

SurTec® 869

Bright Acid Copper Process

Properties

- forms extremely bright copper layers, especially at lower current densities
- excellent levelling, coupled with good throwing power
- for rack and especially for barrel plating
- ductile, good corrosion resistance, no pitting
- economic process, which is easy to operate, works at low temperature and is simple in waste water treatment

Application

The process SurTec 869 includes the following products:

- SurTec 869 A HCD-Booster increases the burning limit
- SurTec 869 I Brightener is used as main additive for maintenance in standard applications
- SurTec 869 II Leveller works together with the Brightener to reach a high brilliance and it is used whenever a high degree of levelling is required

make-up values:

copper sulfate · 5 H ₂ O	200 g/l
sulfuric acid (96 %)	75 g/l
sodium chloride	0.1 g/l
SurTec 869 A HCD-Booster	0.5 ml/l
SurTec 869 I Brightener	6 ml/l
SurTec 869 II Leveller	1-2 ml/l

analytical values:	copper	50 g/l	(45-55 g/l)
	sulfuric acid	75 g/l	(60-80 g/l)
	chloride	60 mg/l	(30-120 g/l)

make-up: Steps for make-up:

1. Dissolve the calculated amount of copper sulfate in hot deionised water (about 2/3 of the desired bath volume), stirring steadily.
2. Start the continuous filtration with small amounts of activated carbon washed onto the filter.
3. Slowly add the required amount of sulfuric acid to the solution.
4. Fill up to the final volume.
5. Cool down to working temperature.
6. Remove activated carbon from the filter.
7. Add the additives.
8. Start dummy plating for about 2 hours at 0.5 A/dm² in order to remove any trace amount of contamination metal.

temperature: 25°C (20-35°C)

cathodic
current density: 4 A/dm² (1-8 A/dm²)

current efficiency:	approx. 100 %
deposition rate:	0.9 µm/min at 4 A/dm ²
ratio	
anode : cathode:	2:1
anodes:	phosphorized copper with 0.03-0.06 % P; PP anode bags are recommended
tank material:	acid-resistant tank
agitation:	for rack processes 3-6 m/min
filtration:	necessary, 1-5 x the total bath volume per hour
hint:	For active carbon treatment, consider the quality of the active carbon: It has to be free of chloride, in order to prevent an increasing chloride concentration.

recommended process sequence (for iron parts):

1. hot degreasing
 - emulsifying:* SurTec 188 + SurTec 415
 - demulsifying:* SurTec 188 + SurTec 089
2. hydrochloric acid pickling with SurTec 424
3. anodic electrolytic cleaning with SurTec 171
4. neutralisation with SurTec 481
5. Copper Process
 - cyanide:* SurTec 861
 - cyanide-free:* SurTec 864
6. **Bright Acid Copper Process SurTec 869**
7. Semi Bright Nickel Process SurTec 854
8. Bright Nickel Process SurTec 855
9. Bright Chromium Process
 - trivalent:* SurTec 876
 - hexavalent:* SurTec 871

Between each step, there has to be rinsed. The rinsing methods have to be adapted to the plating line.

Maintenance and Analysis

Add **SurTec 869 I Brightener** according to ampere-hours. An excess of SurTec 869 I Brightener produces a dull haze in the middle and the low current density, which can be compensated by addition of small amounts of SurTec 869 A HCD-Booster. A deficiency of SurTec 869 I results in a loss of brilliance and levelling.

Add **SurTec 869 II Leveller** only if required. Excessive amounts of SurTec 869 II Leveller result in a dull haze in the middle and low current density. They can be removed by small additions of SurTec 869 I Brightener.

SurTec 869 A HCD-Booster will be required at major loss by drag-out or at higher current densities. An overdosage of SurTec 869 A HCD-Booster up to five times of the normal dosage has no effect on the parts.

Analyse the content of copper and free acid regularly and adjust if necessary.

Sample Preparation

Take a sample at a homogeneously mixed position. Let it cool down to room temperature. If the sample is turbid, let the turbidity settle down and decant or filter the solution.

