

SurTec® 758

Bright Acid Zinc Plating Process

Properties

- produces very bright and ductile zinc layers without chipping off
- additives in high concentration, very economic consumption
- excellent covering, very good throwing power and metal distribution
- perfect for rack plating, with air or rack agitation
- also appropriate for barrel plating
- tolerates low and high temperatures (cloud point > 70°C)
- designed for ammonium free potassium electrolyte; sodium or ammonium or mixed electrolytes also are possible
- runs with high and low zinc content
- can be chromated easily in each colour
- rather insensitive to overdosage of brightener or drag-in of impurities
- IMDS-number: 213570

Application

The process SurTec 758 includes the following products:

- SurTec 758 I Carrier is responsible for the equal metal distribution
- SurTec 758 II Brightener effectuates the desired brightness to the layer
- SurTec 758 A HCD-Booster is an additive for the high current density range and is needed for the rack process, especially while working with low zinc concentration

make-up values:

	standard process (20-30°C)	warm process (30-45°C)
zinc chloride	50 g/l	60 g/l
potassium chloride	205 g/l	205 g/l
boric acid	25 g/l	25 g/l
SurTec 758 I Carrier	30 ml/l	40 ml/l
SurTec 758 II Brightener	1 ml/l	1.5 ml/l
SurTec 758 A HCD-Booster (only for rack process)	4 ml/l	4 ml/l

analytical values:

zinc	25 g/l	(18-35 g/l)	30 g/l	(25-45 g/l)
chloride	125 g/l	(Zn + 100 g/l)	130 g/l	(Zn + 100 g/l)
boric acid	25 g/l	(18-25 g/l)	25 g/l	(18-25 g/l)
pH-value	5.5	(5.2-5.8)	5.5	(5.2-5.8)

make-up:

Steps for make-up:

1. Fill warm deionised water into the tank (50 % of the final volume).
2. Add and dissolve zinc chloride and boric acid.
3. Add potassium chloride.
4. Fill up to 90 % of the final volume.
5. Adjust the pH-value with hydrochloric acid.
6. Add SurTec 758 I, SurTec 758 II and SurTec 758 A in this sequence.
7. Fill up to the final volume.
8. Filtrate before use to prevent rough deposits.

temperature:	<i>standard process</i>	<i>warm process</i>
	20-30°C	30-45°C
	technical limits:	
	15°C	(lower the current density)
	65°C	(coverage and brightness decreased)
cathodic current density:	1 A/dm ²	(0.5-2.0 A/dm ²)
	1.5 A/dm ²	(0.5-4.0 A/dm ²)
		<i>barrel</i>
		<i>rack</i>
	The maximum current density depends on zinc content and temperature and can be extended by adding SurTec 758 A.	
current efficiency:	85-98 %	
deposition rate:	0.25 µm/min	(15 µm/h at 1 A/dm ²)
anodes:	pure zinc 99.99 %	
tank material:	plastic or plastic coated steel	
agitation:	rack agitation (3-6 m/min) or oil-free compressed air agitation	
filtration:	continuous filtration with 1-5 circles/hour recommended for standard, required for warm processes	
heating:	only for warm zinc process necessary	
cooling:	due to its temperature tolerance, SurTec 758 needs no cooling	
exhaust:	recommended	

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 758 I	liquid, yellowish-brownish	1.091 (1.06-1.12)	approx. 5.5
SurTec 758 II	liquid, yellowish-brownish	0.963 (0.95-0.98)	approx. 5.5
SurTec 758 A	liquid, colourless-yellowish	1.005 (0.99-1.02)	5.5 (4.5-6.5)

Maintenance and Analysis

Check the **pH-value** regularly. If the pH-value is too low, a quicker increase of iron can be observed. Covering and metal distribution will get worse. A too high pH-value will lead to a decrease of zinc as well as roughness of the layer caused by included metal hydroxides. Furthermore burnings will occur within the high current density range.

Dose SurTec 758 II according to ampere-hours. **Drag-out losses** of SurTec 758 I and 758 A can be replenished proportional to the addition of potassium chloride: per 10 kg KCl add 1 l SurTec 758 I and - if required - 0.05 l SurTec 758 A. Add also 1-1.25 kg boric acid per 10 kg KCl.

