Florida CirTech
LEADERS IN PCB TECHNOLOGY

Product Data Sheet

PB-433 Adhesion Promoter

DESCRIPTION

PB-433 is normally used as a pre-dip for the Power Bond oxide replacement process. PB-433 can also be used as a stand-alone Adhesion Promoter. In this application, PB-433 produces a copper colored deposit on the surface of the circuit board. This deposit improves adhesion from the copper to dry film photoresists and solder masks.

OPERATING PARAMETERS

Make-Up	See section IV Control Procedures below
Temperature	70-80°F (21-27°C)
Dwell Time	2-3 min
Process	Batch Tank or Conveyorized Flood or Spray
Agitation	Moderate air, pump, or work bar agitation recommended
Ventilation	Recommended
Tanks	Polypropylene, Polyethylene
Heaters	Quartz, Teflon, Stainless Steel (316)
Racks	Stainless Steel (316), Plastisol Covered Steel

PHYSICAL PROPERTIES

	PB-433	**Cir130A**
Specific gravity	1.04-1.06	1.19-1.20
Appearance	Clear amber liquid	Clear liquid
pH	11.0-13.0	NA
Odor	Sweet	None
Flash Point	NA	NA

CONTROL PROCEDURES

Bath Make-up

Component	Pre-dip	PB433 bath
DI water	97.% vol	93.0% vol
Sulfuric acid, reagent grade	0.5% vol	1.0% vol
PB-433	2.5% vol	5.0% vol
Cir130A	-	1.0% vol

DI water must be used to make up the Pre-dip and PB433 bath. Chloride contamination in this process will cause PB433 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 empty
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-433 activity is controlled by analysis and addition of concentrates. Cir130A content, sulfuric acid, and copper concentration are determined by simple titrations. Perform wet analysis on a daily basis to determine additions of all bath components.

The Pre-dip is used to wet the copper surface with the organic additives and to prepare the surface to receive a proper PB-433 depost. The pre-dip does not etch copper, therefore sulfuric acid and PB-433 will not be consumed in the Pre-dip. The pre-dip is also used to protect the PB-433 bath from drag-in of contaminates.

The PB-433 component is not analyzed for directly. Depletion of the organics in PB-433 are proportional to the sulfuric acid depletion. When sulfuric acid is added, then PB-433 is added as well. See section V. Analysis for more details.

When the bath reaches 10 g/L of copper, decant 50% of the bath and remake it. Then, control the bath between 5 g/L and 10 g/L of copper. In a feed and bleed application, control the copper concentration at 10 g/L. Discard and remake the pre-dip whenever the working bath reaches 10 g/L of copper.

PB-433 is a peroxide / sulfuric acid etching solution. The etch depth is typically about 10-15 microinches of copper when PB-433 is run at standard parameters. The total etch depth of the process must be maintained to achieve optimal bond strength.

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 0.5 and 1.0 % vol. An addition of 20 mL Cir130A per gallon of bath will increase the concentration by 0.5%.

Sulfuric Acid 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:

Sulfuric acid content (% vol) = (mL of NaOH) x (N of NaOH) x 3.1

Maintain the sulfuric acid concentration between 0.5 and 1.0 % vol. An addition of 20 mL of sulfuric acid (reagent grade) per gallon of bath will raise the concentration by 0.5%. The sulfuric acid addition also determines the amount of PB-433 that must be added. See the PB-433 section below.

PB-433 and Sulfuric Acid Additions

PB-433 depletion is proportional to sulfuric acid depletion as the bath is run. Sulfuric acid is consumed at a rate four times faster than PB-433.

For an add of 20 mL sulfuric acid per gallon of bath, add 5 mL of PB-433 per gallon of bath. Optional: Mix the sulfuric acid with the PB-433 before adding them to the bath.

Make sure to use reagent grade sulfuric acid. Less pure grades could contain contaminates that will inhibit bath function.

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 5 g/L and 10 g/L. Discard and remake 50% of the bath when the copper concentration exceeds 10 g/L. Copper is not etched by the Pre-dip, so we do not expect an increase of coper in the Pre-dip. The Pre-dip should be discarded and remade when the PB433 bath reaches 10 g/L of copper

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-433 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-433 components in their original vented containers. Keep away from sunlight and temperature extremes.

WASTE TREATMENT

PB-433 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

PB433 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.