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Product Data Sheet

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PRODUCT #: N5101

SOLDERPLATE SGR

Solder Grain Refiner

DESCRIPTION:

A peptone additive designed for plating 60/40 tin/lead alloy on printed circuit boards from a fluoborate plating bath. When properly controlled, ***SOLDERPLATE SGR*** plates 60/40 tin/lead alloy under a wide range of current densities

SOLDERPLATE SGR provides several advantages when used for through-hole plating of printed circuit boards, and may also be used effectively whenever high throwing power tin/lead plating is desired.

ADVANTAGES:

- **Produces eutectic solder alloy over a wide current density range**
- **High throwing power for 1:1 surface to hole distribution**
- **Excellent solderability**
- **Easy to control**

BATH COMPOSITION:

60% Tin – 40 % Lead	OPTIMUM	RANGE
Stannous Tin	2 oz/gal, 15 g/l	1.6 – 2.7 oz/gal, 12 – 20 g/l
Lead	1.3 oz/gal, 10 g/l	1.1 – 1.9 oz/gal, 8 – 14 g/l
Fluoboric Acid, Free	25 oz/gal, 188 g/l	20 – 30 oz/gal, 150 – 225 g/l
Boric Acid	3.3 oz/gal, 25 g/l	1.3 oz/gal, 10 g/l - saturation
SOLDERPLATE SGR	3.0%	2 - 4%

BATH MAKE-UP:

	100 Gallon Bath
Boric Acid	18.5 lbs.
Fluoboric Acid, 48%	28.2 gals.
Lead Fluoborate (53%)	2.1 gals.
Stannous Fluoborate (51%)	4.5 gals.
SOLDERPLATE SGR	3.0 gals.
Deionized Water	62.2 gals.

1. Add 1/2 the required amount of deionized water to the tank.
2. Dissolve boric acid in hot deionized water and add to tank.
3. Add fluoboric acid.
4. Add lead fluoborate.
5. Add tin fluoborate.
6. Add 3% by volume ***SOLDERPLATE SGR.***
7. Add deionized water to volume.

When the bath is made up it may become slightly cloudy because of traces of sulfate precipitating as lead sulfate. The bath may be filtered or the precipitate may be allowed to settle.

OPERATING CONDITIONS:

Temperature:	75°F optimum (70-100°F)
Agitation:	Cathode rod (air must be avoided)
Cathode current density:	20 ASF optimum (15-35 ASF)
Time for 400 micro inches at 20 ASF:	7 minutes
Filtration:	Continuous (5-10 micron filters are recommended)
Anodes:	Anodes should be 60/40 or 63/37 tin/lead, bagged with polypropylene or Dynel bags.

OPERATING VARIABLES:

Temperature:

Tin/lead fluoborate baths operate efficiently in the temperature range of 70 -100°F. Higher temperatures tend to increase the tin in the deposit, will accelerate the oxidation of stannous tin and should be avoided.

Current Density:

The optimum current density for ***SOLDERPLATE SGR*** high throw bath formulation is 20 ASF. Higher current densities increase the amount of tin in the deposit and may result in treeing or burned deposits. This bath has a limiting current density of approximately 25 ASF. Current density much below 20 ASF decreases the throwing power of the bath. Recommended current density range is 15 - 20 ASF.

Agitation:

Agitation is important for the uniform thickness of the deposit in high aspect ratio plating. Mild agitation is recommended for optimum deposition. Vigorous agitation may cause an increase in the stannic tin content of the bath resulting in a decrease of tin in the deposit. Cathode rod agitation or pump circulation provide suitable agitation. Avoid introduction of air into the bath.

Boric Acid:

Boric acid is added to maintain bath stability. Its concentration in the bath is not critical and an anode bag filled with boric acid should be hung in the corner of the tank.

