ELECTRONIC MATERIALS
PACKAGING AND FINISHING TECHNOLOGIES

NIPOSIT™ PM-988

NICKEL PROCESS

For Industrial Finishing Applications

Regional Product Availability			
N. America	Japan/Korea	Asia	Europe
✔		✔	

DESCRIPTION

Niposit PM-988 is a low-temperature electroless nickel process specifically designed for a variety of "plating on plastics" applications. The Niposit PM-988 process is ammonia-, lead- and cadmium-free.

ADVANTAGES

- Low-temperature operation
- Ammonia free formulation
- Lead- and cadmium-free formulation
- Outstanding bath stability

DEPOSIT DATA

Nickel content (wt %)	93–96%
Phosphorous content (wt %) (depending on bath parameters)	4–7%

BATH MAKEUP

Chemicals Required	Metric	U.S.
Deionized Water	750 ml/l	(75% v/v)
Niposit PM-988 M	200 ml/l	(20% v/v)
Cuposit™ Z	22 ml/l	(2.2% v/v)

MAKEUP PROCEDURE

1. Add deionized water to a clean tank.
2. While stirring continuously, add Niposit PM-988 M.
3. While stirring continuously, add Cuposit Z.
4. Adjust pH if necessary using 10% v/v sulfuric acid or 30% v/v Cuposit Z.
5. The pH has to be adjusted at a bath temperature of 20–24°C (68–75°F).
6. Bring to final volume with deionized water.

Operating Parameters—Metric		
Parameter	**Range**	**Recommended**
Nickel Conc.	3.8–4.2 g/l	4.0 g/l
Sodium Hypophyosphite	13.0–17.0 g/l	15.0 g/l
pH	8.8–9.4	8.9*
Temperature	28–34°C	30°C*
Agitation	Filtration pump	
Workload	0.5–2.4 dm^2/l recommended	
Deposition Rate	0.15–0.25 microns in 10 min. (depending on pH and temperature)	

* It is recommended to start a new make-up at a temperature of 34°C (93°F) and a pH of 9.4.

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Operating Parameters—U.S.		
Parameter	**Range**	**Recommended**
Nickel Conc.	0.51–0.56 oz./gal.	0.53 oz./gal.
Sodium Hypophyosphite	1.7–2.3 oz./gal.	2.0 oz./gal.
pH	8.8–9.4	8.9*
Temperature	82–93°F	86°F*
Agitation	Filtration pump	
Workload	0.2–1.0 ft²/gal. recommended	
Deposition Rate	6–10 microinches in 10 min. (depending on pH and temperature)	

* It is recommended to start a new make-up at a temperature of 34°C (93°F) and a pH of 9.4.

BATH MAINTENANCE

NICKEL METAL

Niposit PM-988 R is the nickel-containing concentrate and is use to replenish low nickel concentrations in the working solution. Niposit PM-988 R should be maintained according to nickel metal concentration, following the table in the replenishment section of this document. 1.0 ml Niposit PM-988 R is equivalent to 0.12g nickel. Nickel metal concentration can be determined using the following procedure.

I. Equipment

a) 10 ml Class A volumetric pipette

b) 250 Erlenmeyer flask

c) 25 ml and 100 ml graduated cylinder

d) 50 ml Burette

e) Laboratory spatula

f) Mortar and pestle

II. Reagents

a) Murexide indicator—in a mortar, add 5g Murexide to 100g NaCl; pestle to mix thoroughly

b) Concentrated ammonium hydroxide

III. Titrant

EDTA Solution, 0.0575M (0.115N)

IV. Procedure

a) Pipette a 10 ml of cooled electroless nickel working solution into a 250 ml Erlenmeyer flask.

b) Add 100 ml of deionized water.

c) Add 15 ml of ammonium hydroxide.

d) Add two spatula tips of murexide indicator. The solution color should change to a yellow brown. Excess indicator can obscure the endpoint.

e) Titrate immediately with 0.0575M EDTA until the solution changes to a deep blue violet endpoint.

