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MARQUEE ENVY MP

ELV Compliant- Mid Phosphorous
Electroless Nickel Plating Process
TECHNICAL DATA

10-13-11

MARQUEE ENVY MP

PROCESS FOR MID PHOSPHOROUS ELECTROLESS NICKEL PLATING

MARQUEE ENVY MP	does not contain any lead or cadmium to meet ELV requirements.
MARQUEE ENVY MP	has fast deposition rate throughout the life of the bath.
MARQUEE ENVY MP	meets ASTM-B-733 and AMS2404 C specifications.
MARQUEE ENVY MP	is a simple two component process with an easy to use 1:1 replenishment rate.
MARQUEE ENVY MP	provides deep, brilliant decorative finish.
MARQUEE ENVY MP	produces uniform plating thickness and hardness.
MARQUEE ENVY MP	has excellent stability with long solution life.

OPERATING PARAMETERS

		<u>Range</u>
Nickel Metal:	5.25 - 6 g/Liter	0.7 - 0.8 oz/gal
Operating Temperature:	88° - 92° C	190-197° F
pH:	4.5-5.1	4.85 - 4.95 optimum
Bath Loading:	0.5 - 2.50 sq.dm//L	0.20 - 1.0ft ² /gal
Typical Plating Rate:	17.8 micron/hour	0.70 mil/hr

SOLUTION MAKEUP

MARQUEE ENVY MP-A-10	6.0 %/vol
MARQUEE ENVY MP-B-10	15.0 %/vol
MARQUEE ENVY MP-C-10	Not required for make-up

When making a new solution it is important to follow these steps. Taking shortcuts can increase the cost of your electroless nickel process.

1. Remove the old operating solution.
2. Remove the old filter bags or cartridge filters. If necessary re-seal the filter unit. Fill the tank with 50 %/vol Nitric acid.
3. Circulate the solution through the pumps and filter housings. Turn off air agitation. Allow the solution to contact all the surfaces that it would contact when in operation. Allow the solution to stand overnight to completely strip and passivate the tank.
4. Remove the nitric acid solution from the tank.
5. Rinse the tank/ pumps and filter housings thoroughly.
6. Fill the tank with water higher than the level of the nitric solution and add approximately 1 liter Ammonium hydroxide per 400 liters of volume. Allow this solution to circulate for 1 hour. While the solution is circulating, turn the agitation on and off. The ammonium hydroxide will neutralize the Nitric acid.
7. Drain the system then rinse with clean water. Test the rinse water for nitrates (Fisher Scientific carries M-10020 EM quant test strips for testing for nitrates).
8. Install new filter bags or cartridges.
9. Equipment is now ready for a new operating solution.
10. Fill tank to half its volume with distilled or D.I. water.
11. Add the required amount of MARQUEE ENVY MP-A-10 and mix well.
12. Add the required amount of MARQUEE ENVY MP-B-10 and mix well.
13. Add distilled or D.I. water to volume and mix well.
14. Check pH and adjust to a pH of 4.8. Use dilute 1:1 ammonium hydroxide or potassium Hydroxide to raise the pH. Use 20%/volume sulfuric acid to lower the pH.

MAINTENANCE ADDITIONS

MARQUEE ENVY MP-A-10	See Replenishment Schedule below
MARQUEE ENVY MP-C-10	See Replenishment Schedule below

<u>Nickel Content by Analysis</u>	<u>% Nickel Activity</u>	<u>Amount of Marquee ENVY MP-A-10 and Marquee ENVY MP-C-10 to add</u>
6.0 g/L (0.80 oz/gal) -	100%	0 ml/L (0.0 fl.oz./gal)
5.7 g/L (0.76 oz/gal) -	95%	3 ml/L (0.38 fl.oz./gal)
5.4 g/L (0.72 oz/gal) -	90%	6 ml/L (0.76 fl.oz./gal)
5.1 g/L (0.68 oz/gal) -	85%	9 ml/L (1.15 fl.oz./gal)
4.8 g/L (0.64 oz/gal) -	80%	12 ml/L (1.54 fl.oz./gal)
4.5 g/L (0.60 oz/gal) -	75%	15 ml/L (1.92 fl.oz./gal)
4.2 g/L (0.56 oz/gal) -	70%	18ml/L (2.30 fl.oz./gal)

Regular analysis of the nickel content should be the basis for additions of the MARQUEE ENVY MP-A-10 and the MARQUEE ENVY MP-C-10. Add back equivalent amounts of the MARQUEE ENVY MP-A-10 and MARQUEE ENVY MP-C-10 as needed from the chart above.

Example: If the nickel metal analysis is 5.7g/L (0.76 oz/gallon) then add back 3 ml/L(0.38fl.oz/gal)MARQUEE ENVY MP-A-10 and 3 ml/L(0.38 fl.oz/gal) MARQUEE ENVY MP-C-10.

pH - Measure the pH after all other adjustment have been made. Make adjustments using dilute 1:1 ammonium hydroxide or potassium hydroxide to raise the pH. Use 20%/volume sulfuric acid to lower the pH.