Free Fluoboric Acid:

The free fluoboric acid is maintained in the bath to provide the requisite acidity, increase the conductivity and improve the throwing power. In conjunction with ***SOLDERPLATE SGR***, it will help prevent treeing and give a fine-grained deposit. The optimum concentration of free fluoboric acid is 400 g/l. If the concentration falls below 350 g/l, the throwing power of the bath will decrease. Concentrations in excess of 400 g/l have no significant effects in throwing power.

Metal and Acid Concentration:

The concentration of acid and metal influences both the throwing power and limiting current density of the bath. The metal concentration affects the throwing power more than the acid concentration. In general, for a given acid concentration, raising the metal concentration will increase the limiting current density but decrease the throwing power while lowering the metal concentration will decrease the limiting current density but increase the throwing power.

SOLDERPLATE SGR:

SOLDERPLATE SGR is added to the tin/lead bath to promote the formation of adherent, fine-grained deposits and prevent treeing. ***SOLDERPLATE SGR*** should be added directly into the bath and stirred gently to ensure complete mixing. There is no break-in period required and the bath may be used immediately after make-up. During the operation of the bath, there will be a certain loss of ***SOLDERPLATE SGR*** as a result of drag-out, chemical breakdown and co-deposition with the metal. The amount used for replenishment will be determined by experience with the bath. As a guide, one quart of ***SOLDERPLATE SGR*** solution per 100 gallons per week may be used.

Carbon Treatment:

It is recommended that tin/lead fluoborate baths containing ***SOLDERPLATE SGR*** be carbon treated at least four times per year to ensure the removal of breakdown products and to avoid excessive build-up from indiscriminate additions. The bath is treated with 8 - 10 pounds of activated carbon per 100 gallons of solution until after filtration the solution is water white. Fresh ***SOLDERPLATE SGR*** is added after carbon treatment. Since there is no simple analytical method to determine ***SOLDERPLATE SGR*** concentration in the bath, the carbon treatment and subsequent replenishment every 3 - 4 months ensure the proper amount of ***SOLDERPLATE SGR*** at that time. The carbon treatment should also remove other organic contaminants in the solution such as resist breakdown products and shop fumes.

Stannous Tin Concentration:

Stannous tin concentration is one of the important factors in the successful operation of the tin/lead bath. In the normal operation of the tin/lead bath, stannous tin concentration remains fairly constant, resulting in a uniform tin deposit.

If the bath is left idle for long periods of time, it is advisable to carbon-treat and filter the bath prior to start-up. The tin/lead anodes should be left in the bath, as they have a reducing effect on the stannous tin in the solution.

Metallic Impurities:

Metallic impurities are normally removed by low current density electrolysis; however, in the tin/lead bath, low current density favors the deposition of lead which may unbalance the bath. Metallic impurities should be removed by "dummying" the bath at a current density of 2 amps/sq. ft. at room temperature. Use corrugated steel cathodes for this purpose. The bath should then be analyzed and brought up to specification with stannous or lead fluoborates. Metals above hydrogen in the EMF Series are not readily removed by "dummying". Copper is easily removed.

Filtration:

Constant filtration is recommended for high throwing tin/lead fluoborate baths, since it will keep the bath clear. If constant filtration is not used, the bath may turn cloudy as a result of sulfates entering the solution and precipitating as lead sulfate, or by precipitating of stannic salts. Anode breakdown products can contribute to the cloudy appearance. The end of the return hose from the filter must be submerged in the bath to prevent aeration of the bath.

Current Efficiency:

Under optimum conditions the bath operates at approximately 100% anode and cathode efficiency, with the tin and lead content of the bath remaining constant and the composition of the deposit being consistent.

Control:

The bath is controlled by analysis for stannous tin, lead and free fluoboric acid content as described in the analytical methods section.

Fusing Tin/Lead Deposits (Reflow):

Proper fusing of a tin/lead deposit depends on many factors. Dirty substrates have been found to be a major cause of poorly fused deposits. Other factors include wrong deposit composition, metallic contamination of the deposit, wrong fusing temperature, improper or wrong flux used prior to fusing, etc.