Copper – Analysis by Titration

- reagents: ammonium persulfate
ammonia (25 %)
indicator PAN: 1-(2-pyridylazo)-2-naphthol (1 g/l in ethanol)
0.1 mol/l EDTA solution (Titrplex III)
- procedure: 1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with 50 ml deionised water.
3. Add about 3 g ammonium persulfate and stir it for 5 min with a magnetic stirrer.
4. Add 5 ml ammonia.
5. Add 7 drops of indicator solution.
6. Titrate with 0.1 M EDTA to greyish green.
- calculation: consumption in ml · 3.18 = g/l copper

Free Sulfuric Acid – Analysis by Titration

- reagents: 1 N sodium hydroxide solution (NaOH solution)
indicator: methyl orange solution (0.04 %)
- procedure: 1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with 100 ml deionised water.
3. Add 5 drops of indicator solution.
4. Titrate with 1 N NaOH solution until the colour changes.
- calculation: consumption in ml · 4.9 = g/l sulfuric acid

Chloride – Analysis by Titration

- reagents: 0.01 N mercuric(II) nitrate solution
0.1 N silver nitrate solution
diluted nitric acid (1:1)
- procedure: 1. Pipette 25 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 30 ml deionised water.
3. Add 30 ml diluted nitric acid.
4. Add 3-5 drops of 0.1 N silver nitrate solution to form a steady turbidity.
5. Titrate immediately under strong stirring with 0.01 N mercuric(II) nitrate solution until the turbidity clarifies.
- calculation: consumption in ml · 14.2 = mg/l chloride
- correction: rise by 10 mg/l chloride:
addition of 23.4 ml/l hydrochloric acid (37 %)
or:
addition of 16.48 mg/l NaCl
The chloride content can be adjusted with NaCl or with HCl (both pure p.a. quality).
- note: The analysis of chloride can also be done by measuring the potential difference during the titration with silver nitrate (Hg-free method). Please ask for the description at SurTec.

Hull Cell Test

material:	rectifier with 10-30 V and 0-2.5 A cables air-agitated 250 ml Hull cell, phosphorized copper bar anode, polished brass Hull cell panels (scratched in the middle with type "000" emery paper)
procedure:	<ol style="list-style-type: none">1. Put the clean anode (evtl. activated in HCl and rinsed well) into the Hull cell and connect it with the cable to the (+) pole of the rectifier; fill the cell with the original copper bath up to the Hull cell mark.2. Remove the plastic film of the brass panel mechanically and scratch it in the middle with the emery paper.3. Electro-clean the panel, immerse it into an acid dip, rinse well and put it into the cell. Move slightly to and fro in order to wet the panel properly. Then connect with the cable to the (-) pole of the rectifier.4. Use an aquarium pump for air agitation and plate the panel at 2 A for 10 minutes (full voltage, current adjusted to the desired value).5. Take out the panel, rinse it well and dry it with hot or compressed air. <p>If the analysis of the bath values indicated that some inorganic ingredient should be adjusted, plate a second panel with these corrections.</p>
evaluation:	A correct SurTec 869 panel should be completely bright and levelled.

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 869 A	liquid, light blue	1.012 (1.00-1.02)	approx. 3.5
SurTec 869 I	liquid, dark blue	1.028 (1.02-1.04)	< 1
SurTec 869 II	liquid, colourless	0.997 (0.99-1.01)	approx. 6.5

Consumption and Stock Keeping

The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see [SurTec Technical Letter 11](#). The following values per 10,000 Ah can be taken as estimated average consumption:

SurTec 869 A	0-1 l
SurTec 869 I	1.5-3.0 l
SurTec 869 II	0-2 l

In order to prevent delays in the production process, per 1,000 l bath the following amounts should be kept in stock:

SurTec 869 A	25 kg
SurTec 869 I	100 kg
SurTec 869 II	50 kg

Product Safety and Ecology

The safety instructions and the instructions for environmental protection have to be followed in order to avoid hazards for people and environment. The Material Safety Data Sheets (according to European legislation) contain explicit details for this.

The following hazard designations and classifications into water hazard classes (WHC) have to be taken into account:

<u>product</u>	<u>hazard designation</u>	<u>water hazard class</u>
SurTec 869 A	-	WHC 1
SurTec 869 I	-	WHC 1
SurTec 869 II	-	-

Warranty

We are responsible for our products in the context of the valid legal regulations. The warranty exclusively accesses for the delivered state of a product. Warranties and claims for damages after the subsequent treatment of our products do not exist. For details please consider our [general terms and conditions](#).

Further Information and Contact

In our forum, you can discuss topics of the surface technology:

<http://forum.SurTec.com/>

If you have any questions concerning the process, please contact your local technical department: <http://SurTec.com/International.html>

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