ANALYSIS OF MARQUEE ENVY MP ELECTROLESS NICKEL SOLUTIONS

Determination of nickel metal

Reagents Required:

Standardized 0.1M or 0.0575 M EDTA

Concentrated ammonium hydroxide

Murexide

Table sugar

Deionized water

Table sugar

Murexide indicator – thoroughly mix approximately 0.25 grams murexide with 95 grams of table sugar.

1. Pipette 5 ml. bath sample into a 250 ml Erlenmeyer flask.
2. Add approximately 100 ml Deionized water.
3. Add 10 ml of concentrated ammonium hydroxide.
4. Add 0.2 grams murexide indicator.
5. Titrate immediately with the 0.1 or 0.0575M standardized EDTA to a magenta endpoint.
6. Calculate the nickel metal content:

CALCULATION: Nickel metal (g/L) = ml 0.0575M EDTA x 0.674 or ml 0.1M EDTA x 1.174

Nickel metal (oz/gal) = ml 0.0575M EDTA x 0.090 or ml 0.1M EDTA x 0.1565

pH

Use a calibrated pH meter to check the pH. Make measurements with the sample cooled to room temperature. The solution pH should be checked regularly to insure it is maintained within the operating parameters.

pH papers are not recommended.

To raise the pH use 1:1 dilute ammonium hydroxide or potassium hydroxide. To lower the pH, use 20%/vol. sulfuric acid.

Temperature

Maintain the temperature of the plating bath within specified limits. It is highly recommended that derated heaters (low watt density) are used to maintain the solution temperature of the bath. High temperatures can spontaneously decompose the bath. Low temperatures will slow the plating rate of the bath.

EQUIPMENT

Tanks

If the tank size is less than 500 gallons then tanks made of high density, natural, unpigmented, polypropylene is suggested. Tanks larger than 500 gallons (1900 Liters) should be reinforced using fiberglass, stainless steel or other suitable material. It is a good idea to have two tanks set-up so a spare tanks is available if there is nickel build-up on the heaters or tank. Contact your Columbia Chemical representative for recommendations.

Heaters

316 Stainless Steel heat exchanger, PTFE steam coils, or electric immersion heaters fabricated from PTFE or 316 stainless steel are recommended.

Agitation

Clean, mild air agitation from a low pressure blower is recommended. Other means of agitation may be used such as mechanical or reciprocal.

NICKEL DEPOSIT PROPERTIES

Phosphorous Content:	5-9% (varies depending on operating pH and bath age)
Hardness:	500-700 (VHN) as plated, 900-1000(VHN) heat treated
Appearance:	Bright reflective deposit
Density:	Approximately 7.9 g/cc

HANDLING & STORAGE

Use normal precautions when handling MARQUEE ENVY MP addition agents - wear protective clothing, rubber gloves, and adequate eye protection. As with most chemicals, use in well ventilated areas.

NON-WARRANTY

The data contained in this bulletin is believed by Columbia Chemical Corp. to be accurate, true and complete. Since however, final methods of use of these products are in the hands of the customer and beyond our control, we cannot guarantee that the customer will obtain the results described in this bulletin, nor can we assume any responsibility for the use of this product by the customer in any process which may infringe the patents of third parties.

TROUBLE SHOOTING GUIDE

FOR MARQUEE ENVY MP

<u>PROBLEM</u>	<u>CAUSE</u>	<u>SOLUTION</u>
Poor adhesion to substrate	Poor cleaning prior to plating Organic contamination Metallic contamination	Improve the cleaning process Dump bath Dummy plate
Bath plate out	Temperature too high pH too high Additives out of balance Nickel build-up on equipment	Lower the temperature Lower the pH Adjust additives Strip and passivate tank
Slow plating rate	Temperature is too low pH is too low Additives out of balance Metallic contamination	Increase the temperature Increase the pH Adjust additives Dummy plate
No deposit	Temperature is too low pH is too low Metallic contamination Organic contamination Additives out of balance	Increase the temperature Increase the pH Try to dummy plate Dump bath Adjust additives
Pitting	Low agitation Organic contamination Metallic contamination	Increase agitation Dump bath Dummy plate
Dull deposit	pH is too low Organic contamination Metallic impurities Additives out of balance	Increase the pH Dump bath Dummy plate Adjust additives
Rough deposit	pH is too high Particulate in bath Additives out of balance	Lower the pH Improve filtration Adjust additives
Dark deposit	Metallic contamination Organic impurities	Dummy plate Dump bath
Streaks and/or patterns	Metallic contamination Organic contamination Low surface area	Dummy plate Dump bath Increase surface area
Blisters	Poor cleaning prior to plating Metallic contamination Organic contamination Temperature is too high	Improve the cleaning process Dummy plate Dump bath Lower the temperature