Florida CirTech
LEADERS IN PCB TECHNOLOGY

Product Data Sheet

PB-445 Power Bond

DESCRIPTION

PB-445 is the next generation of oxide replacement systems. It is used to maximize bonding strength between copper and resin systems in multilayer lamination. The PB-445 process can be used to increase soldermask and dry film photoresist adhesion to copper as well. The PB-445 process has few steps, is easy to control and eliminates pink ring.

OPERATING PARAMETERS

Make-Up	82.0% DI water (v/v) 15.0% PB-445 (v/v) 3.0% Cir130A Power Bond Oxidizer (v/v)
Temperature	80-85°F (27-29°C)
Dwell Time	1.5-2.0 minutes
Process	Batch Tank, Conveyorized Flood or Spray
Agitation	Moderate air, pump or work bar agitation recommended
Ventilation	Recommended
Tanks	Polypropylene, Polyethylene
Heaters	Quartz, Teflon, Stainless Steel (316)
Cooling Coils	May be necessary depending upon work load
Racks	Stainless Steel (316), Plastisol Covered Steel

PHYSICAL PROPERTIES

	PB-445	Cir130A
Specific gravity	1.36-1.38	1.19-1.20
Appearance	Dark amber liquid	Clear liquid
pH	<1.0	NA
Odor	None	None
Flash Point	NA	NA

CONTROL PROCEDURES

DI water must be used to make up the PB445 bath, as well as all rinses and steps in the Power Bond process. Chloride contamination in this process will cause Power Bond to stop working. A simple test can be used to determine if the DI water used is acceptable.

DI Water Test for Chlorides
1. Rinse a 250 mL beaker with DI water several times, and drain.
2. Add about 50 mL of DI water from the Power Bond process tanks to the beaker.
3. Add about 5 – 10 mL of 50% nitric acid and mix.
4. Add about 4 – 8 drops of 0.1 N silver nitrate solution and mix.
5. Look for the appearance of a cloud, or haziness.
6. If the mixture stays clear, then the DI water is free of chlorides and can be used.
7. If the mixture turns cloudy or hazy, then there is chlorides in the water, and it cannot be used.

PB-445 activity is controlled by analysis and addition of concentrates. PB-445 content, Cir130A content, and copper concentration are determined by simple titrations. Etch rate is determined by a weight loss method. Perform wet analysis on a daily basis to determine additions of all bath components. When the bath reaches 20 g/L of copper, decant 50% of the bath and remake it. Then, control the bath between 10 g/L and 20 g/L of copper. In a feed and bleed application, control the copper concentration at 15 g/L.

PB-445 is a peroxide / sulfuric acid etching solution. The total etch depth is typically about 50 – 70 microinches of copper when PB-445 is run at standard parameters. The total etch depth of the process must be controlled to achieve optimal bond strength. A test method for total etch depth are listed below. When the Power Bond process is run under normal conditions, copper to resin peel strengths are typically 7 – 10 lbs per inch..

ANALYSIS

Cir130A Power Bond Oxidizer Concentration
Reagents and Equipment:
1.0 mL pipet
25 mL buret
250 mL
Erlenmeyer Flask
Ferroin Indicator solution
0.1 N Ceric Ammonium Sulfate solution

Procedure:

1. Pipet 1.0 mL of the bath into a 250-mL Erlenmeyer Flask.
2. Add 75-100 mL of DI water and 4 - 5 drops of Ferroin Indicator.
3. Titrate with 0.1 N Ceric ammonium sulfate solution, from orange to a pale blue endpoint.
4. Calculation:

Cir130A content (% by vol) = (mL of Ceric Ammonium Sulfate used) x 0.29

Maintain the concentration of Cir130A between 2.5 and 3.0%. An addition of 20 mL Cir130A per gallon of bath will increase the concentration by 0.5%.

PB-445 Concentration
Reagents and Equipment:
1.0 mL pipet
25 mL buret
250 mL Erlenmeyer Flask

Methyl Orange Indicator solution
Sodium hydroxide solution 0.1N

Procedure:

1. Pipet 1.0 mL of the working solution into a 250-mL Erlenmeyer Flask.
2. Add 75-100 mL of DI water and 3-5 drops of Methyl orange indicator.
3. Titrate with 0.1 N NaOH solution, from red-orange to a yellow endpoint.
4. Calculation:

PB-445 content (% vol) = (mL of NaOH) x (normality of NaOH) x 9.3

Maintain the PB-445 concentration between 10 and 15%. An addition of 40 mL of PB-445 per gallon of bath will raise the concentration by 1.0%.

Copper Concentration
Reagents and Equipment:
5.0 mL pipette
25 mL buret
250 mL Erlenmeyer Flask
Ammonium hydroxide solution (concentrated)
Pan Indicator solution (0.1 grams of PAN indicator powder in 100 mL alcohol)
0.05M EDTA solution

Procedure:

1. Pipet 5.0 mL of the working solution into a 250-ml Erlenmeyer Flask.
2. Add 10 mL of ammonium hydroxide solution.
3. Add 75-100 mL of DI water and 4-5 drops of Pan Indicator.
4. Titrate with 0.05 M EDTA, from purple to a green endpoint.
5. Calculation:

Copper content (g/L) = (mL of EDTA) x (Molarity of EDTA) x 12.0

Maintain the copper concentration between 10 g/L and 20 g/L. Discard and remake 50% of the bath when the copper concentration exceeds 20 g/L.

Etch Depth
Reagents and Equipment:
Analytical balance
Oven or dryer
Double-sided copper clad test coupon

Procedure:

1. Accurately weigh a copper clad test coupon to 4 decimal places. Record this weight.
2. Process the test coupon through the entire Power Bond line, using normal parameters.
3. Rinse and dry the coupon to the point of no weight change.
4. Accurately weigh copper clad test coupon to 4 decimal places. Record this weight.
5. Measure the size of the coupon and calculate the surface area of copper on both sides. For example, a 3”x3” coupon with copper on both sides has 18 sq. in. of copper.
6. Calculation: Etch depth = ΔW x 6824 / (area of copper in square inches)

Maintain the etch depth between 50 microinches and 70 microinches for the entire Power Bond line. Do this through proper control of the PB-445 Power Bond baths.

SAFETY AND STORAGE

Cir130A is a strong oxidizing solution containing 50% hydrogen peroxide. It causes eye and skin injury, and the effect may be delayed. When handling concentrate or working solution, wear protective clothing, gloves and chemical safety goggles. Use in a well-ventilated area. Avoid mist. Avoid contact with combustible materials. Avoid contamination from any source, like dust and organic materials. Such contamination can cause rapid decomposition, generation of large quantities of oxygen, and high pressures.
Working solutions containing PB-445 are acidic and should be handled in a manner similar to that of sulfuric acid. Exposed areas should be flushed immediately with copious amounts of cold, clean water for approximately 15 minutes. Seek medical attention promptly in case of over exposure or injury.

Store PB-445 components in their original vented containers. Keep away from sunlight and temperature extremes.

WASTE TREATMENT

PB-445 spent or working solution is an acidic copper etchant. Copper can be removed from solution by precipitation. This can be accomplished by raising the pH of the solution to above 10 with dilute caustic soda. A mild exothermic reaction will occur and a precipitate will form. This precipitate can be removed by filtration. It will contain copper hydroxide sludge. The clear solution remaining can be decanted to the sewer. Observe local waste treatment and 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

PB445 is available in 5 gallon pails and 55 gallon drums. Cir130A is available in 15 gallon carboys and 55 gallon drums. Consult MSDS sheets for additional information.