

SurTec® 852 IV

Pearl Nickel

Properties

- produces uniform, matt and fine-grained nickel coatings; the grade of dullness can be adjusted by dosing SurTec 852 IV
- even polished material will be low-reflective and dazzle-free
- good grip and abrasion resistance
- active nickel layer, easy to chromium-plate

Application

The process SurTec 852 IV includes the following products:

- SurTec 852 A Carrier A
- SurTec 852 B Carrier B
- SurTec 852 IV Pearl Builder

make-up values:

nickel sulfate · 6 H ₂ O	430 g/l	
nickel chloride · 6 H ₂ O	35 g/l	
boric acid	40 g/l	
SurTec 852 A Carrier A	20 ml/l	(18-22 ml/l)
SurTec 852 B Carrier B	12 ml/l	(10-14 ml/l)
SurTec 852 IV Pearl Builder	0.6 ml/l	(0.4-1.0 ml/l)

analytical values:

nickel	105 g/l	(100-110 g/l)
chloride	10 g/l	(7-13 g/l)
boric acid	40 g/l	(35-42 g/l)

make-up:

Steps for make-up:

1. Fill warm deionised water of 60°C into a separate tank.
2. Dissolve the salts and boric acid under vigorous stirring.
3. Admix 2 g/l active carbon powder and stir for 2 h.
4. Allow it to settle and filter into the clean plating tank.
5. Fill up to the final volume with deionised water.
6. Add SurTec 852 A and SurTec 852 B and distribute them homogeneously.
7. Premix SurTec 852 IV Pearl Builder 1:30 with deionised water and add it slowly, while stirring.
8. Wait for 30 minutes, then the electrolyte is ready to use.

temperature: 55°C (50-60°C)

pH-value: 4.3 (4.1-4.5)
adjust with sulfuric acid, or increase by plating

cathodic	
current density:	4-8 A/dm ²
anodic	
current density:	1-3 A/dm ² (voltage: 4-7 V)
anodes:	pure nickel (DIN 1702) of any shape; PP bag recommended
agitation:	rack agitation, optimal 2-dimensional, with "knocking"
tank material:	steel with heat resistant plastic coating
heating:	necessary; made of acid resistant material (e.g. porcelain, PTFE)
exhaust:	recommended for worker's protection
filtration:	NOT during the deposition, but at the end of the working day Filtration will remove SurTec 852 IV Pearl Builder, so it has to be re-added 30 minutes before the next plating shift.
hints:	Any trace of wetting agent or non-related organic will lead to lack of matt effect. The immersion time without current must not exceed 10 seconds.

Technical Specification

(at 20 °C)	Appearance	Density (g/ml)	pH-value (conc.)
SurTec 852 A	liquid, yellowish	1.102 (1.09-1.12)	3-5
SurTec 852 B	liquid, colourless	1.107 (1.05-1.20)	3-5
SurTec 852 IV	liquid, colourless	0.997 (0.99-1.01)	3-5

Maintenance and Analysis

Analyse and adjust the concentration of nickel, chloride and boric acid regularly. Dose SurTec 852 A and SurTec 852 B according to conductivity or to ampere-hours. Besides they can be analysed by HPLC.

SurTec 852 A and B Carrier are the basis of the additive system. An excess will have nearly no effect (neither positive nor negative); a lack will decrease the matt effect slightly. Filtration will not change the concentration of the carrier.

The matt pearl effect depends strongly on the concentration of **SurTec 852 IV Pearl Builder**. The higher the content is, the more intense the effect will be. A heavy overdosage can lead to bad adhesion of the pearl nickel layer. The higher the concentration of SurTec 852 IV Pearl Builder, the shorter the immersion time without current must be (see "hints").

Unfortunately, **wetting agents** and **purifiers** are not tolerated by the pearl nickel electrolyte. Traces of wetting or brightening agents in filter material and pumps will have a very bad influence on the matt effect. Remedy by active carbon treatment is not sure to remove every organic. Thus, high attention must be paid to use only clean material.