Iron, if higher than 100 ppm, will disturb the process within the high current density range - especially with blue-chromated parts - and needs to be removed. To precipitate iron, increase the electrolyte's pH-value to approx. 6.0 with a strongly diluted solution of potassium hydroxide. Oxidate the iron by adding 0.1-0.3 ml/l hydrogen peroxide solution (diluted 1:10) and let it precipitate. Filtrate the iron(III) hydroxide. Do not overdose hydrogen peroxide since it leads to rough zinc layers. To remove at least a part of the iron, continuous oxidation with air oxygen (air current) and filtration is recommended.

Excessive **zinc** will raise the burning point, but metal distribution will deteriorate. A lack of zinc will lead to burnings - that's when SurTec 758 A is needed.

If **chloride** gets too high in concentration, zinc as well as iron will be dissolved. Zinc layers will get more brittle. If chloride is too low in concentration, burnings and a decrease of zinc will occur.

Boric acid, if too high in concentration, won't be dissolved completely. This will lead to roughness in the zinc layer. Undissolved boric acid can be removed from the bath by filtration. If the concentration of boric acid in potassium electrolytes is too low, burnings will occur within the high current density.

A lack of **SurTec 758 I Carrier** leads to roughness within the high current density range, eventually causing chip-off. A certain overdosage of SurTec 758 I won't do any optical or technical harm. But if triple dosage is exceeded, more brightener is needed and problems may occur during passivation.

SurTec 758 II Brightener is added for supply during the process. A decline of brightness of the zinc layer will be overcome by adding SurTec 758 II. Overdosage will lead to greasy brightness, but won't cause problems unless there is a lack of SurTec 758 I. Then brittle zinc layers will occur.

A lack of **SurTec 758 A HCD-Booster** will cause greyness, up to burnings within the high current density. High overdosage will lead to embrittlement and should be avoided.

Analyse and adjust the concentration of zinc, chloride and boric acid regularly.

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.

Zinc – Analysis by Titration

reagents: 0.1 mol/l EDTA solution (Titriplex III)
buffer solution (100 g NaOH and 240 ml 98 % acetic acid
to 1000 ml with deionised water)
indicator: xylenol orange tetra sodium salt (1 % in KNO₃)

procedure: 1. Pipette 5 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with 100 ml deionised water.
3. Add 20 ml buffer solution.
4. Add a spatula tip of indicator.
5. Titrate with 0.1 M EDTA from red to yellow.

calculation: consumption in ml · 1.3074 = g/l zinc

correction: rise by 1 g/l zinc = addition of 2 g/l zinc chloride

Chloride – Analysis by Titration

reagents: 0.1 N silver nitrate solution
indicator: chloride indicator (5 g K₂Cr₂O₇ + 95 NaHCO₃)
or potassium chromate solution (5 %)

procedure: 1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with 100 ml deionised water.
3. Add the indicator.
4. Titrate with 0.1 N silver nitrate solution from yellow to brown.

calculation: consumption in ml · 3.545 = g/l chloride

correction: rise by 1 g/l chloride = addition of 2 g/l potassium chloride

Boric Acid – Analysis by Titration

reagents:	0.1 N NaOH solution mannitol EDTA sodium salt NaOH solution (15 %)
procedure:	1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask. 2. Dilute with 50 ml deionised water. 3. Add 2-4 g EDTA sodium salt. 4. Adjust the pH-value to pH 7.9 with 15 % NaOH solution. 5. Add 2 g mannitol to the clear solution. 6. Titrate with 0.1 N NaOH solution to pH 7.9.
calculation:	consumption in ml · 0.618 = g/l boric acid

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:

	<i>standard process</i>	<i>warm process</i>
SurTec 758 II	1-2 l	1-2.5 l

These values are applied for potassium electrolyte, for ammonium electrolyte the consumption is much higher.

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

SurTec 758 I	25 kg
SurTec 758 II	100 kg
SurTec 758 A	25 kg

In order to prevent crystallisation, store the additives > 0°C. Heating will re-dissolve them, but a remix (e.g. by pumping) would be necessary.

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 758 I	Xi - Irritant	WHC 2
SurTec 758 II	T - Toxic	WHC 2
SurTec 758 A	-	WHC 2

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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