520.495/580.495 Microfabrication Laboratory

Laboratory Assignment

Aluminum Evaporation

This week we will deposit a thin film of aluminum on our wafers. This will involve, first, cleaning the material to be evaporated (aluminum) and placing our wafers in the thermal evaporator for deposition. Finally, we will spin photoresist on the fresh aluminum film and get it ready for next week's photolithography.

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.

I. Prelab Work:

None; grade credit is given to postlab work.

II. Lab Work:

A. Cleaning aluminum -raw material-

1. Prepare PAN etching solution in 200 ml beaker. (75 ml phosphoric acid, 3 ml nitric acid, 15 ml acetic acid, 5 ml water).
2. Handling the wire with gloves, clean 2 g of aluminum wire by soaking for 5 minutes in ethanol, 5 minutes in PAN etch, then rinse with water, acetone and blow dry with nitrogen. Clip into 1 inch pieces on clean piece of aluminum foil, and cover until loaded into evaporator.

B. Evaporation

1. Place wafers onto the stage of the evaporator.
2. Load 1/2" pieces of Al wire into the "boat".
3. Pump down evaporator following instructions provided.
4. When a pressure of approximately 1×10^{-6} torr is reached, use the variac to increase the current through the boat. Aluminum should melt, and will begin to cover the wafers. Deposit aluminium until all aluminum dissapears from the boat (it takes about 10 minutes).

C. Photoresist deposition

1. Set the photoresist spinner RPM at 4000 RPM (Revolutions Per Minute) with acceleration in approximately 5 second and the timer to 60 second for spinning.
2. Make sure that the vacuum is on after centering the wafer on the chuck. You can do that by gently trying to push the wafer off the chuck using the tweezers.
3. Using a transfer pipette, carefully withdraw approximately 1 ml of positive photoresist from the bottle into the pipette. Again, to minimize contamination, do not touch any part of syringe that is going into the photoresist bottle, and use a new pipette each time.
4. Dispense photoresist on to the wafer slowly, and try not to create any air bubbles.
5. Double check that vacuum is on and cover the spinner. Now start spinning (60 seconds at 4000 R.P.M.) Don't forget to hit reset before each spinning.
6. Prebake wafers on hot plate at approximately 110°C for 45 seconds.
7. Carefully get the wafer off the hot plate and place them in their carriage to be stored (in a dark place) until next week.

III. Postlab Work:

1. Based on today's lab work, how thick of an aluminum layer did you deposit? Justify your answer.
2. What photoresist did we use today? Based on the spin on procedure, how think of a photoresist layer do you think you have on your wafer?
3. What does "positive photoresist" mean?

Lab procedure prepared by A.G. Andreou, Fall 1998