

520.495/530.495/580.495 Microfabrication Laboratory

Optical Waveguides

Lab 7: SU-8 deposition (Core)

This week we will finish the fabrication of the waveguide by filling the V-groove of the waveguide with SU-8 negative photoresist. After exposing to UV light and baking, the photoresist will become the core of the waveguide that help to guide light from one mirror to another.

Preliminaries:

1. Transfer wafers with tweezers, try to grasp the wafer at the same place each time, usually at the flat edge.
2. 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.

I. PRELAB ASSIGNMENT:

1. Draw the cross section of the current state of your device.
2. What are the differences between positive and negative photoresist?
3. What is the wavelength of the UV light?

II. LAB WORK:

1. Dehydrate the wafers on the hot plate for 5 minutes at 110°C.
2. Set the photoresist spinner RPM at 2000 RPM (Revolutions Per Minute) with acceleration in approximately 5 seconds and the timer to 60 seconds for spinning.
3. 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.
4. Using a transfer pipette, carefully withdraw approximately 3 ml of **negative photoresist SU-8** 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.
5. Dispense photoresist on to the wafer slowly, and try not to create any air bubbles.
6. Double check that vacuum is on and cover the spinner.
7. Start spinning by pressing the START button of the spinner.
8. Bake the wafer on the hot plate, under the hood for 5 minutes at 90°C then 3 minutes at 110°C.

9. Carefully scraped off the excess SU-8 when it still hot.
10. Expose the SU-8 under UV light for 150 seconds.
11. Bake on hot plate for 5 minutes at 90°C then 5 minutes at 110°C.
12. Let wafer cool down then store it in the single wafer carrier.

III. POSTLAB ASSIGNMENT:

1. The cavity is $> 150 \text{ um}$, but the photoresist is only 25 um thick @ 3000 rpm, did we completely fill the V-groove of the waveguide with SU-8? Why?
2. Draw important cross sections of your device after this lab (properly label all the layers, angles and planes).
3. Why did we bake the photoresist at 90°C first then 110°C after that?
4. Generally speaking, if it takes 30 seconds to completely expose 10 micron layer of negative photoresist, will it take longer? Shorter? Or equal amount of time to completely expose the 10 micron layer of positive photoresist? Why?

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