

SurTec® 830

Electroless Nickel

with Middle Content of Phosphorous

Properties

- weak acid electroless nickel process
- very good stabilised process
- high deposition rate (18-20 $\mu\text{m/h}$)
- phosphorous content of the nickel layer: 6-8 %
- hardness (Vickers) of the deposited layer is about 500 HV and can be increased by heat treatment to 1100 HV
- bath load should be about 0.2-2 dm^2/l
- IMDS-number: 10647411

Application

The process SurTec 830 includes the following products:

- SurTec 830 I Make-up Reductor contains the reduction additives and the stabilisers for the new bath make-up
- SurTec 830 II Nickel Concentrate is used for new bath make-up and for correcting the nickel content according to analysis (for 1 g/l nickel, add 8.3 ml/l SurTec 830 II)
- SurTec 830 III Maintenance Reductor contains the reduction additives in the correct ratio for maintenance (for each part SurTec 830 II, also 2 parts SurTec 830 III have to be added)

make-up values: SurTec 830 I 15 %vol
 SurTec 830 II 5 %vol
 SurTec 830 III only for maintenance

analytical values: nickel 5 - 6 g/l
 sodium hypophosphite 24-36 g/l

make-up: Steps for make-up:

1. Fill 50 % of the deionised water into the tank.
2. Add the calculated amount of SurTec 830 II and stir well.
3. Add the calculated amount of SurTec 830 I and stir well.
4. Fill up to the final volume with deionised water.
5. Check the pH-value and adjust if necessary.
6. Filtrate the bath to prevent rough deposits.
7. Heat up to working temperature.

temperature: 90 °C (85-95 °C)

pH-value (at 20 °C): 4.7 (4.6-4.9)
 adjust with sulfuric acid (10 %) or 25 % ammonia solution (1:1)

Measure the pH-value at room temperature or with a freshly calibrated pH-meter with temperature compensation.

deposition rate: 18-20 $\mu\text{m/h}$; depending on temperature, pH-value and bath age

agitation: strong electrolyte circulation or air agitation (clean/filtered compressed air, to prevent impurities which may disturb the bath).

tank material:	stainless steel (type 316) with anodic protection; or heat resistant PP tanks
filtration:	with filter bags, 5-10 times the bath volume/h, pore size: 1-5 μm Rinse new filter bags several times alternating with hot and cold water. Do not use magnetic valve pumps.
heating:	Tanks with outside wall heating are recommended. Indirect heating with steam tubes is possible (to cool down the bath quickly, the tubes can be fluted with cold water). By use of immersion heaters, they have to be fluted very strongly to prevent an overheating of the solution near the heater (this can lead to bath destruction).
cooling:	required to cool the bath at working breaks; out of acid resistant material
exhaust:	required for worker's protection
hints:	The bath should not be allowed to remain idle at operating temperature for a longer time. If there are longer periods without use, cool down the bath.

recommended process sequence (for iron parts):

- hot degreasing
emulsifying: e.g. SurTec 188 + SurTec 415
demulsifying: e.g. SurTec 188 + SurTec 089
- hydrochloric acid pickling, e.g. with SurTec 424
- anodic electrolytical cleaning, e.g. SurTec 171
- neutralisation, e.g. SurTec 481
- hydrochloric acid pre-dip
- rinsing
- Electroless Nickel SurTec 830**
- hot air drying
- if necessary, heat treatment for 1 hour at 400 °C

Between the immersing steps, there has to be rinsed. The rinsing methods have to be adapted to the plating line. For cleaning other basic materials we can provide a wide range of SurTec cleaner, please consult our technical staff.

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 830 I	liquid, colourless, clear	1.265 (1.23-1.30)	5.7 (5-6.5)
SurTec 830 II	liquid, green, clear	1.320 (1.26-1.38)	3.9 (3-5)
SurTec 830 III	liquid, colourless, clear	1.200 (1.18-1.22)	6.3 (5-7)

Maintenance and Analysis

Check the pH-value regularly (best in a bath sample at room temperature). At growing service life of the bath, pH-value and temperature have to be adjusted to higher values to get a constant deposition rate.

Analyse the nickel content regularly and adjust by dosing SurTec 830 II. For each part SurTec 830 II, also add two parts SurTec 830 III. The replenishment of Nickel solution must not exceed 20 % of the make-up value. Give small additions several times a day.

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 with a fluted filter.