One of the major causes of poor fusing has been found to be sulfate residues on the substrate prior to tin/lead plating. This results in poor or marginal tin/lead adhesion and subsequently poor reflow.

SAFETY and HANDLING:

Fluoboric acid is toxic and corrosive. Avoid breathing mist and use with adequate ventilation. Avoid contact with eyes, skin and cloth.

Stannous fluoborate solution is an irritant that is harmful if swallowed or inhaled. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation.

Lead fluoborate will cause severe irritation or burns to eyes and skin. It is toxic if inhaled or ingested.

Contact with ***SOLDERPLATE SGR*** solution can cause irritation; avoid contact with eyes, skin and clothing. Wash thoroughly after handling the product.

DISPOSAL: Treatment or disposal of waste generated by use of these products may be of concern depending on the manner of use, nature of the waste and the means of discharge, treatment or disposal. Users of this product should review their operations in terms of applicable federal, state and local laws and regulations and are advised to consult with appropriate regulatory agencies before discharge, treatment, or disposal of waste.

ANALYSIS: **TIN**

Reagents: 0.2N iodine solution
Thyodene indicator
30% sulfuric acid

Procedure:

1. Pipette a 2 ml plating solution into a 250 ml flask.
2. Add 50 ml DI water and 20 ml sulfuric acid. Mix.
3. Add 1 g thyodene indicator and shake to dissolve.

Calculation: g/l tin = ml 0.2N iodine X 5.94

oz/gal tin = ml 0.2N iodine X 0.792

LEAD

Reagents: 0.010M EDTA (3.7224 g/l EDTA disodium salt)
30% hydrogen peroxide
20% triethanolamine
Buffer solution (54 g/l ammonium chloride and 350m/l ammonium hydroxide)
Eriochrome Black T Indicator (1 g indicator and 99 g sodium chloride)
0.010 M zinc nitrate (2.9747 g pure zinc nitrate nitric acid and dilute to 1 liter)

Procedure:

1. Pipette a 2 ml sample into a 250 ml flask and dilute to 100 ml with DI water.
2. Add 5 drops 30% hydrogen peroxide and shake. Let stand for five minutes.
3. Add exactly 25 ml 0.010M EDTA and mix well.
4. Add 5 ml 20% triethanolamine and 10 ml buffer solution.
5. Add Eriochrome Black T Indicator to a blue color. Stir until dissolved.
6. Titrate with 0.010M zinc nitrate until the color changes to violet.

Calculation: Lead (oz/gal) = 0.138 x (25 - ml zinc nitrate)

ANALYSIS cont.

FREE FLUOBORIC ACID

Material: 5 ml pipet
250 ml beaker
1.0N sodium hydroxide

Procedure:

1. Pipette 5 ml of the bath into a 100 ml beaker. Do not add any water.
2. Titrate to a turbid endpoint with 1.0N sodium hydroxide.

Calculation: ml NaOH X 17.56 = g/l fluoboric acid

ml NaOH X 2.34 = oz/gal fluoboric acid

CALCULATION OF ADDITIONS

Fluoboric Acid

oz/gal add X 0.011 X gal of bath = gal of 48% fluoboric acid to be added

267 ml Hull Cell

oz/gal add X 3.00 = ml of 48% fluoboric acid to be added

Tin Metal

oz/gal add X 0.023 x gal of bath = gal of 50% stannous (tin) fluoborate concentrate to be added

267 ml Hull Cell

oz/gal add X 6.18 = ml of 50% stannous (tin) fluoborate concentrate to be added

Lead Metal

oz/gal add X 0.015 x gal of bath = gal of 53% lead fluoborate concentrate to be added

267 ml Hull Cell

oz/gal add X 3.96 = ml of 53% lead fluoborate concentrate to be added