ROHM AND HAAS ELECTRONIC MATERIALS

SOLDERON™ ST-380

For Electronic Finishing Applications

Regional Product Availability			
N. America	Japan/Korea	Asia	Europe
✔	✔	✔	✔

DESCRIPTION

Solderon ST-380 is a high-speed, sulphonate-based tin process formulated for continuous electroplating of lead frames in reel-to-reel and magazine-to-magazine machines over a wide current density range. Due to its specific designed chemistry, the Solderon ST-380 electrolyte provides a deposit with low whisker propensity and excellent solderability performance, especially at 215°C (419°F) after 8 hours steam age. Simple neutralization of drag-out rinse water will produce a non-hazardous effluent.

ADVANTAGES

- High deposition rates that lead to high throughput values
- Excellent solderability performance
- Low-carbon content in the deposit
- Consistent and stable surface morphology
- Low foaming electrolyte
- Ease of use

DEPOSIT DATA

Structure/Appearance: Fine grain deposit

BATH MAKE UP—METRIC

Chemicals Required	5–15 A/dm²	15–25 A/dm²
D.I. Water	538 ml/l	524 ml/l
Solderon Tin Concentrate (300 g/l Tin)	233 ml/l	267 ml/l
Solderon Acid HC	125 ml/l	105 ml/l
Solderon ST-380 Primary	80 ml/l	80 ml/l
Solderon ST-380 Secondary*	2–10 ml/l	2–10 ml/l
Solderon ST-380 Antioxidant	20 ml/l	20 ml/l

BATH MAKE UP—U.S.

Chemicals Required	50–150 A/ft²	150–250 A/ft²
D.I. Water	53.8% v/v	52.4% v/v
Solderon Tin Concentrate (300 g/l Tin)	23.3% v/v	26.7% v/v
Solderon Acid HC	12.5% v/v	10.5% v/v
Solderon ST-380 Primary	8% v/v	8% v/v
Solderon ST-380 Secondary*	0.2–1.0% v/v	0.2–1.0% v/v
Solderon ST-380 Antioxidant	2.0% v/v	2.0% v/v

*Solderon ST-380 Secondary is responsible for producing the desired fine-grained deposit. In cases where maximum ductility is required, 2–4 ml/l (0.2–0.4% v/v) Solderon ST-380 Secondary is recommended. In cases where maximum grain refinement is required, 8–10 ml/l (0.8–1.0% v/v) is recommended.

MAKE UP PROCEDURE

1. Add D.I. water to the tank.
2. Add Solderon Acid HC and mix thoroughly.
3. Add Solderon Tin Concentrate 300 g/l and mix thoroughly.
4. Add Solderon ST-380 Antioxidant and mix thoroughly.
5. Add Solderon ST-380 Primary and mix thoroughly.**
6. Add Solderon ST-380 Secondary and mix thoroughly.
7. Dilute to final volume with D.I. water.

**It is recommended not to use the same container to add Solderon ST-380 Antioxidant and Solderon ST-380 Primary. If the same container is used, be sure to rinse thoroughly with DI water prior to adding Solderon ST-380 Primary.

PF04N272, Rev. 8
February 2009

SOLDERON ST-380

Operating Parameters—Metric (5–15 A/dm²)

Parameter	Range	Optimum
Tin (II)	60–80 g/l	70 g/l
Solderon Acid HC	230–300 ml/l	265 ml/l
Solderon ST-380 Primary	60–90 ml/l	80 ml/l
Solderon ST-380 Secondary	2–10 ml/l	2–10 ml/l*
Solderon ST-380 Antioxidant	15–25 ml/l	20 ml/l
Temperature	22–30°C	27°C**
Cathode Current Density	5–15A/dm²	Dependent upon equipment
Anode to Cathode Ratio	1:1 minimum	
Agitation	Moderate to high solution agitation	
Cathode Efficiency	80–100% (5–15 A/dm²), depending on the chemical make-up of the bath.	
Deposition Rate	Ca. 5 microns/minute at 10 A/dm²	

Operating Parameters—Metric (15–25 A/dm²)

