



# NICULOY™ 22-1

For Industrial Finishing Applications

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

## DESCRIPTION

Niculoy 22-1 deposits an alloy of nickel, copper and phosphorus onto metallic and nonconductive substrates.

The alloy has a unique combination of properties—Brightness, deposits are extremely bright, smooth and reflective with an appearance approaching that of bright nickel electroplate. Corrosion resistance is extremely high, e.g. a one mil coating thickness on mild steel will withstand 240 hours salt spray testing without breakdown. Ductility, flexural capacity exceeds that of any other known electroless nickel deposit. Hardness as plated is 600 vickers and heat treatment at 399°C (750°F) maximizes hardness at more than 1,000 vickers. Wear resistance and acid resistance are also very high while the deposit is virtually non-magnetic.

Because of its versatility, the Niculoy 22-1 alloy is found in special applications in areas of high technology such as computer memory discs, high technology such as computer memory discs, high accuracy metal optics and molding tools.

## ADVANTAGES

- Simple to operate—for make-up mix 2 concentrates with water and heat to operating temperature; no pH adjustment or other time-consuming factors are required; replenishers are added directly to the working bath at operating temperature
- Ease of control—replenishment is based on nickel content and replenishers maintain bath concentration and pH
- Fast and consistent plating rate—approximately 0.5 mils consistently deposited per hour at 88–93°C (190–200°F) when operated according to instructions

## DEPOSIT DATA

Specific Gravity:	8.2
Nickel Content:	~87%
Phosphorus Content:	~12%
Copper Content:	~1%
Melting Point:	890°C (1,630°F)
Electrical Resistance:	above 60 micro ohm/cm
Wear Resistance:	taber wear index value 2.7
Corrosion Resistance:	>96 for 1 mil deposit over properly prepared steel as per ASTM-B-117-7
Magnetics:	nonmagnetic
Hardness as Plated:	600 vickers
Heat Treated:	1,000 vickers

## BATH MAKE-UP

**CAUTION!** Rinse tank with sufficient quantities of water to eliminate possibility of contamination, especially where nitric acid has been used previously for stripping.

Add in order listed, and stir between each addition:

Niculoy 22 M-1:	200 ml/l	(20.0% v/v)
Deionized or Distilled water:	767 ml/l	(76.7% v/v)
Niculoy 22 S-1:	33 ml/l	(3.3% v/v)

Heat to 88–93°C (190–200°F) and bath is ready for operation.

## BATH OPERATION

### Agitation

Vigorous and uniform air or mechanical agitation is recommended. Air agitation is preferred with the amount exceeding 600 cubic centimeters per minute per gallon of solution. Mechanical agitation is satisfactory providing the entire bath solution circulates freely.

**Note:** When using air agitation, be sure air is directed away from parts being plated. Filtered air is recommended to ensure optimum results.

## NICULOY 22-I

### Temperature

Operate bath at 88–93°C (190–200°F). Bath should be at operating temperature before parts are immersed. Uniform heating is needed to ensure optimum results.

**Note:** Remove all work from the bath during cool down periods or when bath temperature is below 85°C (185°F) to ensure bath stability.

### Plating Rate

12.5 micron per hour at 90.5°C (0.5 mil/hour at 195°F)

### Loading

0.6–2.45 dm<sup>2</sup>/liter (0.25–1.0 ft<sup>2</sup>/gal.) optimum

### Depletion Rate

Approximately 10% per hour at 0.6 square decimeters per liter (0.25 square feet per gallon loading).

### Yield

Approximately 1.6 mil feet per gallon of bath per cycle based on a 3-cycle operation and depletion of 40% prior to discarding.

### Filtration

Continuous filtration to ensure maximum smoothness of the deposit (5–10 micron polypropylene filters are recommended).

## BATH CONTROL

Replenishment additions are based solely on nickel content of the bath, determined by the standard EDTA method.

After nickel content determination, replenish according to the following table, adding Niculoy 22 R first and then Niculoy 22 S-1.

Replenishment with R and S-I components for each 378 liters (100 gallons) of bath						
optimum ↑	% Nickel Concentration	g/l (as metal)	Niculoy 22 R		Niculoy 22 S-1	
	100%	7.1	—	—	—	—
	90%	6.4	2,500 ml	84.5 oz.	5,000 ml	169.0 oz.
	80%	5.7	5,000 ml	169.0 oz.	10,000 ml	338.0 oz.
	70%	5.0	7,500 ml	235.5 oz.	15,000 ml	507.0 oz.
	60%	4.3	10,000 ml	338.0 oz.	20,000 ml	676.0 oz.

**Note:** To ensure that the copper remains in solution, the bath concentration must be maintained between 90 and 100%. Should the concentration fall below 90%, replenish in 10% increments—not in one charge.

## DETERMINATION OF NICKEL IN NICULLOY 22-I MAKE-UP BATH CONTROL PROCEDURE

### I. Principle

The nickel is determined complexometrically with EDTA in ammonia solution, using murexide indicator.

### II. Reagents

- EDTA 0.05M; Dissolve 18.61g of EDTA disodium salt in water and dilute to 1 liter; standardize with copper or nickel solution
- Ammonia solution (S.G. 0.88)
- Triethanolamine, 33%; dissolve 165g of triethanolamine in water and dilute to 500 ml
- Murexide indicator dispersion; mix 1g of indicator with 200g of sodium chloride
- Deionized, or distilled water

### III. Procedure

- Pipette 5.0 ml of Niculoy 22-I make-up bath into a 250 ml. Erlenmeyer flask and dilute to 100 ml with deionized water.
- Add 25 ml of ammonia (S.G. 0.88), 5 ml of triethanolamine and 0.5g. of murexide indicator.
- Titrate slowly with EDTA (0.05M). The end point should be approached slowly and the color change is brown-red to red-violet.

### IV. Calculation

1 ml 0.05M EDTA = 2.9355 mg Ni

$$\text{g/l Nickel} = \frac{\text{ml EDTA} \times \text{Molarity} \times 58.71}{(\text{aliquot}) 5 \text{ ml}}$$

## NICULOY 22-1

### DEPOSIT REMOVAL

Substrate:	Method
Steel and steel alloys:	Niculoy Stripper 432 removes 25 $\mu\text{m}$ /hour at 93°C (1 mil per hour, at 200°F), fresh bath
Aluminum:	Concentrated nitric acid part must be dry
Stainless steel:	Nitric acid 30% minimum by volume

### EQUIPMENT

Tanks:	Polypropylene (natural), pyrex or suitable high-temperature liners (natural)
Heaters:	Teflon™ fluoropolymer, quartz, pyrex or jacketed tank with suitable plastic liner
Pumps:	Seal-less CPVC

Do not use metallic tanks, heaters or pumps.

### PRODUCT DATA

Niculoy 22-1 concentrates are water-based solutions.

#### Niculoy 22 M-1

Specific gravity at 20/20°C:	~1.2
Appearance:	Green
pH:	~4

#### Niculoy 22 R

Specific gravity at 20/20°C:	~1.3
Appearance:	Dark green
pH (approx.):	>2

#### Niculoy 22 S-1

Specific gravity at 20/20°C:	~1.2
Appearance:	Clear
pH:	~9

### 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.

## NICULLOY 22-1




### ELECTRONIC MATERIALS

  
Circuit Board Technologies

  
CMP Technologies

  
Flat Panel Display Technologies

  
Microelectronic Technologies

  
Packaging and Finishing Technologies

For locations and information please visit <http://electronicmaterials.rohmhaas.com>

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