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A2LA Accredited ISO/IEC 17025:2005 Certificate # 2558.01

394 Low Temperature Bright Electroless Nickel/Phosphorus Plating System

The 394 System is specifically formulated to produce a lead-free and cadmium free bright nickel-phosphorus deposits at a consistent rate of deposition at a temperature that is suited for plating on plastics and EMI/RFI shielding applications. The 394 System meets Mil-26074B, AMS 2404B and AMS 2405 specifications.

The 394 System offers the following characteristics:

- Lead and Cadmium free deposits
- Operates at a plastic friendly temperature
- Excellent Stability
- Consistent Rate of Deposition 0.3-0.5 mils/hour
- Consistent Pit-Free Smooth Semi-Bright to Bright Deposits
- 1:1 Replenishment
- High Tolerance to Impurities
- RoHS, WEEE, & ELV Compliant

TYPICAL DEPOSIT PROPERTIES:

Phosphorus Content	4-7% Typical Weight Percentage
Melting Range	1620-1760° F
Density	8.1 grams per cubic centimeter
Hardness	52-56R as plated (66-68R @ 400°C)
Magnetic Properties	Slightly Magnetic
RCA Nitric Acid Test	Fails
Hydrochloric Acid Test	Passes (50% HCl, 3 min. R.T.)
Neutral Salt Spray	100 hours at 1 mil (ASTM B-117)
Electrical Resistance	35-80 micro-ohm/cm

BATH OPERATING DATA:

Solution Make-up Materials Required and Operating Guidelines

- 394-N (Nickel Component) 7% by volume
- 394-M (Makeup Component) 15% by volume
- DI water to operating volume balance
- Aqueous Ammonia for pH

Operating Guidelines:

Component	Range	Optimum
Nickel Metal	4.3 - 4.8 g/l	4.5 g/l
Hypophosphite	25.0 - 30.0 g/l	27.5 g/l
pH	5.10 - 5.50	5.30
Temperature	153 - 157° F	155° F
Bath Loading Sq Ft/Gal	0.10 - 0.70	0.40

Accu-Labs 394 Make-up Procedure:

- Add DI water to properly cleaned and passivated tank (fill to half volume)
- Add required amount of 394-M
- Add required amount of 394-N
- Fill tank to working volume with DI water
- Mix thoroughly with solution and slight air agitation
- Heat to 155° F
- Analyze nickel content and adjust to 4.5 g/l
- Check pH and adjust to 5.30

Note: pH can be adjusted upward with a 50% solution of ammonium hydroxide; if pH needs to be adjusted downward a solution of 10% sulfuric acid can be used. All additions should be made slowly, with agitation and preferably without work in the tank.

Additionally: The use of an electroless nickel strike (Accu-Labs 388) prior to processing parts in the 394 bath may be required for process optimization and may substantially increase the 394 bath life. Contact your Accu-Labs Technical Representative for more information.

Bath Maintenance:

To ensure proper operation of the 394 system, the solution chemistry should be maintained using the aforementioned operating guidelines. This is accomplished by measuring and monitoring the nickel metal concentration.

Upon determination of the nickel metal concentration, additions of both 394-N and 394-R are made based on the following replenishment guide for a 100-gallon bath:

Nickel %	Nickel Concentration	Additions 394-N	Additions 394-R
100	4.5 grams/liter	None	None
95	4.3 grams/liter	1300 mls	1300 mls
90	4.0 grams/liter	2600 mls	2600 mls
85	3.8 grams/liter	3900 mls	3900 mls
80	3.6 grams/liter	5200 mls	5200 mls

NICKEL METAL DETERMINATION:

Reagents:

- 0.0575M EDTA or 0.1M EDTA
- 50% Ammonium Hydroxide
- Murexide Indicator

Procedure:

- Add 10 ml bath sample to 100 ml DI water
- Add 10 ml ammonium hydroxide solution
- Add 0.2 grams murexide indicator
- Titrate with EDTA from pale yellow to purple (violet) end point
- Record number of mls of EDTA titrated

Calculation:

- Mls of 0.0575 EDTA x 0.339 = grams/liter nickel or
- Mls of 0.0575 EDTA x 5.65 = % nickel in bath
- Mls of 0.1000 EDTA x 0.589 = grams/liter nickel or
- Mls of 0.1000 EDTA x 13.1 = % nickel in bath

Handling Considerations:

When handling Accu-Labs 394 components proper precautions should be observed. Do not take internally and avoid contact to skin and eyes. Wear clean chemical resistant gear, goggles, gloves, apron, footwear, and face shield. Read MSDS prior to use.

Notice of Disclaimer:

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