Parameter	Range	Optimum
Tin (II)	70–90 g/l	80 g/l
Solderon Acid HC	230–300 ml/l	265 ml/l
Solderon ST-380 Primary	60–90 ml/l	80 ml/l
Solderon ST-380 Secondary	2–10 ml/l	2–10 ml/l*
Solderon ST-380 Antioxidant	15–25 ml/l	20 ml/l
Temperature	22–30°C	27°C**
Cathode Current Density	15–25A/dm²	Dependent upon equipment
Anode to Cathode Ratio	1:1 minimum	
Agitation	Moderate to high solution agitation	
Cathode Efficiency	80–100% (15–25 A/dm²), depending on the chemical make-up of the bath.	
Deposition Rate	Ca. 9 microns/minute at 20 A/dm²	

Operating Parameters—U.S. (50–150 A/ft²)

Parameter	Range	Optimum
Tin (II)	8.0–10.7 oz./gal.	9.3 oz./gal.
Solderon Acid HC	23–30% v/v	26.5% v/v
Solderon ST-380 Primary	6–9% v/v	8% v/v
Solderon ST-380 Secondary	0.2–1% v/v	0.2–1% v/v*
Solderon ST-380 Antioxidant	1.5–2.5% v/v	2% v/v
Temperature	72–86°F	81°F**
Cathode Current Density	50–150 A/ft²	Dependent upon euipment
Anode to Cathode Ratio	1:1 minimum	
Agitation	Moderate to high solution agitation	
Cathode Efficiency	80–100% (50–150 A/ft²), depending on the chemical make-up of the bath.	
Deposition Rate	Ca. 200 microinches/minute at 100 A/ft²	

Operating Parameters—U.S. (150–250 A/ft²)

Parameter	Range	Optimum
Tin(II)	9.3–12.0 oz./gal.	10.7 oz./gal.
Solderon Acid HC	23–30% v/v	26.5% v/v
Solderon ST-380 Primary	6–9% v/v	8% v/v
Solderon ST-380 Secondary	0.2–1.0% v/v	0.2-1.0% v/v*
Solderon ST-380 Antioxidant	1.5–2.5% v/v	2.0% v/v
Temperature	72–86°F	81°F**
Cathode Current Density	150–250 A/ft²	Dependent upon equipment
Anode to Cathode Ratio	1:1 minimum	
Agitation	Moderate to high solution agitation	
Cathode Efficiency	80–100% (150–250 A/ft²), depending on the chemical make-up of the bath.	
Deposition Rate	Ca. 360 microinches/minute at 200 A/ft²	

*Solderon ST-380 Secondary is responsible for producing the desired fine-grained deposit. In cases where maximum ductility is required, 2–4 ml/l (0.2–0.4% v/v) Solderon ST-380 Secondary is recommended. In cases where maximum grain refinement is required, 8–10 ml/l (0.8–1.0% v/v) is recommended.

**At temperatures above 30°C (86°F), the Solderon ST-380 is much less effective at providing the desired deposit grain refinement and grain structure. It is strongly recommended to ensure operating temperatures do not exceed 30°C (86°F).

SOLDERON ST-380

BATH MAINTENANCE

Solderon ST-380 Primary

Solderon ST-380 Primary is necessary to maintain primary deposit grain refinement. Suggest adding 400–450 ml of Solderon ST-380 Primary for every 1,000 Ah, or as required by CVS analysis to maintain the concentration as recommended concentration range.

Solderon ST-380 Secondary

Solderon ST-380 Secondary is necessary to maintain fine-grained deposits, improve the solderability and contact resistance performance. Add 300–500 ml of Solderon ST-380 Secondary for every 1,000 Ah, depending on the operation (see Note 1), or as required by UV/VIS analysis to maintain the concentration as recommended concentration range.

Solderon ST-380 Antioxidant

Solderon ST-380 Antioxidant is used to protect the bath from oxidation, minimize the stannic tin formation and increase the operation window at HCD. Maintenance additions are made based on UV/VIS analysis for Solderon ST-380 Antioxidant.

Solderon Tin Concentrate

To increase the tin concentration by 1 g/l (0.13 oz./gal.), add 3.3 ml/l (0.33% v/v) of Solderon Tin Concentrate 300 g/l. With the addition of 1 ml/l (0.1% v/v) Solderon Tin Concentrate 300 g/l (40 oz./gal.), the Solderon Acid HC content will be inceased by 0.6 ml/l (0.06% v/v).

NOTES:

1. Replenishment rates suggested are based on a typical reel-to-reel machine operation. Replenishment will vary with changes in operating conditions, such as the type of machine used and product to be plated. It is recommended to control the bath by UV/VIS analysis to maintain the concentration as recommended.
2. For convenience, Solderon Acid HC is expressed as ml/l total acid. A more correct description of acid concentration is g/l free acid. This is calculated as follows:

   g/l free acid =

   (ml/l total Solderon Acid HC - g/l Sn(II) × 1.713) × 0.945
3. As the bath ages, the color of the solution can change to slight-yellow, to yellow and even to brown.

