Florida CirTech
LEADERS IN PCB TECHNOLOGY

Product Data Sheet

# SP – 210 Tin and Solder Addition Agent

## DESCRIPTION

SP-201 is a ready to use liquid stabilized organic grain refiner. It is a non-peptone based addition agent used in electroplating tin and solder alloys. SP-201 has been formulated to improve the throwing power of the bath, aid in refining grain structure, and prevent treeing. Added on a routine basis, it will increase limiting current density and control deposit ratio. Its bright silver white deposit gives a re-flowable alloy over a wide range of current densities.

## OPERATING PARAMETERS

| | |
|---|---|
| SP201 components | See the make-up section below |
| Temperature | 70 to 85F (21 to 30C) |
| Immersion Time | Depends upon thickness desired |
| Current Density | 10 to 40 Amps/Sz. Ft.<br>1.1 to 4.3 Amps/Sq. D |
| Anodes | Baskets or Slab, 63 Tin / 37 Lead |
| Anode Bags | Plypropylene or Dynel |
| Filtration | Continuous while plating |
| Ventilation | Advised |
| Tanks | Polypropylene, Polyethylene, PVC |
| Racks/Baskets | Stainless Steel, Plastisol Covered Steel |
| Heaters | Stainless Steel, Teflon Coils |

## CHEMICAL PARAMETERS

| | |
|---|---|
| Stannous Tin Metal | 3.0 to 3.5 ozs per gallon (22 – 26 g/L) |
| Lead Metal | 1.8 to 2.1 ozs per gallon (13 – 16 g/L) |
| Tin to Lead Ratio | 1.6 to 1.8 : 1 |
| Fluoboric Acid 50% | 12.0 to 18.0 oz per gallon (9 – 14% by volume) |
| SP-201CS | 1.5 oz. per gallon (11.5 g/L) |
| SP201M Addition | 4.0% by volume on make-up |
| SP-201 Addition | 0.38 mls per amp hour |

## PHYSICAL PROPERTIES

| | SP 201 M | SP 201 | SP 201C |
|---|---|---|---|
| Specific gravity | 1.00-1.04 | 0.98-1.02 | NA |
| Appearance | Dark brown liquid | Brown liquid | Crystal blend |
| pH | 9.0-10.0 | 9.0-10.0 | NA |
| Odor | Surfactant | Surfactant | None |
| Flash Point | >200F | >200F | >200F |

## CONTROL PROCEDURES

### NEW BATH START-UP PROCEDURES

Prior to bath make-up, the tank must be clean and leached with a 5% solution of Fluoboric Acid for a period of 12 hours. The anode bags should be washed in warm water to remove any sizing and then leached in 5% solution of fluoboric acid. All equipment, heaters, filters, racks, etc., should also be washed prior to coming in contact with the new plating solution.

### NEW BATH MAKE-UP

| BATH | PER 100 GALLONS | PER 100 LITERS |
|---|---|---|
| 50.0% Stannous Bluoborate | 7.5 Gallons | 7.5 Liters |
| 50.0% Lead Fluoborate | 3.5 Gallons | 3.5 Liters |
| 50.0% Fluoboric Acid | 10.5 Gallons | 10.5 Liters |
| SP-201CS | 9.0 Pounds | 1.1 Kilograms |
| SP-201M | 4.0 gallons | 4.0 Liters |

### MAKE-UP

1. Fill tank half way with de-ionized water.
2. Add the required amount of Fluoboric Acid and mix.
3. Add the required amount of lead fluoborate solution and mix.
4. Add the required amount of stannous fluoborate and mix.
5. Add the required amount of SP-201CS and mix until dissolved.
6. Add the required amount of SP-201M addition agent and mix.
7. Raise the volume of the bath to operating height with de-ionized water.
8. Fill a clean anode bag with boric acid and place it in the corner of the plating tank.
9. The plating solution is now ready to use.

### SOLUTION CONVERSIONS

Peptone and non-peptone plating baths can be converted to SP-201 plating bath. A simple batch carbon treatment will remove the organic addition agents. This can be accomplished by treating the bath with 4 pounds of carbon per 100 gallons. Carbon treatment can also be accomplished by continuously filtering the bath through activated carbon filters until a 2-amp 5-minute hull cell shows no sign of active grain refiner. After the organics have been stripped out of solution, and alloy ratio adjustments have been made, the addition agent can be added and plating can continue.