V. Calculation

Nickel Metal g/l = ml Titrant x 0.338

Nickel Metal oz./gal. = ml Titrant x 0.045

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HYPOPHOSPHITE

Sodium hypophosphite is maintained by additions of Niposit PM-988 S according to nickel metal analysis, following the table in the replenishment section of this document. A weekly analytical check of the sodium hypophosphite concentration should be made using the method described below. 1.0 ml Niposit PM-988 S is equivalent to 0.40g sodium hypophosphite.

I. Equipment

a) 250 ml Glass stoppered iodine flask

b) 5 ml Class A transfer pipette

c) 50 ml Class A transfer pipette

d) 25 ml Graduated cylinder

e) 50 ml Burette

II. Reagents

a) Iodine solution, 0.1N (0.1M)

b) Standard starch indicator, 1%

c) Hydrochloric acid solution, 50% v/v

III. Titrant

a) Sodium thiosulfate solution, 0.1N (0.2M)

IV. Procedure

a) Pipette a 5.0 ml sample of the cooled electroless nickel working solution into a 250 ml iodine flask.

b) Add 30 ml of 50% hydrochloric acid (must be room temperature) to the flask.

c) Pipette 50.0 ml of 0.1N iodine solution into the flask. Immediately stopper the flask and pour water around the stopper to seal. Place flask in a dark place for 30 ±1 minutes between 18–24°C (65–75°F).

d) Titrate with 0.1N sodium thiosulfate solution until a pale yellow color is observed.

e) Add approximately 2 ml of starch indicator. The solution color must turn blue upon addition of starch. If the solution is colorless, the sample has been over titrated and the procedure must be repeated.

f) Continue to titrate with sodium thiosulfate to a colorless endpoint.

Note: The endpoint appears slowly so care must be taken to avoid over titration.

V. Calculation

Hypophosphite g/l = [(50 x Normality of Iodine) - (ml Titrant x Normality of Titrant)] x 10.58

Hypophosphite oz./gal. = [(50 x Normality of Iodine) - (ml Titrant x Normality of Titrant)] x 1.41

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NIPOSIT PM-988 X

Niposit PM-988 X must only be used in the case of insufficient replenishment! The maximum single addition must not exceed 0.2 ml/l (0.02% v/v).

NIPOSIT PM-988 Z

A single addition of 0.2 ml/l (0.02% v/v) Niposit PM-988 Z is required when a new solution has completed 3–4 bath loads. During this addition, the bath must be mixed thoroughly. Further additions will only be advised after analysis by Rohm and Haas Electronic Materials.

NIPOSIT PM-988 K

Niposit PM-988 K is an additional additive that is only used in the case of too low a concentration of complexing agents. The range is 4–8 ml/l (0.4–0.8% v/v). Before adding, please contact your Rohm and Haas Electronic Materials technical service representative.

REPLENISHMENT

The concentrations of nickel and hypophosphite must be kept in a range of ±10%. Niposit PM-988 R and S can be premixed, if necessary.

Replenishment—Metric (100 liter bath)

% Activity	grams/liter (as metal)	Niposit PM-988 R	Niposit PM-988 S
105%	4.2	None	None
100%	4.0	None	None
95%	3.8	166 ml	260 ml
90%	3.6	332 ml	520 ml

Replenishment—U.S. (100 gallon bath)

% Activity	oz./gal. (as metal)	Niposit PM-988 R	Niposit PM-988 S
105%	0.56	None	None
100%	0.53	None	None
95%	0.51	0.5 qt.	0.78 qt.
90%	0.48	1.00 qt.	1.56 qt.

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pH CONTROL

The pH of the Niposit PM-988 solution should be maintained between 8.8–9.4. pH measurement should always be made at room temperature. To raise the pH of the solution, add 30% v/v Cuposit Z.

To lower the solution pH, add a 100 ml/l (10% v/v) solution of reagent-grade sulfuric acid.

Use extreme caution when mixing and handling sulfuric acid solutions as the reaction is exothermic (heat producing), and temperatures may exceed 70°C (158°F). Always add acid to water and mix thoroughly during addition. Allow this mixture to cool to room temperature before making additions to the plating solution.

When making pH adjustments at operating temperature, add small, frequent amounts of pH adjuster over the entire solution surface area.

