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COLLOY A-Z-N 200

ACID CHLORIDE ZINC/NICKEL PLATING PROCESS
TECHNICAL DATA
01-23-14

COLLOY A-Z-N 200

PROCESS FOR ZINC/NICKEL ALLOY PLATING FROM AN AMMONIUM CHLORIDE PLATING BATH

COLLOY A-Z-N 200	provides a level, mirror bright, ductile electro-deposited zinc-nickel alloy containing from 8% to 16% nickel that is evenly distributed at low, mid and high current densities.
COLLOY A-Z-N 200	operates at lower, more economical temperatures of 90° - 110°F (32° - 42°C).
COLLOY A-Z-N 200	alloy deposits provide greatly enhanced corrosion resistance compared to zinc plate when properly chromated.
COLLOY A-Z-N 200	bath readily plate substrates such as malleable iron castings, heat treated and other hardened steels.
COLLOY A-Z-N 200	does not require Boric Acid.
COLLOY A-Z-N 200	has a wide operating range.
COLLOY A-Z-N 200	user friendly Brightener-Carrier system.
COLLOY A-Z-N 200	process does not require separate rectifiers.
COLLOY A-Z-N 200	deposits accept Trivalent Blue, Yellow and Black as well as other hexavalent chromates.

OPERATING PARAMETERS

RACK AND BARREL BATHS: ***YIELDS 12% TO 16% NICKEL ALLOY***

	Range	Optimum
Zinc Metal:	3.5 – 5.5 oz/gal (26 – 41 g/l)	4.0 oz/gal (30 g/l)
Nickel Metal:	4.0 – 6.0 oz/gal (30 – 45 g/l)	4.5 oz/gal (34 g/l)
Nickel-Zinc Metal Ratio	1.1:1 to 1.5:1	1.3:1
Total Chloride:	26 – 32 oz/gal (195 – 240 g/l)	28 oz/gal (210 g/l)
COLLOY A-Z-N 200 CARRIER:	4% – 6%	5%
pH:	6.0 – 6.5	6.3
Operating Temperature:	90º – 110º F (32° – 42° C)	90º F (32° C)

SOLUTION MAKE-UP

	100 LITERS	100 GALLONS
Zinc Chloride:	6.25 kg	52 pounds
Nickel Chloride ($NiCl_2 \cdot 6H_2O$):	14.0 kg	117 pounds
Ammonium Chloride:	20.4 kg	170 pounds
COLLOY A-Z-N 200 CARRIER:	5.0 liters	5 gallons
COLLOY A-Z-N 200 BRIGHTENER:	100 ml	13 fluid oz.

Make Up of the baths as above will yield an optimum operating analysis of:

Zinc Metal:	4.0 oz/gal (30 g/l)
Nickel Metal:	4.5 oz/gal (33.75 g/l)
Total Chloride:	28.0 oz/gal (210 g/l)
pH (Electrometric):	6.3

RACK AND BARREL BATHS: ***YIELDS 8% TO 12% NICKEL ALLOY***

	Range	Optimum
Zinc Metal:	3.5 – 5.5 oz/gal (26 – 41 g/l)	4.0 oz/gal (30 g/l)
Nickel Metal:	1.75 – 2.75 oz/gal (13 – 20 g/l)	2.0 oz/gal (15 g/l)
Nickel-Zinc Metal Ratio	0.4:1 to 1:1	0.5:1
Total Chloride:	26 – 32 oz/gal (195 – 240 g/l)	28 oz/gal (210 g/l)
COLLOY A-Z-N 200 CARRIER:	4% – 6%	5%
pH:	6.0 – 6.5	6.3
Operating Temperature:	90º – 110º F (32° – 42° C)	90º F (32° C)

SOLUTION MAKE-UP

	100 LITERS	100 GALLONS
Zinc Chloride:	6.25 kg	52 pounds
Nickel Chloride ($NiCl_2 \cdot 6H_2O$):	6.25 kg	52 pounds
Ammonium Chloride:	24.0 kg	200 pounds
COLLOY A-Z-N 200 CARRIER:	5.0 liters	5 gallons
COLLOY A-Z-N 200 BRIGHTENER:	100 ml	13 fluid oz.

