

SurTec® 690

Black Passivation for Zinc Plating

Properties

- provides a black passivated conversion coating on alkaline zinc
- hexavalent chromium free black passivation based on chromium(III)
- produces layers of beautiful and uniform black appearance
- superior corrosion protection, even without sealer or finishing solution
- easy waste water treatment
- usable with conventional equipment
- IMDS-number: 63172992

Application

The process SurTec 690 includes the following products:

- SurTec 690 I Make-up Solution contains chromium and cobalt ions and is only needed for new make-up of the passivation
- SurTec 690 II Additive is mainly responsible for the black appearance of the layer and for buffering the solution
- SurTec 690 III Replenisher contains chromium and cobalt ions for the maintenance of the passivation

make-up values:	<i>rack</i>	<i>barrel</i>
SurTec 690 I	8 %vol (6-10 %vol)	8 %vol (7-9 %vol)
SurTec 690 II	5 %vol (4 - 6 %vol)	5 %vol (4-6 %vol)
temperature:	30 °C (20-40 °C)	30 °C (20-40 °C)
application time:	60 s (50-70 s)	30 s (20-40 s)
agitation:	forced air agitation	barrel rotation
pH-value:	1.9 (1.8-2.0)	2.3 (2.0-2.5)
	adjust with nitric acid (HNO ₃) or caustic soda (NaOH)	
make-up:	Steps for make-up:	
	1. Fill the calculated amount of SurTec 690 I into the tank.	
	2. Dilute with deionised water to about 90 % of the final volume, mixing well.	
	3. Add the calculated amount of SurTec 690 II slowly under continuous stirring.	
	4. Fill up to the final volume with deionised water.	
	5. Check the pH-value and adjust if necessary.	
analytical value:	chromium 1.3 g/l	
	(for a make-up concentration of 8 %vol SurTec 690 I)	
tank material:	lined with PVC or PP	

recommended process sequence:

1. alkaline zinc process SurTec 704
2. cascade rinsing
3. activation in 0.5 %vol nitric acid, pH 1.4-2.0
4. rinsing
5. **Black Passivation SurTec 690**
6. cascade rinsing
7. Post-Dip SurTec 544 or Sealing e.g. SurTec 555 S
8. hot air drying (40-70°C)

The rinsing methods have to be adapted to the plating line.

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (at 100 g/l)
SurTec 690 I	liquid, dark grey-violet	1.094 (1.08-1.11)	1.8 (1.3-2.3)
SurTec 690 II	liquid, colourless	1.121 (1.11-1.13)	3.6 (2.6-4.6) (conc.)
SurTec 690 III	liquid, dark-grey-violet	1.115 (1.10-1.13)	1.1 (0.6-1.6)

Maintenance and Analysis

Check the pH-value regularly. Analyse the concentration of chromium regularly and adjust by adding SurTec 690 III Replenisher.

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.

Chromium – Analysis by AAS

equipment:	atomic absorption spectrometer (AAS): wave length: 357.9 nm
reagents:	hydrochloric acid (1:1) chromium standard solutions
procedure:	Prepare a device-specific dilution, e.g. 1:2000: <ol style="list-style-type: none">1. Pipette 5 ml bath sample into a 100 ml volumetric flask.2. Add 50 ml deionised water.3. Acidify with 2 ml half conc. hydrochloric acid.4. Fill up to 100 ml with deionised water.5. Pipette 5 ml from this dilution into a 500 ml volumetric flask.6. Add approx. 5 ml half conc. hydrochloric acid.7. Fill up to 500 ml with deionised water.8. Measure against chromium standard solutions using an AAS.
correction:	rise by 0.1 g/l chromium = addition of 8 ml/l SurTec 690 III
hints:	Prepare the dilution of the sample according to the specified range of the measuring device. The measuring can also be done via ICP.

Chromium – Analysis by Photometry

equipment:	spectrophotometer or filter photometer with 371 nm filter unit (± 50 nm) 50 ml and 100 ml volumetric flask 100 ml beaker 1 cm cuvette
reagents:	NaOH solution (10 %) H ₂ O ₂ (30 %)
procedure:	Prepare a chromium standard with SurTec 690 concentrate in a 100 ml beaker: Fill 8 ml SurTec 690 I and 5 ml SurTec 690 II up to 100 ml with deionised water. For each analysis prepare and measure the standard in the same way as the bath sample (standard = absorbance S). Sample preparation: <ol style="list-style-type: none">1. Pipette 10 ml bath sample into a 100 ml volumetric flask.2. Fill up with deionised water.3. Pipette 2.0 ml of this dilution into a 100 ml beaker.4. Add: 10 ml deionised water, 0.2 ml NaOH solution and 2 ml H₂O₂ (30 %) and mix by rotation.5. Cover the beaker with a watch glass and let react for 5 minutes (gas evolution!).6. Then heat up the solution and boil for 1 minute, and let it cool down.7. Pour the solution quantitatively into a 50 ml volumetric flask, fill up with deionised water and mix. Sample measurement: <ol style="list-style-type: none">1. Filtrate the so prepared solution through a blue ribbon filter.2. Fill the filtrated solution into the same 1 cm cuvette that was used for measuring the standard.3. Measure it in the photometer at 371 nm (bath sample = absorbance P) against deionised water.
calculation:	$1.3 \cdot (\text{absorbance } \mathbf{P}) / (\text{absorbance } \mathbf{S}) = \text{g/l chromium}$
correction:	rise by 0.1 g/l chromium = addition of 8 ml/l SurTec 690 III

Chromium – Analysis by Titration

<u>Important:</u>	While preparing the samples, nitrous gases will be formed – therefore an extractor hood is absolutely essential!
reagents:	sodium hydroxide solution (NaOH solution, 25 %) H ₂ O ₂ (30 %) hydrochloric acid (conc.) nitric acid (conc.) sulfuric acid (conc.) potassium iodide 0.1 N sodium thiosulfate solution (= 0.1 mol/l) starch solution (1 %) sodium bifluoride (sodium hydrogen bifluoride)
procedure:	<ol style="list-style-type: none">1. Pipette 10 ml bath sample into a 250 ml beaker.2. Acidify with 5 ml sulfuric acid and 5 ml nitric acid.3. Heat up the solution and boil for approx. 1 hour, until no nitrous gases will be formed any more.4. Let it cool down and add 50 ml deionised water.5. Add 5 ml H₂O₂.6. Very slowly add 40 ml NaOH solution. Caution: gas evolution! (The solution becomes yellow/brown.)7. Heat up again and boil for at least 45 min; at least 60 ml of the solution should remain in the beaker.8. In case of precipitations, filtrate the chilled solution and wash the filter with deionised water.9. Add 1 g sodium bifluoride and 15 ml hydrochloric acid to the filtrate.10. Add 2 g potassium iodide.11. Titrate with 0.1 mol/l sodium thiosulfate solution to a weak yellow colour.12. Add a few drops of starch solution (colour changes to blue).13. Continue titrating until the colour disappears.
calculation:	consumption in ml · 0.18 = g/l chromium
correction:	rise by 0.1 g/l chromium = addition of 8 ml/l SurTec 690 III

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 m² can be taken as estimated average consumption:

SurTec 690 II Additive	5-15 ml
SurTec 690 III Replenisher	10-20 ml

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 690 I	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 690 II	Xi - Irritant	WHC 1
SurTec 690 III	T - Toxic N - Dangerous for the environment	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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