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TECHNICAL BULLETIN NS41 Nickel Stripper Solution

I. Description

NS41 is a nickel stripper concentrate. This is used in combination with stabilized hydrogen peroxide, Cir130A, to strip nickel metal from copper substrates. NS41 gives very little copper attack. The NS41 process leaves the copper bright and shiny and ready for further processing. NS41 is used for electroless and electrolytically plated nickel. NS41 will not strip gold. Gold stripping must be done prior to nickel stripping, when necessary.

II. Operating Parameters

Make-Up	See Section IV Control Procedures below.
Temperature	95 – 115 F (105 F nominal)
Immersion Time	Typically 2 - 3 hours
Process	Batch tank
Agitation	Recommended, by pump.
Ventilation	Advised
Filtration	Recommended, using a 10 micron polypro filter
Tanks	Polypropylene, Polyethylene
Racks/Baskets	Plastisol Covered Steel
Heaters	Quartz, Teflon coated

III. Physical Properties

Specific gravity	1.18 – 1.22
Appearance	Clear to light amber liquid
PH	2.8 – 3.2
Odor	None
Flash Point	> 200F

IV. Control Procedures

Makeup of a NS41 Bath

1. Add 85% by volume NS41 to the tank.
2. Add 10% by volume DI water to the tank and mix.
3. Add 5% by volume Cir130A and mix.
4. Check the pH and adjust to 3.2 using either caustic potash 45% (KOH 45%) or phosphoric acid 85%.

Use and Control of NS41

The NS41 bath should be analyzed and replenished before use. Hydrogen peroxide (Cir130A) is lost over time, even when the bath is idle. The NS41 concentration should be controlled through analysis and replenishment. As the bath is run, the pH will slowly climb. Higher pH values reduce the strip rate, and lower

pH values increase copper attack. The pH should be controlled between 3.0 and 3.4, with a nominal value of 3.2. See Section V. Analysis for more details.

The rate of nickel stripping is dependent upon the thickness and type of nickel deposit. Typically 40 to 50 microinches of nickel are removed per hour. Measurement of nickel strip rate is not necessary, but it can be done if desired. Nickel strip rate can be measured easily with an XRF. One would measure the initial nickel thickness, then strip a board for 60 min, and finally measure the nickel thickness again. The difference in nickel thicknesses is the etch rate per hour.

Copper is also dissolved, but much more slowly than nickel. Once the nickel is stripped, the copper etch rate is approximately 5 to 15 microinches per hour. Areas with low nickel thickness will strip faster than areas of high nickel thickness, leaving some exposed copper in the bath. This exposed copper will have very little attack, while the remainder of the nickel is stripped.

Replacment of NS41

The NS41 solution should be discarded and remade when the nickel metal content reaches 4 grams per liter. Higher nickel metal concentrations will give a less desirable copper appearance. The bath may have to be discarded and remade if the copper appearance becomes unacceptable.

V. Analysis

NS41 Concentration

1. Pipet 5 mL of the working solution into a titration flask.
2. Dilute to 50 - 75 mLs with de ionized water and add 3 to 4 drops of phenolphthalein indicator
3. Titrate with 1.0 N NaOH to a pink endpoint and record the volume titrated.
4. Calculation:

$$\text{NS41 concentration (\% vol)} = (\text{mLs of 1.0N NaOH}) \times 8$$

Maintain the NS41 concentration between 80 and 90% by volume. This is done through additions of NS41 and/or DI water.

Cir130A Concentration

1. Pipet 1.0 mL of the working bath into a titration flask and then add 50-75 mL of DI water.
2. Add 5 mL of sulfuric acid 50% by vol.
3. Add 4 - 6 drops of Ferroin indicator solution.
4. Titrate with 0.1N Ceric Ammonium Sulfate solution from red-orange to the pale blue endpoint.
5. Calculation:

$$\text{Cir130A content (\% vol)} = (\text{mLs Ceric Ammonium Sulfate used}) \times 0.29$$

Maintain the Cir130A concentration between 4 and 5% by volume, through additions.

PH Adjustment

1. After NS21 and Cir130A adjustments are made, then the pH must be adjusted.
2. Measure the pH of the working bath.
3. Adjust the pH to 3.2 using either phosphoric acid 85% or caustic potash 45%.

Control the pH in the range of 3.0 to 3.4, 3.2 nominal.

Nickel Concentration by AAS

1. Pipet 5.0 mL of working solution into a 50 mL volumetric flask.
2. Dilute to the mark with 10% v/v HCl and mix.
3. Pipet 1.0 mL of the dilute solution into another 100 mL volumetric flask.
4. Dilute to the mark with 10% v/v HCl and mix.
5. Set up and calibrate the AAS for nickel with 1.0, 5.0, and 10.0 ppm standard solutions.
6. Analyze the 2nd dilute solution (from step 4) for nickel content.
7. Nickel calculation:

$$\text{Nickel metal (g/L)} = \text{ppm Ni reading}$$

Discard and remake the NS41 bath when the nickel content reaches 4 g/L.

VI. Safety and Storage

NS41 working solution is acidic containing buffered phosphoric acid and hydrogen peroxide. Avoid breathing vapors. Use in a well-ventilated area. When handling concentrate or working solution, wear protective clothing, gloves and chemical safety goggles. In case of skin contact, remove contaminated clothing and flush affected area with plenty of cold water. In case of eye contact, flush immediately with plenty of cold water and seek medical attention immediately.

Store components in their original containers. Keep away from direct sunlight and temperature extremes. Protect from freezing. Consult the MSDS sheets for additional information.

VII. Waste Treatment

NS41 spent solution contains buffered phosphoric acid, hydrogen peroxide, copper metal, and nickel metal. Consult with local officials for waste disposal regulations. Please ask a Florida CirTech sales rep. for more information regarding waste treatment of this chemistry and our complete line of waste treatment chemistry if additional help or information is desired.

VIII. Miscellaneous

NS41 is available in 5 gallon pails and 55 gallon drums. Cir130A is available in 15 gallon carboys and 55 gallon drums.

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