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RIAG Zn 260 Na

Cyanide free alkaline bright zinc process based on sodium hydroxide

Properties

- Excellent metal distribution
- A high brilliant zinc deposit
- Easy to chromate
- Very ductile, without blistering
- Perfectly suited for rack as well as for barrel or continuous applications
- Easy plating even on parts with difficult shapes
- High burning limit, suited for high current densities
- Simple waste water treatment
- Excellently adapted for an external zinc generator

Electrolyte make up

	Range	Optimum
Zinc oxide	10 – 16 g/L	12.5 g/L
Sodium hydroxide	110 – 150 g/L	120 g/L
RIAG Zn 260 Brightener	7 – 10 mL/L	7 mL/L
RIAG Zn 260 Conditioner	5 – 10 mL/L	5 mL/L
RIAG Zn 260 Purifier	0 – 20 mL/L	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 oxide and stir until the solution is clear. Cool down, then add the **RIAG Zn 260 Purifier** and the **RIAG Zn 260 Conditioner** and fill the tank with DI water to its final volume. Dummy plate the solution at low current density for 8 hours. Finally add the **RIAG Zn 260 Brightener**.

Analytical values and maintenance

	Rack	Barrel
Zinc	8 – 11 g/L	10 – 14 g/L
Sodium hydroxide	110 – 130 g/L	120 – 150 g/L
Sodium carbonate	< 70 g/L	< 70 g/L
Temperature	20 – 35 °C	20 – 35 °C
Voltage	3 – 8 V	6 – 15 V
Cathodic current density	0.5 – 3 A/dm^2	0.3 – 1.5 A/dm^2
Anodic current density	0.3 – 3 A/dm^2	0.3 – 3 A/dm^2

Analyse zinc and caustic soda. Keep the zinc content constant by regulation of the anode surface or by an external zinc generator. Dose caustic soda corresponding to the analysis.

Consumption

	due to drag out* (mL per kg NaOH)	electrolytic (L per 10 kAh)
RIAG Zn 260 Brightener or **RIAG Zn 260 Carrier****	83	1.5 – 2.0
RIAG Zn 260 Purifier	40	0.75 – 1.0***
RIAG Zn 260 Conditioner	40	0.75 – 1.0***

*valid only for the given make-up values

if a low degree of brightness is desired, replace a part of **RIAG Zn 262 Brightener through a part of **RIAG Zn 260 Carrier**. In case of a too low dosage, this will cause a bad metal distribution.

***The consumption of the additives is caused by the anodes used:

Steel anodes: (unplated)

Dosage ratio **RIAG Zn 260 Brightener : RIAG Zn 260 Purifier** approx. 2 : 1

Nickel anodes: (or nickel plated steel anodes)

Dosage ratio **RIAG Zn 260 Brightener : RIAG Zn 260 Conditioner** approx. 2 : 1

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

Operating parameters

Temperature:	20 – 40 °C
Cathodic current density:	0.5 – 6 A/dm^2
Current efficiency:	60 – 80 %
Deposition rate (1 A/dm^2):	0.2 µm/min.
Tank material	Plastic or steel with plastic coating
Agitation	Cathode movement with 3 – 5 m/min.
Filtration	Continuous filtration is necessary
Cooling	Necessary at high current load depending on the electrolyte volume
Exhaust	Strongly recommended, especially when using inert anodes

Function of the components

RIAG Zn 260 Carrier

The **RIAG Zn 260 Carrier** effectuates the excellent metal distribution. It is already included in the **RIAG Zn 260 Brightener**. An overdosing may cause blistering. A lack of **RIAG Zn 260 Carrier** degrades the excellent metal distribution.

RIAG Zn 260 Brightener

The **RIAG Zn 260 Brightener** is responsible for the brightness of the layer and an excellent metal distribution. An overdosing may cause blistering.

RIAG Zn 260 Conditioner

The **RIAG Zn 260 Conditioner** avoids negative optical influences of the layer due to water hardness or impurities of raw materials. A lack of **RIAG Zn 260 Conditioner** effects the brightness, even when enough **RIAG Zn 260 Brightener** is added.

RIAG Zn 260 Purifier

The **RIAG Zn 260 Purifier** eliminates metal impurities as lead, cadmium or copper. Support the effect of the **RIAG Zn 260 Brightener**. Dark or black coloured layer in the LCD area, add 1 mL/L. When plating defect layers, which can't be corrected with **RIAG Zn 260 Brightener,** add 3 – 5 mL/L **RIAG Zn 260 Purifier**. Such trials should happen in the laboratory first.