LOADING FACTOR

The workload to solution volume ratio (loading factor) of the Niposit PM-988 process should be maintained between 0.5–2.4 dm^2/liter (0.2–1.0 ft^2/gal). The process has been designed to tolerate large variations in loading factor; however, continual underloading (<0.25 dm^2/liter, 0.1 ft^2/gal.) will result in low plating rates and eventual overstabilization while overloading (>2.4 dm^2/liter, 1.0 ft^2/gal.) will cause low initial plating rates and may lead to instability of the process.

Recommended Control Schedule

Analysis of	Procedure	Frequency
Nickel Metal	Volumetric	3x per day
Hypophosphite	Volumetric	Daily
pH	Electrometric	Regularly

ROHM AND HAAS ELECTROLESS NICKEL CONTROLLERS

The SE-471 SINGLE CHANNEL CONTROLLER and SE-480 A DUAL CHANNEL CONTROLLER have been developed by Rohm and Haas Electronic Materials to precisely and automatically control electroless nickel baths, such as Niposit PM-988. Their use is recommended. Ask your Rohm and Haas Electronic Materials Technical Representative for details. Refer to the Controller Manual for detailed operating instructions.

PRODUCT DATA

For the specific Product Data values, please refer to the Certificate of Analysis provided with the shipment of the product(s).

NIPOSIT PM-988 NICKEL PROCESS

ASSOCIATED PRODUCTS

Niposit PM-988 M
Niposit PM-988 R
Niposit PM-988 S
Niposit PM-988 X
Niposit PM-988 Z
Niposit PM-988 K
Cuposit Z

EQUIPMENT

Tanks:	Polyethylene, polypropylene unpigmented or stainless steel
Heaters:	Indirect or direct heating is possible; for direct heating, (PTFE, glass or quartz heater is recommended)
Filtration:	Continuous solution filtration
Agitation:	Flitration pump
Exhaust:	It is recommended that all process tanks be equipped with an exhaust system to remove spray and steam

EQUIPMENT PREPARATION

I. Tanks and Ancillary Equipment

Prior to makeup, the process tank and ancillary equipment should be thoroughly stripped and conditioned according to the procedure outlined below.

II. Stripping Solution

Nitric Acid 300 ml/l (30% v/v)

III. Conditioning Solution

Cuposit Z 300 ml/l (30% v/v)

IV. Procedure

a) Transfer any remaining spent electroless nickel solution to a separate holding tank.

b) Thoroughly wash down the process tank and ancillary equipment with tap water. Circulate water through filtration system. Any residual plating solution remaining in the tank will shorten the life and effectiveness of the stripping solution.c) Discard water.d) Add stripping solution to the process tank. Recirculate through pump(s) and filtration system for approximately 3 hours.e) Allow the stripping solution to remain in the tank overnight, or until all metallic nickel has been stripped and heaters and pump(s) have been re-passivated.

f) Transfer the stripping solution into an appropriate holding tank.

g) Thoroughly rinse process tank with tap water. Circulate water through the filtration system.

h) Discard water.

i) Add conditioning solution to the process tank and recirculate through pump(s) and filtration system for approximately 30 minutes.

j) Check pH of conditioning solution. If the pH is less than 7.0, add additional ammonium hydroxide and continue recirculation. Repeat procedure until conditioning solution pH is greater than 7.0.

k) Discard conditioning solution.

l) Thoroughly rinse process tank, all pump(s) and the filtration system with tap water.

m) Discard water.

n) As a final rinse, use deionized water as above.

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HANDLING PRECAUTIONS

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

CAUTION! Keep combustible and/or flammable products and their vapors away from heat, sparks, flames and other sources of ignition including static discharge. Processing or operating at temperatures near or above product flashpoint may pose a fire hazard. Use appropriate grounding and bonding techniques to manage static discharge hazards.

CAUTION! Failure to maintain proper volume level when using immersion heaters can expose tank and solution to excessive heat resulting in a possible combustion hazard, particularly when plastic tanks are used.

STORAGE

Store products in tightly closed original containers at temperatures recommended on the product label.

DISPOSAL CONSIDERATIONS

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Rohm and Haas Electronic Materials Technical Representative for more information.

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ELECTRONIC MATERIALS

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Flat Panel Display Technologies

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