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RIAG ZnNi 280

Cyanide free alkaline zinc-nickel-process for rack plating

Properties

- Excellent metal distribution
- A high brilliant zinc deposit
- Easy to chromate
- Very ductile, without blistering
- Perfectly suited for rack applications
- High burning limit, suited for high current densities
- Excellently adapted for an external zinc generator

Make up

	Range	Optimum
Zinc	5.5 – 7.0 g/L	6.5 g/L
Nickel	0.7 – 2.0 g/L	0.7 g/L
Sodium hydroxide	120 – 140 g/L	125 g/L
RIAG ZnNi 280 Nickel	7 – 9 mL/L	8 mL/L
RIAG ZnNi 280 Complex 1	35 – 45 mL/L	40 mL/L
RIAG ZnNi 280 Complex 2	70 – 80 mL/L	75 mL/L
RIAG ZnNi 280 Brightener	0.5 – 2.0 mL/L	0.5 mL/L

Fill the tank to 2/3 with DI water, add and dissolve the sodium hydroxide in small portions while stirring the solution (attention: the solution becomes hot). Add the zinc anodes to the hot solution and stir until they are dissolved. Mix the **RIAG ZnNi 280 Complex 1, ZnNi 280 Complex 2** and **RIAG ZnNi 280 Nickel** in a separate tank. Once the hydroxide solution has cooled down to below 50 °C, add the premixed nickel solution and the **RIAG ZnNi 280 Brightener** and top up to the final volume. Dummy plate the solution with 10 Ah/liter. After this treatment an addition of 0.2 – 0.5 mL/L **RIAG ZnNi 280 Brightener** will be necessary. When making up the electrolyte wear protection clothes, gloves and safety goggles.

Analytical values

	Range	Optimum
Zinc	5.5 – 7.0 g/L	6.5 g/L
Nickel	0.7 – 2.0 g/L	0.7 g/L
Sodium hydroxide	80 – 140 g/L	125 g/L
Sodium carbonate		< 80 g/L
RIAG ZnNi 280 Nickel	7 – 9 mL/L	8 mL/L
RIAG ZnNi 280 Complex 1	35 – 50 mL/L	40 mL/L
RIAG ZnNi 280 Complex 2	40 – 75 mL/L	75 mL/L
RIAG ZnNi 280 Brightener	0.5 – 2.0 mL/L	0.5 mL/L

The optimum values are valid after a new make up and will change during the aging of the process.

Operating parameters

Temperature:	33 – 37 °C
Cathodic current density:	1.5 – 2.5 A/dm^2
Anodic current density:	max. 2 A/dm^2
Current efficiency:	50 – 80 %
Deposition rate:	0.2 – 0.25 µm/min. at 2.5 A/dm^2
Tank material	Plastic or steel with plastic coating
Agitation	Cathode movement with 3 – 5 m/min.
Filtration	Continuous filtration is necessary, normally between the external zinc generator and the electrolyte, 2 – 3 bath volumes per hour
Cooling	Necessary at high current load depending on the electrolyte volume, use as cooling tubes titanium or stainless steel
Exhaust	Strongly recommended
Anodes:	Nickel

Maintenance

Analyse zinc, nickel and caustic soda. Keep the zinc content constant by an external zinc generator. Dose caustic soda and nickel corresponding to the analysis. The **RIAG ZnNi 280 Complex 1 and 2** may be analysed in our laboratory. Generally the use of an online-analysis system is recommended.

Consumption

	electrolytic (L per 10 kAh)
RIAG ZnNi 280 Nickel	9 – 10
RIAG ZnNi 280 Brightener	1.0 – 1.5

The total consumption consists of the drag out and the electrolytic consumption. For the dosage both have to be considered.

RIAG ZnNi 280 Nickel

The concentration of nickel will mainly influence the content of nickel in the zinc-nickel-layer. A higher concentration of nickel in the electrolyte will lead to a higher content of nickel in the zinc-nickel-layer. This content should always be between 12 – 15 %, as determinated with Hull cell panels. Should the content be too low, add in steps of 1 mL/L **RIAG ZnNi 280 Nickel** to increase the content of nickel. When the content of nickel in the zinc-nickel-layer is in the desired range, set the higher concentration of nickel in the electrolyte as the new target value. New made up electrolytes will have a nickel concentration of 0.6 – 0.8 g/L, due to the complexing of nickel the aging electrolyte requires more nickel.

RIAG ZnNi 280 Complex 1

It is used as nickel complexing agent and the reason for the solubility of the nickel, it’s analytical detectable. Due to special plant and plating conditions the concentrations may vary. Shortages will cause a too low concentration of nickel in the zinc-nickel-layer or even lead to nickel hydroxide precipitations in the electrolyte. Overdosage causes in oily films on the surface and bad deposition of the layer in high current densities. Edges may be burned.

RIAG ZnNi 280 Complex 2

Against burning in high current densities.

RIAG ZnNi 280 Brightener

Additions increase the brightness of the layer, overdosage will decrease the current efficiency.

Zinc

The concentration of zinc has to be kept in the desired range by dosing a zinc concentrate from an external zinc generator. The volume of this external zinc generator should be around 15 % of the electrolyte volume.

Sodium hydroxide

The make up values are 120 – 140 g/L. Due to the generation of sodium carbonate it is necessary to decrease the content of sodium hydroxide to 80 – 100 g/L. Avoid lower concentrations as they will influence the brightness throwing power negatively.

Carbonate- and sulphate

Carbon dioxide from the air increases the content of sodium carbonate in the electrolyte. But additions of **RIAG ZnNi 280 Nickel** will also increase the content of sodium sulphate. Such an increase of salts has to be reduced by freezing out. When cooling the solution down to ≤ 3 °C the contents of sodium carbonate and sodium sulphate in the electrolyte will be reduced. This procedure is normally done in a bypass, therefore a continuous plating is possible.

Environmental considerations

When plating cyanide is formed. It reacts with nickel to a very stable nickel cyanide complex. A treatment of the waste water may be carried out with ozone, hydrogen peroxide, UV irradiation or a combination of these methods. The electrolyte contains complexing agents and metals, it is not recommended to mix it with other waste water. All concentrates, rinse waters and waste solution must be treated and discharged according to local effluent control regulations. Chemicals shall not be stored below 10 °C.

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Analysis

Sample preparation

Take the sample at a homogeneously mixed spot and let it cool down to room temperature. If turbid, allow to settle and decant or filter.

Hull cell test for visual control of the layer

The performance of electrolyte should be checked by hull cell tests regularly. The following parameters are recommended:

Base material:	Iron, polished (RIAG Art-No: 821011)				
Hull cell:	Hull cell (267 mL) with heating				
Anode material:	Nickel				
Anode bags:	without				
Agitation:		without	X	mechanical (paddle)		air
Filtration:	without				
Temperature:	35 °C				
Current:	1 A				
Plating time:	20 min				
Speciality:					