

SOP 0001 NICKEL PLATING

DESCRIPTION: The nickel facility plates a wide range of nickel deposits. The system is comprised of four different processes: 1) The Wood's nickel process is a "strike" (thin metallic coating) used to improve adhesion on stainless steel, nickel, invar (a nickel iron containing 36 per cent of nickel) and titanium. 2) The Watt's nickel deposit has been developed for producing a hard, ductile and compressively stressed nickel deposit. 3) The electroless nickel deposit has a high phosphorous (10-12%) content. The deposits produce smooth, hard, and easy to solder surfaces. 4) The black nickel deposit is a dark, thin, nonreflective deposit that performs best over corrosion resistant coatings.

MODE OF OPERATION: Check the blank before each procedure with a pencil if it is done. Mark the changes you made to the procedures with a pencil.

__1) The part is degreased using an aqueous solution (organic solvent).

__2) The physical soils are removed in an ultrasonic cleaning bath.

__3) Water wash.

The steps (a-d) may be used to clean stainless wafers thoroughly.

__a) Electroclean anodically.

__b) Water wash.

__c) Anodically etch in:

Sulfuric acid, H ₂ SO ₄ (density 1.84 g/cm ³)	205 mL
Water	To 1 L
Temperature	Below room temperature
Current density	200A/ft ² (range 175 to 250 A/ft ²)
Duration	30 s to 5 min
Cathode	Lead 7% tin-93% lead alloy
Tank	PVC/rubber-lined tank

__d) Water wash thoroughly.

__4) Metal-oxide films are removed by strong acids.

Immerse in:

Hydrochloric acid, HCl (concentrated)	1 mL
Sulfuric acid, H ₂ SO ₄ (concentrated)	10 mL
Water	To 1 L
Temperature	Room temperature
Duration	30 to 45 s
Tank	PVC/rubber-lined tank

__5) A thin metal "strike" is electro-deposited upon the part to improve adhesion. If

the part is made of stainless steel, nickel, invar or titanium, the Wood's nickel process is used for striking the part.

Nickel chloride, $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$	240 g
Hydrochloric acid, HCl (concentrated)	125 mL
Water	To 1 L
Temperature	Room temperature
Anode	Nickel
Tank	PVC/rubber-lined tank

Cathodically at 50 A/ft^2 for 2 min and then at 15 A/ft^2 for 2 min.

__6) Water rinse thoroughly.

__7) After striking, the part is nickel plated with a sulfamate-chloride coating.

Nickel sulfamate, $\text{Ni}(\text{NH}_2\text{SO}_3)_2$	300 g
Nickel chloride, $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$	6 g
Boric acid, H_3BO_3	30 g
Water	To 1 L (pH 3.5 to 4.2)
Temperature	28 to $60 \text{ }^\circ\text{C}$.
Anode	Nickel
Tank	PVC/rubber-lined tank

Cathodically at 75% of the full current load, allow the job to warm up, and raise the current to the full value (200 to 2500 A/m^2) for the time duration according to the thickness of deposited nickel.

__8) Water rinse thoroughly.

__9) Dip in 20 g/L sodium hydroxide (NaOH) solution at around $60 \text{ }^\circ\text{C}$.

__10) Thoroughly rinsed with water.

__11) Dry.

__12) Bake at $190 \text{ }^\circ\text{C}$ (range 150 to $250 \text{ }^\circ\text{C}$) for 2 h (range 1 to 3 h) in the case of high-carbon stainless steel.