



PLATINGINTERNATIONAL, INC.
CHANGING THE WORLD OF PLATING!!!

Revision Date: 8.23.18

Plating International Presents ONE PLATE

High Phosphorus Electroless Nickel

Plating International's ONE PLATE 2001 is the only single component system of its kind; the process is made up and maintained with the same single product. The bath is highly stable, simple to operate; depositing a smooth bright high phosphorus coating on a variety of substrates. The deposit contains 10 to 13% by weight phosphorus, which provides excellent corrosion resistance for a variety of applications. ONE PLATE 2001 self regulates the pH for ease of operation!

The Plating International's ONE PLATE 2001 process is tolerant of many typical impurities. It is designed to provide a high rate of deposition and long service life. It is well suited for those production facilities where maximum economy of operation is required. Properly applied deposits of Plating International's ONE PLATE 2001 will meet specifications MIL-C-26074, AMS 2404, AMS 2405 and ASTM B-733.

The Plating International ONE PLATE 2001 process is a patented process and covered under 5,863,616 6,306,466 7,744,685 8,147,601 8,598,260 and 10,006,126.

Advantages

- Stable long life solution w Consistent pH through-out
- Same Single Component for both Make-Up and Maintenance
- Easy to Use, Easy to Make Up, Easy to Ship, Easy to Stock
- Lower Temperature then Traditional Systems for a Safer and Energy Efficient Process
- Less Inventory
- Makes Up at 15 % compared a two component system which makes up at 6 & 15 %
- Cost Reduction (less chemicals means less money)
- Consistent high rate of deposition
- Excellent hardness and wear resistance after heat treatment

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Deposit Properties

<u>Property</u>	<u>Typical Value</u>
Density	7.8 g/cm ³
Phosphorus Content	10-13%
Melting Point	890°C (1630°F)
Hardness	
1. As plated	500-600 HK ₁₀₀
2. Heat treated @ 750°F (400°C) for 1 hour	850-950 HK ₁₀₀
Ductility	1.0% Elongation
Wear Resistance:	
1. (As plated)	20-25 TWI
2. (Heat treated @ 750°F for 1 hour)	10-15 TWI
Magnetic Tendency as plated	Non-Magnetic
Electrical Resistivity	75-100 micro ohm/cm
Corrosion Resistance	Passes nitric test & NSS 1000 Hrs (ASTM B-117)

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Process Components

ONE PLATE 2001

This Component is used for make-up and replenishment; 15% by volume for make-up, and at 15% by volume per metal turn over.

Bath Make Up

A new bath is made up with 15% by volume of ONE PLATE 2001.

<u>Tank Size</u>	<u>ONE PLATE 2001</u>
100 gallons	15 gallons

To make up the bath:

1. Clean & passivate the plating tank using 30-50% nitric acid solution for 4-8 hrs. Rinse the tank thoroughly after passivating. Plating tank must be free of all traces of nitric acid. The use of nitrate test strips is recommended.
2. Fill the clean plating tank to about one half of its volume with deionized water.
3. Add the required amount of ONE PLATE 2001 and mix well.
4. Fill the tank to its final operating level with deionized water and mix thoroughly.
5. Measure the solution's pH and adjust to the working range as needed. (Dilute sulfuric acid is used to lower pH and dilute ammonium hydroxide is used to increase pH).
6. Heat to operating temperature.

THE BATH IS NOW READY FOR OPERATION.

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Bath Operation & Control

<u>Operating Condition</u>	<u>Range</u>	<u>Optimum</u>
Nickel g/l	4.5-5.5	5.0
oz/gal	0.60-0.74	0.67
Hypophosphite g/l	22.5 – 35.0	25.0
oz/gal	4.4-5.6	5.0
Temperature F°	181-189 F°	185 F°
C°	83-87 C°	85 C°
pH	4.5-5.5	5.0
Replenishment ratio	(15 % per MTO)	
Plating rate - micron/hr	7.5-12.5	12
mil/hr	0.3-0.5	0.5
Bath loading – dm ² /l	0.75-2.5	1.5
ft ² /gal	0.3-1.0	0.6
Plating tank	Natural high density polypropylene or anodically protected stainless steel.	
Heating	Steam or hot water via externally mounted heat exchanger or internally mounted electric using stainless steel immersion heaters. Teflon® coated immersion heaters can be used.	
Agitation	Solution movement using a circulation pump or a cathode agitator rod or clean mild air from an air blower.	
Filtration	Continuous through a 1 micron filter at the rate of 10 tank volumes per hour. Filters can be bags or cartridges.	