### RATE OF DESPOSITION FROM SOLDER BATH

| AMPS/SQ FT mils | .0001 | .0002 | .0005 | .001 |
|---|---|---|---|---|
| 10 | 4.5 min. | 9.0 min | 22.5 min | 45.0 min |
| 20 | 2.3 min | 4.5 min | 11.3 min | 22.5 min |
| 30 | 1.5 min | 3.0 min | 7.5 min | 15.0 min |
| 40 | 1.1 min | 2.2 min | 5.6 min | 11.2 min |

| AMPS/SQ D microns | 2.54 | 5.08 | 19.7 | 39.4 |
|---|---|---|---|---|
| 1.4 | 3.0 min | 6.0 min | 15.0 min | 30.0 min |
| 1.87 | 2.3 min | 4.5 min | 11.2 min | 22.5 min |
| 2.8 | 1.5 min | 3.0 min | 7.5 min | 15.0 min |
| 3.73 | 1.1 min | 2.2 min | 5.6 min | 11.2 min |

## ANALYSIS

### DETERMINATION OF STANNOUS TIN

1. Pipet 2.0 mL of the working bath into a 250 mL Erlenmeyer flask.
2. Add 75 mL of DI water and 25 mL of 50% v/v HCl.
3. Add about 0.2 g of sodium bicarbonate slowly with mixing.
4. Add 5 mL of starch indicator solution.
5. Titrate with 0.1 N Potassium Iodate - Iodide to the blue/black endpoint.
6. Calculation:

(mls. of 0.1N Iodate-Iodide) x 0.5 = Stannous Tin (oz/gal)

To raise the tin content 0.1 ounces per gallon add 0.24 gallons of Stannous Fluoborate 50% concentrate per 100 gallons.

### DETERMINATION OF FLUORBORIC ACID

1. Pipette 5.0 ml of the plating bath into a 250-ml Erlenmeyer Flask.
2. Add 5 mls of 13.5% Sodium sulfate (wt/vol.) solution and ~50 mL of DI water and mix.
3. Add 2-3 drops of methyl orange – xylene cyanole indicator.
4. Titrate with 1.0 N NaOH to a gray end point.
5. Calculations:

Free Fluoboric acid (oz/gal) = (mls. NaOH x N NaOH ) - (0.1714 x Sn++ oz/gal) x 2.12

Alternate Calculations:
(mls. of Sodium Hydroxide) x 1.8 = ounces per gallon of Total Fluoboric Acid
(mls. of Sodium Hydroxide) x 19.7 = mls per liter of Total Fluoboric Acid

To raise the fluoboric Acid content 1.0 ounces per gallon add 1.12 gallons of 50% fluoboric Acid per 100 gallons.

**DETERMINATION OF LEAD**

1. Pipet a 2 mL sample into a 250 mL titration flask and dilute to 100 mL with DI water.
2. Add 3-4 drops of 50% hydrogen peroxide and shake. Let stand 5 minutes.
3. Add exactly 5 mL of 0.05 M EDTA solution and mix well.
4. Add 5 mL of 20% triethanolamine solution and 10 mL of ammonium buffer and mix well (Buffer: 54g/L ammonium chloride and 350 ml/L ammonium hydroxide)
5. Add Eriochrome Black T indicator to get a blue color.
6. Titrate with 0.01 M zinc nitrate until the color changes to violet.
7. Calculation

Lead (oz/gal) = (25 – mL of zinc nitrate) x 0.138

To raise the lead content 0.1 ounces per gallon add 0.15 gallons of Lead Fluoborate 50% concentrate per 100 gallons of plating solution.

## SAFETY AND STORAGE

SP-201 is a slightly irritating solution. It contains wetting agents and 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 SP-201 in its original container. Keep away from direct sunlight and temperature extremes. Protect from freezing.

## WASTE TREATMENT

SP-201 contains organic wetting agents and surfactants. Discarded solution can be treated by adjusting the pH to between 6 and 8 before sending the spent solution to the sewer. Consult with local officials for further waste disposal regulations. Please ask a Florida CirTech sales rep. for more information regarding waste treatment of this chemistry and our complete line of waste treatment chemistry if additional help or information is desired.

## MISCELLANEOUS

Available in 5-gallon pails and 55 gallon drums. Consult MSDS for additional information.

## TROUBLESHOOTING GUIDE

| PROBLEM | CAUSE | CORRECTION |
|---|---|---|
| Treeing | Low SP-130<br>Low Sulfuric Acid<br>Low Temperature | Add SP-130 to required levels<br>Analyze and adjust acid content<br>Adjust to within operation limits |
| Roughness | Stannic tin or solids in bath | Filter solution |
| Graininess | Low SP-130<br>Tin content too low | Add SP-130 to required levels<br>Add Stannous Sulfate |
| Dark Plating Bath | Low temperature<br>Low SP-130 | Adjust temperature<br>Add SP-130 to required levels |
| Burning | Low temperature<br>Too high current density | Adjust temperature<br>Lower current |
| Blistering | Poor surface<br>Cleaning | Check and adjust pre-cleaning |
| Streaking | Low SP-130 | Add SP-130 to required levels |
| Reduced Throwing Power | Low SP-130<br>Low Sulfuric acid<br>Low tin content | Add SP-130 to required levels<br>Analyze and adjust acid content<br>Analyze and adjust |
| Gassing | Too high a current | Lower current density |
| Polarized Anodes | Anode current density too high | Add anodes or lower current density |
| Brittle deposits | Organic contamination | Carbon treat |