Make Up of the bath as above will yield an optimum operating analysis of:

Zinc Metal:	4.0 oz/gal (30 g/l)
Nickel Metal:	2.0 oz/gal (15 g/l)
Total Chloride:	28.0 oz/gal (210 g/l)
pH (Electrometric):	6.3

The following equivalents should be noted when maintaining the chloride, zinc and nickel content of the bath:

Ammonium Chloride (NH_4Cl):	contains 66% chloride
Zinc Chloride (ZnCl2):	contains 52% chloride, 48% zinc metal
Nickel Chloride ($NiCl_2 \cdot 6H_2O$):	contains 30% chloride, 24% nickel metal

MAINTENANCE ADDITIONS

COLLOY A-Z-N 200 CARRIER must be replaced in the plating bath as it is lost by drag-out. Typically, most rack lines drag-out about 0.25 to 0.5 gallons of COLLOY A-Z-N 200 CARRIER for every 1 gallon of COLLOY A-Z-N 200 BRIGHTENER consumed. Most barrel lines drag-out about 0.5 to 1.0 gallon of COLLOY A-Z-N 200 CARRIER for every 1 gallon of COLLOY A-Z-N 200 BRIGHTENER consumed.

COLLOY A-Z-N 200 BRIGHTENER is added at a rate of 1 gallon per 30,000 – 40,000 ampere-hours (1 liter per 7,900 – 10,500 A-H).

Zinc Metal - is normally maintained by anodic dissolution during electrolysis. High grade zinc slab anodes of minimum 99.99% purity are recommended as an economical anode source. Anodes may be drilled and tapped or used in titanium anode baskets. Zinc anode baskets need to be removed during idle periods to prevent build-up of zinc metal. Anode baskets should be kept full. Acid resistant anode bags of cotton, dynel, or polypropylene are recommended for rack operation to reduce anode-caused roughness. Zinc anode baskets can be cleaned in 20% – 30% Hydrochloric Acid if polarization occurs.
Note: Liquid Zinc Chloride can also be used to adjust and maintain proper zinc metal level.

Nickel Metal - is maintained through the use of Nickel anodes in combination with Zinc anodes. Typically, 1 full nickel anode basket is used per 2 full zinc anode baskets. Adjustments should be made to the nickel-zinc ratio to maintain optimum metal content.
Note: Liquid Nickel Chloride or Nickel Chloride Salt can also be used to maintain the Nickel metal level.

Operating Temperature - optimum temperature of 90° – 110°F (32° – 42°C) should always be maintained to ensure proper alloy content, overall brightness, deposit ductility and bath chemistry dissolution.

pH - should be maintained with optimum range of 6.0 – 6.5. Use Ammonium Hydroxide to adjust up and Hydrochloric Acid to adjust down.

Filtration - continuous filtration through polypropylene filter tubes of approximately 15 microns is recommended for routine operation. When carbon treatment or other bath purification is necessary, 5 – 10 micron filter tubes should be substituted.

Equipment - all plating tanks, racks carriers, etc. should be plastisol, polyethylene, hard rubber or similarly coated to provide adequate protection from corrosion.

Agitation - use mechanical or air agitation.

Cooling Coils - made from Teflon are optimum, but titanium coils may be used as long as they are insulated from the electrical circuit. Lead or steel coils are not suitable.

HANDLING & STORAGE

Use normal precautions when handling COLLOY A-Z-N 200 addition agents - wear protective clothing, rubber gloves, and adequate eye protection. As with most chemicals, use in well ventilated areas.

COLLOY A-Z-N 200 addition agents are stable on standing, with a shelf live in excess of 2 years.