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During operation, the solution's nickel and sodium hypophosphite concentration should be maintained between 80 and 100 percent activity to achieve consistent deposit quality and plating rate performance.

Replenishment additions may be made while parts are plating. For best results, however, replenishment should be made away from parts in the bath and in 5 or 10 percent activity increments. Many smaller volume additions are preferred over fewer larger additions.

pH measurements should be made after replenishment additions have been completed and solution stirred well to assure homogeneity and equilibrium. If necessary, pH may be adjusted upward by small additions of dilute ammonium hydroxide (50% by volume) or lowered by additions of dilute sulfuric acid (10% by volume).

The nickel concentration is determined using the EDTA titration procedure outlined in the solution analysis section. The Plating International's ONE PLATE 2001 bath may be replenished as illustrated in the following table:

mLs EDTA (0.0575 M)	Nickel Concentration		Replenishment
	Percent	g/l	ONE PLATE 2001
			gal/100 gal
14.8	100	5	0
14.2	95	4.75	0.75
13.4	90	4.5	1.5
12.7	85	4.25	2.25
11.9	80	4.0	3.0

IT IS EXTREMELY IMPORTANT TO FOLLOW THE ABOVE RECOMMENDATIONS TO MAINTAIN A CONTINUOUS SUCCESSFUL OPERATION.

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Solution Analysis

Nickel analysis

Procedure:

1. Pipette a 10 mL cooled sample of the ONE PLATE 2001 bath into a 250 mL Erlenmeyer flask.
2. Add approximately 100 mL of DI water and 10 mL ammonium hydroxide.
3. Add a “pinch” of murexide indicator to form a yellow/brown color.
4. Titrate with 0.0575M EDTA to a purple endpoint.

Calculations:

(mLs of EDTA)

See Chart

General Operation

The plating equipment for electroless nickel must be resistant to nickel build up on all parts which are in direct contact with the solution. Furthermore, equipment must be resistant to and unaffected by nitric acid and able to operate continuously at temperatures up to 200°F. Tanks fabricated from natural high-density polypropylene or 316 stainless steel with anodic protection are suggested.

Proper pretreatment is vital to the successful application of electroless nickel. Surfaces to be plated must be thoroughly clean and free of oxides.

Electroless nickel solutions are sensitive to contamination. In order to avoid bath contamination, plating equipment and/or pretreatment solutions should not be shared between electroless nickel and other finishes. Deionized water should be used for bath make up and volume adjustments. After each passivation period, thorough rinsing of plating tank and all accessory equipment is necessary to remove all traces of nitric acid.

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Waste Treatment

Spent solution is acidic and contain nickel salts. These solutions must not be discharged directly into a sewage system without proper treatment according to local/state/federal regulations. In addition, the complexing agents present in electroless nickel solutions will make conventional treatment more difficult if they are mixed with wastes from other finishing processes.

Specific options for management of waste can be obtained through your local Plating International representative. However, prior to using any recommendations or suggestions by Plating International Inc. for waste treatment, the user is required to know the appropriate local/state/federal regulations for on-site or off-site treatment which may require permits. If there is any conflict regarding our recommendations, local/state/federal regulations take precedence.

Safety

When handling liquid concentrations and solutions, wear rubber gloves, safety glasses and chemical-resistant apron. Wash thoroughly after handling. The area immediately around the plating tank must be ventilated.

In case of eye or skin contact, immediately flush with large amounts of water for at least 15 minutes. Read and follow the Material Safety Data Sheet information on all chemicals before using.

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