Metallic impurities lead to discoloration and sometimes to bright spots but can only be removed by selective (dummy) plating.

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.

Nickel – Analysis by Titration

reagents: 0.1 mol/l EDTA (Titrplex III)
ammonia solution (conc.)
indicator: murexide

procedure: 1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 100 ml 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 · 5.87 = g/l nickel

correction: rise by 1 g/l = addition of 4.5 g/l nickel sulfate · 6 H₂O
or: 4.1 g/l nickel chloride · 6 H₂O

Chloride – Analysis by Titration

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

procedure: 1. Pipette 1 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 100 ml deionised water.
3. Add some indicator (pH-value has to be between 6.5 and 10.5).
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 = addition of 3.0 ml/l HCl (30 %)
or: 3.4 g/l nickel chloride · 6 H₂O

Boric Acid – Analysis by Titration

reagents: 0.1 N NaOH solution
EDTA sodium salt
mannitol
NaOH solution (15 %)

procedure: 1. Pipette 2 ml bath sample into a 250 ml Erlenmeyer flask.
2. Dilute with approx. 50 ml deionised water.
3. Add 2-4 g EDTA salt.
4. Adjust the pH-value to pH 7.9 with 15 % NaOH solution.
5. Add so much mannitol to the **clear** solution, until the pH is not changing more than 0.1 points (approx. 10 g).
6. Titrate with 0.1 N NaOH solution to pH 7.9 again.

calculation: consumption in ml · 3.09 = g/l boric acid

Consumption and Stock Keeping

The additives are consumed by drag-out as well as electrochemically (anodic oxidation and cathodic build-in). The consumption depends heavily on the drag-out. To determine the exact amounts of drag-out, see [SurTec Technical Letter 11](#).

The following values can be taken as estimated average consumption:

SurTec 852 A	0.5-1.5 l per 10,000 Ah
SurTec 852 B	1.5-3.0 l per 10,000 Ah
SurTec 852 IV	0.04 ml/l per hour

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

SurTec 852 A Carrier A	30 kg
SurTec 852 B Carrier B	60 kg
SurTec 852 IV Pearl Builder	60 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 852 A	-	WHC 0
SurTec 852 B	-	WHC 1
SurTec 852 IV	-	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>

Trouble Shooting

problem	possible cause	remedy
burnings	a) current density is too high	lower the current density
	b) insufficient agitation	improve the agitation
	c) low metal content	add nickel sulfate (after checking pH and Cl)
	d) boric acid content is too low	add boric acid
bright deposit areas	a) insufficient pretreatment	check pretreatment and rinsing steps
	b) insufficient "knocking" during rack movement	improve the "knocking" process
	c) wetting agents or other organic impurities	stop the source of contamination, treat with active carbon
turbid bath solution	a) bath temperature is too high	lower the temperature
	b) boric acid content is too high	filtrate the bath solution at 25 °C
	c) iron impurity	treat with peroxide at high pH
	d) calcium impurity	precipitate Ca by addition of KF
insufficient layer thickness	a) metal content is too low	add nickel sulfate
	b) current density is too low	rise the current density
	c) defective contacts	check the contacts and clean them
	d) anode surface is too small	increase the anode surface
	e) plating time is too short	prolong the plating time
double nickel	a) pH-value is too high	adjust the pH with sulfuric acid
	b) bad contacts	check contacts and clean them
yellowish nickel layer	a) iron impurity	treat with peroxide at high pH
	b) iron in the spare rinse	refill spare rinse freshly
rough deposit	a) contamination with anode sludge	check the anode bags; filtrate the bath solution
	b) iron impurity	treat with peroxide at high pH
	c) bad pretreatment	improve the pretreatment
dark in the lcd	a) zinc impurity	selective plating in the lcd
	b) copper impurity	selective plating in the lcd