520.495/530.495/580.495 Microfabrication Laboratory

Flow Cytometer **Lab 6: Metal Patterning**	

This week we will do lithography on the deposited thin film of aluminum to define the electrode patterns. We will first place the wafer that is coated with photoresist in the mask aligner so that we can align the wafer to the mask using the alignment keys on the wafer and mask #2. After the wafer and the mask are properly aligned, we will expose the photoresist to transfer the pattern from the mask onto the wafer. We will then develop to remove the exposed photoresist and etch the aluminum in the areas not covered by photoresist.

Preliminaries:

1. All the cleaning procedures (except using spin/rinse/dryer) should be done in the hood.
Aprons, protective sleeves, gloves, face shield, lab coat, and goggles must be worn during cleaning procedures. Wear plastic disposable gloves at all times.
2. Transfer wafers with tweezers; try to grasp the wafer at the same place each time, usually at the flat edge.
3. Using the spin/rinse/dryer: Turn on nitrogen gas (50 psi). Test the spin/rinse/dryer to make sure that the door seals after pressing start. Line the wafers in the blue wafer holder so that the wafers are far apart. After rinsing and drying, do not open washer door until wafer holder has automatically turned right side up.

I. Prelab Work:

1. Draw the cross section of the current stage of your device (properly lable all the layers, their thicknesses and angles)
2. In a schematic diagram show today's processing steps -draw a cross-section of the wafer for each step showing the desirable effect.
3. What is the purpose(s) of the metal? why is it being deposited on top of an oxide layer?

II. Lab Work:

Task #1 Lithography

1.Fill a 90 mm crystallization dish with about 100ml of developer 453. Fill a 2000 ml beaker with 1500 ml of de-ionized water for rinsing the wafers following development.
2. Set wafer on to the chuck of the photo mask aligner, and align the wafer with the mask. Set exposure timer at 300 seconds. Turn away from the aligner during exposure. DONOT bake after exposing.

3. Develop the photoresist by immersing the wafer in the developer for 25 minutes. Rinse the wafer by first immersing and gently shake the wafer in the beaker of DI water for 60 minutes, then again under running de-ionized water at the sink for 30 seconds. Dry the wafer then inspect it under the microscope.
4. Post bake the wafer on the hot plate for 120 seconds at 110°C. Let the wafers cool down for 2 minutes in their carriers but in the laminar flow hood.

Task #2: Aluminum etching

1. Fill a 90 mm crystallization dish with 50 ml of PAN etch (prepared last week). Also fill two 2000 ml beakers with de-ionized water for use as rinse.
2. Immerse a wafer into the acid in the crystallization dish. Gently swirl the dish to insure the etching is uniform. After approximately 10 minutes, the aluminum should clear at one edge of the wafer, revealing the patterns. Continue to etch until the field is clear across the entire wafer. Remove from the acid, and immerse in DI water to rinse.
3. Rinse, dry and inspect the wafers.

Task #3: Photoresist removal

1. Fill a 1000 ml beaker with approximately 700 ml of acetone. Fill another with 700 ml of isopropanol
2. Immerse the wafers in the acetone for 2 minutes, then for 2 minutes in the isopropanol. Rinse with deionized water and then blow or spin dry the wafer.
3. Place your wafer in the wafer holder until next week.

III. Postlab Work:

1. Why does it take longer time to etch away the aluminum in the center of the wafer as opposed to the periphery.
2. Why do we use Quartz or soda-lime plates as the support material for our plastic film? Why not regular glass.
3. Why did we pattern the metal?
4. Why did we expose the photoresist for 300 seconds instead of 10 seconds?

Lab procedure prepared by H. Vo and A.G. Andreou, Fall 2003.