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COLLOY A-Z-N 300

ACID CHLORIDE ZINC/NICKEL PLATING PROCESS
TECHNICAL DATA
07-17-18

COLLOY A-Z-N 300

PROCESS FOR ZINC/NICKEL ALLOY PLATING FROM AN AMMONIUM AND BORIC ACID FREE PLATING BATH

COLLOY A-Z-N 300	provides a level, mirror bright, ductile electro-deposited zinc-nickel alloy containing from 12% to 15% nickel that is evenly distributed at low, mid and high current densities.
COLLOY A-Z-N 300	operates at lower, more economical temperatures between 90 - 100°F (32 - 37 °C).
COLLOY A-Z-N 300	deposits accept Trivalent Blue, Yellow and Black as well as other hexavalent chromates.
COLLOY A-Z-N 300	can readily plate substrates such as malleable iron castings, heat treated and other hardened steels.
COLLOY A-Z-N 300	is free from boric acid and ammonium salts and does not require separate rectifiers.
COLLOY A-Z-N 300	user friendly four additive system: Buffer, Complexer, Wetter, Brightener.
COLLOY A-Z-N 300	second generation product that offers improved ductility, better throwing power, enhanced brightness across current densities, more uniform alloy, > 95% efficiency, less dissolution of zinc anodes during downtime

OPERATING PARAMETERS

Rack Plating and Barrel Plating *- Yields 12-15 % Nickel*

	Range	Optimum
Zinc Metal:	2.0 – 4 oz/gal (15 – 30 g/l)	2.6 oz/gal (20 g/l)
Nickel Metal:	2.0 – 4.6 oz/gal (15 – 35 g/l)	4 oz/gal (30 g/l)
Nickel-Zinc Metal Ratio	0.6:1 to 2.0:1	1.5:1
Total Chloride:	16.6 – 23.3 oz/gal (125 – 175 g/l)	20 oz/gal (150 g/l)
COLLOY A-Z-N BUFFER 310	3.6 - 6 oz/gal (27 – 45 g/L)	4.8 oz/gal (36 g/L)
COLLOY A-Z-N COMPLEXER 320	0.5% – 1.5%	1%
COLLOY A-Z-N WETTER 330	0.2% - 0.75%	0.375%
COLLOY A-Z-N BRIGHTENER 340	0.075% – 0.2%	0.1%
pH:	5.0 – 5.6	5.3
Operating Temperature:	90º – 100º F (32° – 37° C)	95º F (35° C)

SOLUTION MAKE-UP

	100 LITERS	100 GALLONS
Zinc Chloride:	4.17 kg	34.8 pounds
Nickel Chloride ($NiCl_2 \cdot 6H_2O$):	12.15 kg	101.4 pounds
Potassium Chloride:	20.0 kg	166.9 pounds
COLLOY A-Z-N BUFFER 310:	3.6 kg	30.0 pounds
COLLOY A-Z-N COMPLEXER 320:	1.0 Liters	1 gallon
COLLOY A-Z-N WETTER 330:	375 mL	12.68 fluid oz.
COLLOY A-Z-N BRIGHTENER 340:	100 mL	3.38 fluid oz.

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

Zinc Metal:	2.6 oz/gal (20 g/l)
Nickel Metal:	4 oz/gal (30 g/l)
Total Chloride:	20.0 oz/gal (150 g/l)
pH (Electrometric):	5.3 (after adjustment with hydrochloric acid)

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

Potassium Chloride (KCl):	contains 48% chloride
Zinc Chloride ($ZnCl_2$):	contains 52% chloride, 48% zinc metal
Nickel Chloride ($NiCl_2 \cdot 6H_2O$):	contains 30% chloride, 24% nickel metal

MAINTENANCE ADDITIONS and GENERAL OPERATION

COLLOY A-Z-N BUFFER 310 contains buffering components that prevent high current density burning and increase the nickel within the alloy deposit. It must be replaced in the plating bath as it is lost through dragout. See the “Basic Analysis Section” for monitoring buffer amount.

COLLOY A-Z-N COMPLEXER 320 contains complexing agents that enhance the brightness and alloy uniformity of the alloy as well as prevent high current density burns. It must be replaced in the plating bath as it is lost primarily by drag-out. Recommended addition rate is based solely on dragout calculations, which often amount to approximately 1 - 2 L per 10,000 Amp·Hours based on a medium dragout rate.

COLLOY A-Z-N WETTER 330 contains surfactants that lower the surface tension of the system to prevent pitting, dispel gassing, etc. It must be replaced in the plating bath as it is lost primarily by drag-out. Recommended addition rate is 375 - 500 mL per 10,000 Amp·Hours.

COLLOY A-Z-N BRIGHTENER 340 helps provide a mirror bright deposit across a wide range of current densities. It is primarily consumed by electrolysis and must be added regularly. Recommended addition rate is 3 - 4.5 L per 10,000 Amp·Hours.

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 – 100°F (32 – 37 °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 5.6 – 5.0. Use hydrochloric acid to adjust pH downward.

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 – mild uniform air agitation is recommended.

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 300 addition agents - wear protective clothing, rubber gloves, and adequate eye protection. As with most chemicals, use in well ventilated areas.

COLLOY A-Z-N 300 addition agents are stable on standing, with a shelf life 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, simply allow the container to completely thaw and warm to room temperature of 70 - 75°F / 21 - 24°C. Thoroughly mix to bring back to original condition.

BASIC ANALYSIS FOR COLLOY A-Z-N 300 BATHS

Analysis for Zinc Metal in the Plating Solution

Reagents Used
+ Concentrated Nitric Acid

Titration Procedure
1. Pipette 10 mL bath solution into a 100 mL volumetric flask.
2. Add 50 mLs distilled water and 2-3 mLs concentrated nitric acid to the flask.
3. Dilute to 100 mL volume with distilled water. Mix well.
4. Pipette 1.0 mL of the above diluted bath solution from Step 3 into a new 100 mL volumetric flask.
5. Dilute to volume with distilled water. Mix well.
6. Determine zinc content through Atomic Absorption Spectroscopy.

FACTOR: (AA Conc.) x 1,000 = ppm Zinc metal (ppm = mg per liter)

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 250 ml Erlenmeyer flask and dilute to 100 ml with 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 COLLOY A-Z-N BUFFER 310

Titration Procedure

1. Pipette 10 ml bath sample into a 250 ml volumetric flask. Dilute to 100 ml with distilled water and mix well.
2. Add 2 - 3 mL Methyl Orange Indicator.
3. Titrate with Standard Hydrochloric Acid Solution 0.1 N from a bright yellow solution to an orange-red solution.

FACTOR: ml Standard Hydrochloric Acid Solution 0.1 N x 2.268 = % of Optimal COLLOY A-Z-N BUFFER 310

Analysis for Nickel Metal in the Plating Solution

Reagents Used
+ Concentrated Nitric Acid

Titration Procedure
1. Pipette 10 mL bath solution into a 100 mL volumetric flask.
2. Add 50 mLs distilled water and 2-3 mLs concentrated nitric acid to the flask.
3. Dilute to 100 mL volume with distilled water. Mix well.
4. Pipette 1.0 mL of the above diluted bath solution from Step 3 into a new 100 mL volumetric flask.
5. Dilute to volume with distilled water. Mix well.
6. Determine nickel content through Atomic Absorption Spectroscopy.

FACTOR: (AA Conc.) x 1,000 = ppm Nickel metal (ppm = mg per liter)

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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