

riag Ni 114

Brightness preserving nickel process

riag Ni 114 produces nickel deposits with the following advantages:

Properties

- brightness preserving, possibly slightly glossy
- very good ductility
- light deposits, extremely active nickel pre-plating
- uniform brightness in all current densities
- ideal for technical nickel plating
- ideal as pre-nickel for the **riag NiZn 170** process

Make up

	Range	Optimum
riag Ni 114 Elektrolyte	997 – 1000 mL/L	998 mL/L
riag Ni 138 Tenside M * or riag Ni 139 Tenside L *	0 – 3 mL/L	*2 mL/L
riag Ni 132 Make up *	0 – 4 mL/L	*2 mL/L
pH-value	4.5 – 5.5	5.0

* depending on customer-specific process requirements

Make up

The riag Ni 114 electrolyte is filled into the tank. Optionally **riag Ni 138 Tenside M / riag Ni 139 Tenside L** can be added. For the adjustment "slightly glossy" 2 – 4 mL/L **riag Ni 132 Make up** are added.

Alternatively the **riag Ni 114 electrolyte** can be prepared with 250 g/L **riag Ni 114 Salt**.

Operating values

	Range	Optimum
Nickel (Ni ²⁺)	36 – 44 g/L	40 g/L
Chloride (Cl ⁻)	19 – 23 g/L	21 g/L
Boric acid (H ₃ BO ₃)	6 – 10 g/L	8 g/L
Density (g/mL)	1.12 – 1.14 g/mL	1.13 g/mL
Density (°Bé)	15 – 18 °Bé	16.5 °Bé

Operating Parameters

Temperature:	30 °C (20 – 40 °C)
pH-value:	5.0 (4.5 – 5.5)
Cathodic current density:	Barrel : 0.1 – 0.5 A/dm ² Rack: 0.7 – 1.3 A/dm ²
Anodic current density:	< 3.0 A/dm ²
Current efficiency:	< 100 %
Deposition rate:	Barrel: at 0.5 A/dm ² ca. 0.1 µm/min Rack: at 1.0 A/dm ² ca. 0.2 µm/min
Anodes:	All types of nickel anodes can be used which have the minimum purity of 99.7 % Ni. We recommend polypropylene anode bags.
Agitation:	Electrolyte movement by means of a filter pump, mechanical or air agitation (depending on the tenside). Suitable barrel rotation required
Tanks:	Plastic or lined steel
Filtration:	The filtration rate should be two to three times the electrolyte volume per hour. Continuous filtration is not necessary, but recommended.
Heating:	Immersion heaters, but thermostatic control is essential
Cooling:	not required
Fume extraction:	Recommended
pH-value adjustment:	To lower the pH chem. pure sulphuric acid (10 %) is added. In exceptional cases (usually temporary) pure hydrochloric acid is used to increase the chloride content of the electrolyte. Ammonia is used to increase the pH value.

Maintenance: Analyse nickel and chloride regularly and correct with **riag Ni 114 Salt**. The addition of 100 g/L **riag Ni 114 Salt** increases the nickel content by 16 g/L.
Alternatively, you may operate in the nominal density range, in which case the following applies:
15 g/L **riag Ni 114 Salt** increase the density by 1 °Bé

Metallic contamination can be removed by frequent selective plating-out at 0.1 – 0.3 A/dm². 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.

riag Ni 132 Make up

riag Ni 132 Make up produces a basic gloss.

riag Ni Tenside M / L

The consumption of **riag Ni Tenside M / L** is 0.1 - 0.3 litres per 10 kWh. The consumption may vary due to electrolyte drag out.
A minimum content of **riag Ni Tenside M / L** in barrel nickel electrolytes is necessary to avoid e.g. the formation of perforation spots on flat parts which repeatedly "stick" to the barrel walls.

