

SurTec® 753

Acid Zinc Process

Properties

- mirror-bright deposits are reached
- superior throwing power
- suitable for rack and barrel applications
- constant very high cloud point
- can be used in potassium based electrolytes as well as in full ammonia and mixed ammonia bath types
- economical technology with easy bath control
- the resulting layers can easily be passivated
- IMDS-number: 213570

Application

SurTec 753 can be applied in rack or barrel application. The process includes the following products:

- SurTec 753 I Carrier is responsible for the equal metal distribution and is the basis for the brightener additive
- SurTec 753 II Brightener brings the desired brightness to the layer

make-up values:	<i>ammonia electrolyte</i>	<i>potassium electrolyte</i>	<i>mixed electrolyte</i>	<i>warm zinc electrolyte</i>
Zn	30 (12 - 37) g/l	25 (18-35) g/l	30 (12-37) g/l	35 (25-45) g/l
NH ₄ Cl	160 (120-180) g/l	-	30-60 g/l	-
KCl	-	200 (175-225) g/l	120-180 g/l	200-220 g/l
boric acid	-	18-25 g/l	-	18-25 g/l
SurTec 753 I	40 ml/l	40 ml/l	40 ml/l	40 ml/l
SurTec 753 II*	1 ml/l	1 ml/l	1 ml/l	1 ml/l
pH-value	5-6	5.2-5.8	5-6	5.2-5.8
temperature	20-40°C	20-30°C	20-40°C	30-45°C

*for barrel application: only use 0.5-0.75 ml/l SurTec 753 II Brightener

make-up:

Steps for make-up:

1. Fill 50 % warm deionised water into the tank.
2. Add and dissolve zinc chloride and boric acid.
3. Add potassium chloride.
4. Fill up to 90 % of the final volume and adjust the pH-value with hydrochloric acid.
5. Add SurTec 753 I Carrier and SurTec 753 II Brightener in this sequence.
6. Fill up to the final volume.
7. Filter before use to prevent rough deposits.

pH-value:

5.3 (5.0-6.0)

adjust with hydrochloric acid (1:1) resp. with 10 % KOH solution

	<i>rack</i>	<i>barrel</i>
cathodic current density:	3 A/dm ² (2-5 A/dm ²)	1 A/dm ² (0.5-1.5 A/dm ²)
voltage:	2.5 V (1-4 V)	5 V (2-8 V)
plating speed:	approx. 45 µm/h at 3 A/dm ²	approx. 15 µm/h at 1 A/dm ²
current efficiency:	96-99 %	
anodes:	pure zinc 99.99 %	
tank material:	steel with acid-resistant coating	
filtration:	continuous filtration with 1-5 circles/hour	
heating:	only for warm zinc process necessary: out of acid-resistant material	
cooling:	due to its temperature tolerance, SurTec 753 needs no cooling	
exhaust:	recommended	

recommended process sequence (for steel parts):

1. hot degreasing
emulsifying: SurTec 188 + SurTec 415
demulsifying: SurTec 188 + SurTec 089
2. hydrochloric acid pickling with SurTec 424
3. anodic electrolytical cleaning SurTec 171
4. neutralisation SurTec 481
5. **Acid Zinc Process SurTec 753**
6. activation in 1 %vol nitric acid
7. passivation, e.g. Chromiting® SurTec 680
8. hot air drying

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

Technical Specification

(at 20°C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 753 I	liquid, reddish, clear	1.112 (1.09-1.12)	5.5 (4.5-6.5)
SurTec 753 II	liquid, yellowish, clear	1.060 (1.05-1.07)	6.0 (5.0-7.0)

Maintenance and Analysis

Check the pH-value regularly. Analyse and adjust the concentration of zinc, boric acid and chloride regularly. Dose SurTec 753 according to plated ampere-hours. Analyse metal impurities in larger intervals or if difficulties occur.

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:	0.05 mol/l EDTA (Titriplex III) buffer solution (55 g NH_4Cl and 350 ml conc. ammonia) 5 N sulfuric acid ammonia solution (conc.) indicator: methyl thymol blue indicator mix (methyl thymol blue sodium salt/potassium nitrate 1:100)
procedure:	<ol style="list-style-type: none">1. Pipette 10 ml bath sample into a 250 ml volumetric flask.2. Add 1 ml 5 N sulfuric acid.3. Fill up to the mark with deionised water and mix well.4. Pipette 25 ml of this solution into a 500 ml Erlenmeyer flask and dilute with 200 ml deionised water.5. Add 10 ml conc. ammonia solution.6. Add 20 ml buffer solution.7. Add a spatula tip of indicator mix.8. Titrate with 0.05 mol/l EDTA from blue to colourless or pale grey.
calculation:	consumption in ml \cdot 3.27 = 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 chloride indicator (5 g $\text{K}_2\text{Cr}_2\text{O}_7$ + 95 NaHCO_3) or potassium chromate solution (5 %)
procedure:	<ol style="list-style-type: none">1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer beaker.2. Dilute with 100 ml deionised water.3. Add some indicator.4. Titrate with 0.1 N silver nitrate solution from yellow to brown.
calculation:	consumption in ml \cdot 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:	<ol style="list-style-type: none">1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer beaker.2. Dilute with 50 ml deionised water.3. Add 2-4 g EDTA.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 \cdot 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 (for barrel application):

SurTec 753 I	2 l
SurTec 753 II	0.7-1.5 l

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

SurTec 753 I	50 kg
SurTec 753 II	25 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 753 I	-	WHC 1
SurTec 753 II	Xi - Irritant	WHC 1

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>