**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, H₂SO₄ (density 1.84 g/cm³) | 205 mL |
| Water | To 1 L |
| Temperature | Below room temperature |
| Current density | 200A/ft² (range 175 to 250 A/ft²) |
| 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, H₂SO₄ (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, NiCl₂ · 6H₂O** 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/ft² for 2 min and then at 15 A/ft² for 2 min.

6) Water rinse thoroughly.

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

- **Nickel sulfamate, Ni(NH₂SO₃)₂** 300 g
- **Nickel chloride, NiCl₂ · 6H₂O** 6 g
- **Boric acid, H₃BO₃** 30 g
- **Water** To 1 L (pH 3.5 to 4.2)
- **Temperature** 28 to 60 °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/m²) 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 C.

10) Thoroughly rinsed with water.

11) Dry.

12) Bake at 190 °C (range 150 to 250 °C) for 2 h (range 1 to 3 h) in the case of high-carbon stainless steel.