riag Oberflächentechnik AG · Postfach 169 · CH-9545 Wängi TG

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riag Cr 300

Trivalent decorative chromium process

The **riag Cr 300** bright chromium process produces bright, bluish chromium layers out of trivalent salt. The process has got an excellent covering and throwing power.

Properties

- excellent covering and throwing
- low metal concentration
- low power consumption
- no hexavalent chromium compounds

Make up

	Range	Optimum
riag Cr 300 Salt	240 – 340 g/L	260 g/L
riag Cr 300 Make up 1	160 – 240 mL/L	220 mL/L
riag Cr 300 Make up 2	8 – 12 mL/L	10 mL/L
riag Cr 300 Tenside	2 – 4 mL/L	3 mL/L
pH-value	3.3 – 3.7	3.4

Operating data

Chromium (Cr^{3+})	9.0 – 12.0 g/L	11.0 g/L
Boric acid (H_3BO_3)	65 – 85 g/L	75 g/L
Density	1.15 – 1.30 g/mL	1.21 g/mL

Make up procedure

Fill the tank with 60 % of the final volume with deionised water. Heat to 55 °C, add **riag Cr 300 Salt** and stir until dissolved. After the addition of **riag Cr 300 Make up 1** mix thoroughly and adjust the pH to 3.5 with caustic soda 25 %. After a few hours adjust the pH to 3.5 again and repeat the procedure until the pH is stable. **The pH-value must never rise above 3.8!**
Add 1 mL/L **riag Cr 300 Purifier**, stir overnight. To filter the solution, coat the filter with 1 g/L **riag Carb SF** (activated carbon) and add 1.5 mL/L hydrogen peroxide 30 %. Filter the solution over activated carbon during at least 12 hours and 15 turnovers. After the cleaning add **riag Cr 300 Make up 2** and **riag Cr 300 Tenside** and fill to the final volume with deionised water. Work the electrolyte through during 1 h.

Operating Conditions

Temperature	47 °C (43 – 50 °C)
pH-value	3.4 (3.3 – 3.7)
Cathodic current density	3 – 5 A/dm^2 (depends on the part geometry)
Voltage	max. 12 volts
Plating time	2 min. (1 – 6 min.)
Anodes	use **riag Cr 300 Anodes** only
Agitation	Agitation with filter pump (1 – 2 turnover/h) and mild air agitation necessary
Tank and pipe work	New plastic tanks (PE, PP or PVC) or lined steel tanks The equipment should be treated with sulfuric acid 1 % at 65 °C during 8 hours
Filtration	It is important to use continuous filtration. The filtration rate should be one to two times the electrolyte volume per hour.
Heating	Immersion heaters, but thermostatic control is essential
Cooling	not required
Fume extraction	Recommended
Maintenance	The content of chromium and conductivity salt should be analysed and corrected regularly. Additions of **riag Cr 300 Replenisher 1, riag Cr 300 Replenisher 2** and **riag Cr 300 Tenside** are done via ampere-hour consumption.

Additive consumption

The additives are consumed during electrolytic reactions as well as drag-out losses, the use per 10 kAh can therefore vary.

riag Cr 300 Replenisher 1	0.5 – 1.0 L/1000 Ah
riag Cr 300 Replenisher 2	0.4 – 0.6 L/1000 Ah
riag Cr 300 Tenside	0.04 – 0.06 L/1000 Ah
riag Cr 300 Salt	13 g/L needed to increase the density of the electrolyte for 0.01 g/mL

The density of the electrolyte should be 1.15 – 1.30 g/mL. The optimum value depends on the plating line and has to be evaluated.

Hydrogen peroxide 30 % daily additions of 0.5 mL/L at the end of the working period

The additives may not be pre-mixed.

Metallic contamination

Metallic contamination can be removed by frequent selective plating-out at 0.05 – 0.1 A/dm^2. The filter pump should be on with the filter outlet directed at the panels. This will ensure thorough electrolyte circulation and essential agitation at the same time.
If you don't choose to selective plating-out, it is possible to work with **riag Cr 300 Purifier**.

pH-value setup

To lower the pH chem. pure sulphuric acid (20 %) is added. To raise the pH use caustic soda (20 %).
The pH-value must never rise above 3.8 or a loss of efficiency will occur.

Function of electrolyte components

riag Cr 300 Replenisher 1	Replenishing solution with 50 g/L chromium (III)
riag Cr 300 Replenisher 2	Replenishing solution with organic compounds
riag Cr 300 Replenisher 3	Replenishing solution with organic compounds, additions only on advice
riag Cr 300 Tenside	Wetting agent
riag Cr 300 Salt	Conductivity salt used for make up and replenishing (drag out)
riag Cr 300 Make up 1	Make up solution with 50 g/L chromium (III)
riag Cr 300 Make up 2	Make up solution with organic compounds
riag Cr 300 Purifier	Purifier solution
riag Cr 300 Anodes	Special anodes

Environmental considerations and product safety

All concentrates, rinse waters and waste solution must be treated and discharged in accordance with local effluent control regulations. Information can be gleaned from the material safety data sheets. Chemicals shall not be stored below 10 °C.

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Analytical Instructions:

Sample Preparation: Take a well mixed, homogeneous sample and allow to cool down to room temperature.

Optical finish evaluation using hull cell analysis:
Generally, we recommend to check the finish deposed by the electrolyte using hull cell analysis at regular intervals.
Therefore, we recommend to use the following parameter setup for the hull cell analysis:

Ground material (panel):	brass, polished (riag Art-No: 821011) bright nickel pre-plated (plated in a nickel electrolyte without brightener in a beaker setup)
Hull cell setup:	standard hull cell (267 mL)
Anode material:	**riag Cr 300**
Anode coverage (bag):	None
Agitation:	X without | mechanic (paddle) | air
Filtration:	without
Temperature:	47 °C
Current:	3 A
Deposition duration:	5 min
Comments:	Use the metal panel directly after pre-plating with nickel, activation and well flushed with clear water for the hull cell plating.

Chromium

Reagents:
Sodium hydroxide solution 50 %
Hydrogen peroxide 35 %
Hydrochloric acid 1 : 1 (18 %)
Potassium iodide solution 10 %
Starch solution, water soluble 1 %
Sodium thiosulphate solution 0,1 mol/L

Procedure:

2 mL	of the electrolyte into a 150 mL beaker (high build) and fill it up to 30 mL with deion. water. Stir well.
4 mL	of sodium hydroxide 50 % and
4 mL	H_2O_2 35 % were added. Boil under agitation for at least 30 minutes. Due to evaporative loss, add deion. water to keep the volume constant (arraound 30 mL). Let the solution cool down to room temperature.
20 mL	of deion. water,
25 mL	hydrochloric acid 1 : 1 and
10 mL	potassium iodide solution 10 % were added. The colour of the solution get dark. Titrate with sodium thiosulphate solution 0,1 mol/L till the color begins to lighten. With weaker colour, add
2 mL	of the starch solution. Continue the titration till the colourchangeover.

Calculation: needed volume of sodium thiosulphate solution 0,1 mol/L in mL x 0,865 = g/L chromium concentration.