FREEZABILITY: As with most chemical products, it is preferable that freezing be avoided. However if freezing should occur during transportation or storage, directions for handling the products covered in this technical data sheet are as follows:

> If COLLOY A-Z-N 200 addition agents freeze, simply allow the container to completely thaw and bring to room temperature of 70-75F/ 21-24C. Thoroughly mix to bring back to original condition.

BASIC ANALYSIS FOR COLLOY A-Z-N 200 BATHS

Analysis for Zinc Metal

Titration Procedure

1. Pipette 5 ml bath sample into a 250 ml Erlenmeyer flask and add 100 mL distilled water.
2. Add 10 mL ammonium hydroxide buffer solution.
3. Add 10 mL 20% Sodium Cyanide.
4. Add approximately 0.2 gm. Eriochrome Black T Indicator Mix.
5. Add 10 mL 8% formaldehyde solution.
6. Titrate immediately with Standard EDTA Solution 0.0575 M to a blue endpoint.

FACTOR: (mL Standard EDTA Solution 0.0575 M) x 0.10 = oz/gal zinc metal (oz/gal x 7.5 - g/L)

Analysis for Total Chloride

Titration Procedure

1. Pipette 10 ml bath sample into a 250 ml volumetric flask. Dilute to 250 ml with distilled water and mix well.
2. Pipette 10 ml of above solution into a 500 ml Erlenmeyer flask and add 100 ml distilled water.
3. Add 5 ml Sodium Chromate Indicator.
4. Titrate with Standard Silver Nitrate Solution 0.153 N to a reddish-brown endpoint. (The first permanent brown color is the endpoint).

FACTOR: (ml Standard Silver Nitrate Solution 0.153 N) x 1.82 = oz/gal Chloride (oz/gal x 7.5 = g/l)

Analysis for Nickel Metal in the Bath Solution

Reagents Used

+ Concentrated Nitric Acid

Titration Procedure

1. Pipette 1.0 ml bath solution into a 100 ml volumetric flask and add DI water to 100 ml level. Mix well.
2. Pipette 1.0 ml of the above diluted bath solution from step 1 into a 100 ml volumetric flask. Mix well.
3. Add 50 ml distilled water and 2 – 3 ml concentrated nitric acid to the flask.
4. Dilute to volume with distilled water. Mix well.
5. Determine nickel content through Atomic Absorption Spectroscopy.

FACTOR: (AA Conc.) x 10,000 = ppm Nickel metal (ppm = mgs per liter)

ppm Nickel x 0.001 = g/l Nickel
g/l x 0.134 = opg Nickel

Analysis for % Nickel in Deposit of Plated Parts

Reagents Used

+ Concentrated Hydrochloric Acid
+ Pickle Pal

Titration Procedure

1. Weigh sample part or parts and record the weight as “Weight #1”
2. Add approx. 1% Pickle Pal to enough conc. hydrochloric acid to cover the sample part(s). If total volume to immerse the parts is 500 mls solution then you would use 5mls. of Pickle Pal and 495 ml conc. hydrochloric acid.
3. Immerse the parts in the acid solution and strip the electroplate off the base metal. The stripping is complete when the blackish color is totally removed from the substrate.
4. Remove the parts from the solution and rinse with additional water. Record total volume of water used.
5. Add the acid stripping solution to the rinse water. Record the total volume as “Acid Volume”.
6. Completely dry the part(s) that were stripped and weigh. Record this as “Weight #2”.
7. Determine nickel content of the acid solution by Atomic Absorption Spectroscopy.

Calculations:

1. “Weight #1” - “Weight #2” = “Weight of electroplate” (in gms)

2. $\frac{\text{“Weight of electroplate” (gms)}}{\text{“Acid Volume” (ml)}} \times 1{,}000{,}000 = \text{ppm electroplate}$

3. $\frac{\text{ppm Nickel (from AA)}}{\text{ppm electroplate}} \times 100 = \%\ \text{Nickel in deposit}$

NON-WARRANTY

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