution. Swirl to mix.

2. Filter the solution with suction through a glass filter paper. Use Barium Hydroxide solution to wash out beaker; filter all washing. Wash filter paper with Barium Hydroxide solution until paper turns to a light gray. Save all washing for analysis.
The filter paper (solid) analysis is designed to measure the breakdown products from the permanganate etch. Label this part B.
The filtrate (liquid) analysis is designed to measure the active ingredients (EB-613A) which produce the etch. Label this part A.
3. Placed the washed filter paper, or part B, into a 250 ml beaker and add 20 ml of 20% Nitric Acid. To part A also add 20 ml of 20% Nitric Acid.
4. Add 20 ml of Potassium Iodide to each sample. Swirl to dissolve all precipitate.
5. Titrate each sample with 0.1 Normal Sodium Thiosulfate to a yellow end point.
6. Add 5 ml of starch indicator solution and continue to titrate to a clear endpoint.
Record volume used for each.

CALCULATION:

Part A (**EB-613A**)

grams/liter **EB-613A** = (ml 0.1 N Sodium Thiosulfate) x 1.6

Part B (By-products)

(ml 0.1 N Sodium Thiosulfate) x 2.46 = grams/liter by products.

EB- 613B Concentration

Reagents and equipment needed

1.0 N acid, either sulfuric or hydrochloric
5 ml pipet
250 ml beaker
50 ml burette
pH meter

PROCEDURE

1. Pipet 5 ml of the working solution into a 250-ml beaker. Dilute sample with 50 ml of de-ionized water.

2. Using a pH meter, titrate with 1.0N acid to a pH of 10.5.

CALCULATIONS:

% EB- 613B = (ml acid) x (Normality of Acid)

Maintain the concentration of **EB-613B** between 4% to 8%. % SOLIDS ANALYSIS PROCEDURE

1. Clean and weigh a Pyrex evaporating dish, record weight (W1).
2. Pipet a 5-ml sample of the **EB-613** working solution into the dish.
3. Weigh the dish and the **EB-613** together, record weight (W2).
4. Heat an oven heat and dry the evaporating dish. Heat slowly to prevent the solution from splattering out of the dish.
5. Cool and weigh the dish with the dry residue, record weight (W3).
6. CALCULATIONS:

Weight % Solids = {(W3-W1) / (W2-W1)} * 100

Discard the **EB-613** solution when solids content exceed 25 %

SAFETY AND STORAGE

EB 613A

EB-613A is a salt containing the inorganic oxidizing agent permanganate. It contains organic surface conditioners. Avoid breathing vapors. Use in a well-ventilated area. When handling concentrate or working solution, wear protective clothing, gloves, and chemical safety goggles. In case of skin contact, remove contaminated clothing and flush affected area with plenty of cold water. In case of eye contact, flush immediately with plenty of cold water and seek medical attention immediately.

Store **EB-613A** in its original container. Keep away from direct sunlight and temperature extremes. Protect from freezing. Keep away from flammable and solvents.

EB 613B

EB-613B is a liquid containing sodium hydroxide and wetting agents. It is corrosive and strongly alkaline. Avoid breathing vapors. Use in a well-ventilated area. When handling concentrate or working solution wear protective clothing, gloves, and chemical safety goggles. In case of skin contact, remove contaminated clothing and flush affected area with plenty of cold water. In case of eye contact, flush immediately with plenty of cold water and seek medical attention immediately.

Store **EB-613B** in its original container. Keep away from direct sunlight and temperature extremes. Protect from freezing.

WASTE TREATMENT

EB-613 working solution contains permanganate and sodium hydroxide. It may be treated by diluting 50% with water, and then pH adjusting the solution to a pH of 5 with dilute sulfuric acid (CAUTION). To this solution, add 100 grams of Sodium Bisulfate per liter. Mix for 20 minutes and allow to react to a brown sludge. This will be Manganese Dioxide. The sludge can then be filtered out from the solution and treated according to local regulations. The solution can be pH adjusted to between 6 and 8 with dilute caustic soda before sending the spent solution to the sewer. Consult with local officials for further waste disposal regulations. Please ask a Florida CirTech technical sales rep. for more information regarding waste treatment of this chemistry and our complete line of waste treatment line if additional help or information is desired.

MISCELLANEOUS

EB-613A	Available in 50 lb. pails. Consult MSDS for additional information.
EB-613B	Available in 5-gallon pails and 55 gallon drums. Consult MSDS for additional information.