Environmental considerations

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.

Anodes

We recommend using inert anodes in combination with an external zinc generator. Despite this recommendation, **RIAG Zn 260 Na** can of course be operated with soluble zinc anodes. However, we strongly warn against mixed operation of inert and soluble anodes.

Operation with inert anodes and external zinc generator

Anodes made of expanded metal (30 mm x 8 mm piccolo mesh, rib width 6 mm, material thickness 2 mm) of mild steel (e.g. ST 38). They can be plated with 15 µm semi bright nickel. The expanded metal should be installed with the ribs horizontally oriented for driving the gas evolution to the back side.

Before plating the expanded metal with semi bright nickel, it should be vertically stiffened with flat irons leading to the anode hooks. For optimal current distribution, the anodes should be placed at both sides of the cathode along the full width of the plating tank. Anodic current density up to 20 A/dm^2.

Zinc generator with baskets (optimal: 62.5 mm x 62.5 mm x 1000 mm of 1.5 mm perforated mild sheet DD 11 GK according to DIN 10111/10051; perforation Rv 3 – 5 DIN 24041) plated with semi bright nickel (**RIAG Ni 140**). Fill the baskets with zinc clippings (approx. 100 mm ⥣, lead content <0.002 %). Control the zinc concentration in the electrolyte adjusting the exchange rate between plating cell and zinc generator. For an online calculation of the necessary number of catalytically baskets and for determination of the size of the zinc generator, please consult RIAG.

Operation with soluble anodes

Soluble zinc anode pieces, clippings, drops or balls in titanium baskets as usual in the trade, or zinc anode panels at titanium hooks (the lead content of the zinc anodes must be generally <0.002 %). Up to a current density of about 3 A/dm^2, the anodic current efficiency lies at 100 %. Above 3 A/dm^2 the anode gets covered with a semi conductive zinc oxide parting layer, the anode becomes black, the cell voltage increases abruptly by 3 to 4 V, and the anodic current efficiency drops down to 2 – 5 % in favour of 95 – 98 % O_2 evolution. However, it is not impossible, but it is hard to control the zinc content of the electrolyte by adjusting the anode surface. Anodes must be removed and placed back frequently. Consequently, the current in the plating cell is of course very unevenly distributed.

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Analysis

Sample preparation

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

Zinc

Reagents	0.1 mol/L Na_2EDTA Buffer solution (100 g/L NaOH and 240 mL/L 98% acetic acid in DI water) Indicator: xylenol orange, (mixture of 1 % in KNO_3).	
Process		Pipette
	5 mL	sample into a
	250 mL	Erlenmeyer flask, add about
	100 mL	DI water,
	20 mL	buffer solution and
	a spatula tip	of indicator. Titrate with 0.1 mol/L EDTA from red to yellow.
Calculation	zinc (g/L) = Consumption in mL x 1.3078	

Sodium hydroxide

Reagents	0.5 mol/L sulphuric acid Indicator: 0.1 % solution of tropaeolin 0	
Process		Pipette
	5 mL	sample into a
	250 mL	Erlenmeyer flask, add about
	100 mL	DI water,
	5 drops	of indicator and titrate with 0.5 mol/L sulphuric acid from orange-brown to yellow.
Calculation	NaOH (g/L) = Consumption in mL x 8.00	

Sodium carbonate

Reagents: Barium chloride 10 %
Methyl orange 0.1 % in water
Hydrochloric acid 1 mol/L
Sodium hydroxide 1 mol/L

Procedure:

	pipette
10 mL	electrolyte in a 250 mL beaker, add
100 mL	deion. water and heat until boiling, add
50 mL	Barium chloride solution and stir for another 30 s. Filter by suction and rinse with hot deion. water until the rinse water is neutral.
	Put the filter in a 250 mL beaker and add
150 mL	hot deion. water, add
30.0 mL	Hydrochloric acid 1 mol/L, stir, add
5 drops	Methyl orange solution

Titrate with sodium hydroxide 1 mol/L until the colour turns from pink to yellow.

Calculation: Sodium carbonate g/L = (30 - mL NaOH 1 mol/L) x 5.3