EQUIPMENT

Tanks:	Temperature-stabilized translucent white polypropylene
Heaters:	PVDF-clad panel heaters or titanium with thermostatic control
Coolers:	PTFE or titanium coils
Filtration:	Preferably continuous using 5 microns woven polypropylene cartridges; flow rate at least three times tank volume/hour
Electrical:	Up to 12 volts stabilized DC supply with preference for stepless control supply and ampere-minute/hour meter; ripple control less than 1%
Anodes:	Pure tin anodes or balls in titanium baskets, or pure tin slabs (<0.005% Pb)

Note: Anode baskets must be kept minimum ¾ full at all times.

EQUIPMENT PREPARATION

Prior to make up, the process tank and ancillary equipment should be thoroughly cleaned and then leached with a Solderon Acid solution. This procedure is particularly important for new equipment or equipment previously used for other processes, for example, fluoboric acid based or solder plating systems.

CHEMICAL REAGENTS

Cleaning Solution

Cleaning solution #1:	Potassium Hydroxide 120 g/l (16 oz./gal.)
Cleaning solution #2:	Potassium Hydroxide 15 g/l (2 oz./gal.)

Leaching Solution

Leaching solution #1:	Sulphuric Acid 100 ml/l (10% v/v)
Leaching solution #2:	Solderon Acid HC 200 ml/l (20% v/v)

SOLDERON ST-380

PROCEDURE

1. Pump out the tin-lead solution.
2. Remove all tin/lead anodes and baskets from the machine.
3. Rinse the anode baskets with pressurized D.I. water until no tin/lead residues are found on the surface.
4. Leach the anode baskets and tin anodes with 10% v/v of Solderon Acid HC for 8 hours.
5. Thoroughly wash down tanks/plating cells and ancillary equipment with pressurized D.I. water.
6. Rub the tanks/plating cells and ancillary equipment until all the tin/lead residues are wiped off.
7. Recirculate D.I. water through the complete system to remove residual materials.
8. Discard rinse water. Rub the tanks/plating cells and ancillary equipment again until no tin/lead residues are found on the tanks/plating cells surface.
9. Add Cleaning solution #1 to the tank, heat to 55–60°C (131–140°F) and recirculate through the complete system for 10–15 hours. If time permits, allow for 15–25 hours.
10. Discard the Cleaning solution #1.
11. Recirculate D.I. water through the complete system for at least an hour.
12. Discard rinse water.
13. Add Leaching solution #1 to the tank and recirculate through the complete system for a minimum of 5–10 hours at room temperature. If time permits, allow for 10–15 hours.
14. Discard Leaching solution #1.
15. Recirculate D.I. water through the complete system at least for an hour.
16. Add Cleaning solution #2 to the tank, heat to 55–60°C (131–140°F) and re-circulate through the complete system for a minimum of 4 hours.
17. Discard the Cleaning solution #2.
18. Recirculate D.I. water through the complete system for at least an hour.
19. Add Leaching solution #2 to the tank, heat to 40–45°C (104–113°F) and recirculate through the complete system for minimum of 12–24 hours. Take sample and analyze for lead every 4 hours to determine the trend of the lead content leaching out from the solution.
20. Discard Leaching solution #2. See comment below.
21. Recirculate D.I. water through the complete system at least for an hour. Take sample and analyze for lead.

    Repeat the entire procedure until the lead content is stable below 10 ppm. This should then be safe for lead-free plating

    NOTE: Appropriate safety equipment MUST BE WORN during the entire procedure.

SOLDERON ST-380

PRODUCT DATA

Solderon ST-380 Primary

Appearance:	Colorless to pale yellow liquid
pH:	6.5
Specific Gravity: (at 20°C)	1.01

Solderon ST-380 Secondary

Appearance:	Colorless to pale yellow liquid
pH:	2.75
Specific Gravity:	0.97

Solderon ST-380 Antioxidant

Appearance:	Clear, yellow liquid
pH:	<2
Specific Gravity:	1.1

Solderon Acid HC

Appearance:	Clear, liquid
pH:	<1
Specific Gravity:	1.35

Solderon Tin Concentrate 300 g/l

Appearance:	Light yellow, liquid
pH:	<1
Specific Gravity:	1.51

HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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