Nickel Phosphorous Electroless Plating

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Operations Procedure

General 3 Stage Process

1. Remove oxide growth with Sulfuric Acid (H2SO4) Bath.
2. Coat wafer surface in Palladium Sulfate, PdSO4(Catalyst).
3. Plate wafer with Nickel Phosphorous, Ni(P).

* Rinse wafer before and after each step.

Nickel Phosphorous (Ni(P)) Solution

Concentrations:

* DI Water = 76.5%
* Ephithas ANPM = 20.0%
* Ephithas ANPN = 3.4%
* Ephithas ANP Brightener = 0.1%

Plating Preparation

Note: Preparation should be done a day before plating.

1. Rinse the Jacketed Beaker 3X.
   1. Fill with DI water while running stir paddle and drain.
2. Fill Jacketed Beaker with Nickel Phosphorous solution.
   1. IMPORANT: This needs to be pumped in with the in-line filter (0.2um).
      1. This is necessary because the Ni(P) solution is an active chemistry. Plating occurs in solution naturally without a catalyst. Consequently, particles of any kind can mask plating on the surface of the wafer.
      2. First run water through the line. Both to ensure that it is operating properly and to make sure there are no leaks.
      3. The in-line filter can only be used TWICE. If it is used beyond that pressure will build in the housing and burst open.
      4. Keep in mind that the filter can only be used in one direction (Arrow on filter housing).
      5. Pay attention to kinks and try to keep the filter as up-right as possible as to use as much surface area of the filter as possible.
3. Measure the pH of the Ni(P) before plating.
   1. pH is measured and adjusted at room temperature.
   2. pH should read around 6.
4. The morning of plating turn on the stir paddle and the heater.
   1. Bath needs to be around 85 degrees Celsius.

Qualifying Process

* Generally, use a 2x2” piece of copper dummy wafer.
* Mask out a small area with red tape in the center and process the wafer normally.
* Measure the step height across the area that was masked.

Operations Procedure

Note: Move ON DI water hose from tank to take with the processing wafer. To keep a constant flow of DI water in the tank.

1. Rinse wafer in the 1st DI water tank.
2. Bath wafer in H2SO4 for 3 minutes.
   1. This will remove oxide growth.
3. Rinse wafer in the 2nd DI water tank for 1 minute.
4. Bath wafer in PdSO4 tank for 4 minutes.
   1. This acts as a catalyst to focus a reaction on the wafer’s surface.
   2. 2 minutes for a dummy wafer.
   3. IMPORTANT: Rotate the wafer by moving the wafer holder handle from one side of the tank to the other after every minute.
      1. This will help to avoid any “micro air bubbles” from masking out parts of the wafer to being coated.
5. Dip wafer in the 3rd DI water tank.
   1. This is intended to be a quick rinse to shed any excess PdSO4.
   2. A longer rinse could wash away to much PdSO4.
6. Set a timer and lower wafer into the Ni(P) solution.
   1. Time is variable as this is electroless plating (Based on target thickness).
7. Remove wafer from Ni(P) tank and rinse for 2 minutes in the 4th DI water tank for 2 minutes.
8. Dry wafer in Spin Dryer.

Filtering Solutions

Ni(P) – Nickel Phosphorus

IMPORTANT: This solution should be filtered before each use. The chemistry is very active and due to the electroless nature of the process a small about of Ni is plating in solution. These floating scraps of Ni can mask out the intended plating area on the surface of a wafer during processing. In fact any particles in the solution can result in this.

1. Measure the pH of the solution.
   1. This is done before every use of the solution. To ensure and monitor the quality and potential degradation of the bath.
   2. Be sure to calibrate the probe beforehand with both the 4pH and 7pH standards.
2. Lower the pH probe into the solution at room temperature and while the stirrer homogenizes.
3. You will hear a beep when the pH reader stabilizes on a pH.
4. Set up the parasitic pump on the counter aside the jacketed beaker.
5. We use an inline filter between tubing with the parasitic pump.
6. Pump DI water into the filter to rinse it out (1 minute).
7. Place the inlet end of the tubing into the NiP solution.
   1. Be sure that the filter is up right. This will ensure that the full surface area of the filter is being used.
8. Once done pumping solution rinse the filter and tubing with DI water (1 minute).

H2SO4 – Sulfuric Acid – Decision to be made about this will be handled.

- 10/01/2019 Meeting Notes:

- No house vacuum – pump down- water aspirator, check DI source - 12 megaohm, May not need filtration?- Use mrl sulfuric (high grade), Pd sulfate – higher quality? – contact vendor, Pd sulfate filtration to be done in a Teflon container in the sink, NiP tank is no good – no more jacketed beaker – NPR,

PdSO4 – Palladium Sulfate – to be decided. May be looking into buying and discarding purer chemistry.