Activated Carbon

Continuous filtration over activated carbon is recommended. This can be done via a by-pass whereby the carbon will remove organic contaminants such as oils and breakdown products.
For this we recommend our **riag Carb SF** dust-free product which has an active surface area of 1500 m² /g. The additional brightener consumption should not exceed 5 %.
A significant contamination of the electrolyte can be removed by filtration in the bypass (filter pump with a filled sack of **riag Carb GR**). **riag Carb GR** is ideally suited for this purpose, as such treatment may be performed during the plating process. **riag** can provide such filter system.

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.

Liability

This instruction manual was compiled with reference to the state of the art and all current standards, and is based on the long-term knowledge and experience of riag. However, riag cannot monitor compliance with this instruction manual and the methods described herein at the customer/end-user's premises. Work carried out with riag products must be adapted accordingly to meet local conditions. In particular, riag cannot accept liability for damage, loss or cost incurred due to a failure to adhere to this instruction manual, improper application of the methods, unauthorised technical modifications, insufficient maintenance or the absence of maintenance in respect of the requisite technical hardware or equipment, or in the event of use by unqualified personnel. riag is not liable for damage or loss caused by riag or its employees except where intention or gross negligence can be proved. riag furthermore reserves the right to make changes in relation to products, methods and the instruction manual without prior notice.

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Analysis (Analytical Methods)

Sample preparation:

The sample must be taken from a well-mixed point and allowed to cool down to 25°C.

Boric acid

Reagents: Sodium hydroxide solution 0.1 mol/L
Bromcresol purple (1 % in Ethanol)
Mannitol

Procedure: 10 mL electrolyte are transferred via pipette into a 100 mL measuring flask and filled up to the mark with deionised water followed by mixing well.
10 mL of this mixture is given into a
250 mL beaker via pipette followed by
100 mL deionised water addition.
2 – 3 g Mannitol is added followed by addition of 10 drops Bromcresol purple.
0.1 mol/L Titration with Sodium hydroxide from yellow to green, to dark green and finally to blue-violet.

Calculation: Boric acid (g/L) = consumption of mL NaOH x 6.18

Nickel chloride hexahydrate

Reagents: Silver nitrate solution 0.1 mol/L
Potassium dichromate solution 5 %

Procedure: 5 mL electrolyte are transferred into a
250 mL glass beaker and diluted with
50 mL deionised water.
10 drops of Potassium dichromate solution are added.
Titration with 0.1 mol/L Silver nitrate solution from white yellow to a light brown end point.

Calculation: Nickel chloride hexahydrate (g/L) = consumption of mL AgNO₃ x 2.380

Chloride (g/L) = consumption of mL AgNO₃ x 0.709

Nickel

Reagents:	Buffer solution pH 10 Na ₂ EDTA 0.1 mol/L Murexide (Sodium chloride 1: 100)
Procedure:	10 mL electrolyte are transferred via pipette into a 100 mL measuring flask and filled- up to the mark with deionised water and mixed well 10 mL of this mixture is given into a 250 mL glass beaker by pipette followed by 15 mL Buffer solution addition 100 mL deionised water and 1 spatula tip of Murexide are added The sample colour should then be deep yellow Titrate immediately with Na ₂ EDTA 0.1 mol/L to a blue- end- point
Calculation:	Nickel (g/L) = consumption of mL Na ₂ EDTA 0.1 mol/L x 5.869 Nickel sulphate hexahydrate (g/L) = [A – (B x 0.247)] x 4.48 A = Nickel concentration in g/L B = Nickel chloride conc. in g/L

riag Ni 138 Tenside M

Reagents:	Glycerine Butyl phosphate solution: Mix 5 mL Tri-n-Butyl phosphate 500 mL Methanol 500 mL water DI
Procedure:	25 mL electrolyte are transferred via pipette into a 300 mL Erlenmeyer flask, add 3 drops glycerine, shake well, to form a foam cover. Add in steps of 0.5 mL butyl phosphate solution, shake well after each addition, until the foam cover disappears within 10 seconds
Calculation:	consumption in mL = mL/L riag Ni 138 Tenside M