Nickel – Analysis by Titration

reagents:	0.1 mol/l EDTA (Titrplex III) ammonia solution (conc.) indicator: murexide
procedure:	1. Pipette 10 ml bath sample into a 250 ml Erlenmeyer flask. 2. Dilute to approx. 100 ml with deionised water. 3. Add 12 ml ammonia solution. 4. Add a spatula tip of indicator. 5. Titrate with 0.1 M EDTA from yellow to violet.
calculation:	consumption in ml · 0.587 = g/l nickel
correction:	rise by 1 g/l nickel = addition of 8.3 ml/l SurTec 830 II Together with 8.3 ml/l SurTec 830 II, also add 16.6 ml/l of SurTec 830 III to the bath.

Na-hypophosphit – Analysis by Titration

reagents:	hydrochloric acid (1:1) 0.1 N Iodine solution 0.1 N sodium thiosulfate solution starch solution (1 %, freshly made)
procedure:	1. Pipette 5 ml bath sample into a closable iodine count flask. 2. Dilute with 50 ml deionised water. 3. Add 30 ml hydrochloric acid. 4. Add 50.0 ml of 0.1 N Iodine solution. 5. Close the flask and store for 30-40 min in the dark, mix it from time to time slightly. 6. Add some starch solution. 7. Titrate with 0.1 N sodium thiosulfate solution until complete discolouration.
calculation:	$(50 - \text{consumption in ml}) \cdot 1.0575 = \text{g/l Na-hypophosphit}$
correction:	rise by 1 g/l = addition of 3 ml/l SurTec 830 III
hint:	SurTec 830 III is normally dosed according to SurTec 830 II Nickel Concentrate, in the ratio 2:1. Only in special cases, small amounts of SurTec 830 III can be added separately.

Ingredients

- sodium hypophosphit
- lead and cadmium compounds

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](#).

Following values per 100 dm² per plated layer thickness of 1 µm can be taken as estimated average consumption:

SurTec 830 II	60 ml
SurTec 830 III	120 ml

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

SurTec 830 II	50 kg
SurTec 830 III	100 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 830 I	Xi - Irritant	WHC 2
SurTec 830 II	T - Toxic N - Dangerous for the environment	WHC 2
SurTec 830 III	Xi - Irritant	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>

Trouble Shooting

If any trouble occurs, always control temperature, pH-value and nickel content at first.

problem	possible cause	remedy
skip plating, bad throwing or rough edges	a) pretreatment is inefficient	check the pretreatment
	b) too strong bath agitation	reduce the bath agitation
	c) bath load is too low	increase work load
	d) metallic contamination	analyse; work out or new make-up
	e) organic contamination	throw bath away and make new bath make-up
roughness in the deposits	a) bath contamination by small solid particles, metal abrasion	control the filtration (pore size approx. 5 µm)
	b) bath solution is turbid	can occur at too high pH-values: check and adjust the pH-value
	c) make-up water is contaminated	check the water quality
	d) too fast or too high dosage of the additives during deposition	dose the additives portion by portion over the day (or automatically), choice adding place far away from the parts
	e) magnetism in the substrate	demagnetize the substrate before plating
	f) filter bag is contaminated	change filter bag regularly
streaks in the deposits	a) gas streaks by sort of agitation/part fixation	control agitation and part fixation
	b) drag-in of silicates	change pretreatment or make a fluoride containing post-dip
	c) rinsing method is inefficient	improve the rinsing procedure
	d) metallic contamination	analyse, work out or new bath make-up
	e) organic contamination	throw bath away and make a new bath make-up
	f) bath agitation is inefficient	improve the bath agitation
	g) bath load is too low	increase work load
	h) content of reductor is too low	analyse and correct the content
pitting	a) heavy metal contamination	analyse, work out or new bath make-up
	b) too high bath activity	lower pH-value, temperature and bath load
	c) wrong content of reductor	analyse and adjust/work out
matte deposits	a) organic contamination	throw the bath away and make a new bath make-up
	b) bath parameters are not correct	analyse the bath completely
	c) metallic contamination	analyse, work out onto a large surface
	d) bath is too old	throw the bath away and make a new bath make-up
poor adhesion	a) zinc content is too high	throw the bath away and make a new bath make-up
	b) pretreatment is insufficient	improve the pretreatment
	c) passivated parts	reduce the transfer times
	d) drag-in of (pickling-) inhibitors	improve the rinsing process
	e) quality of the basic material	control the alloy