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-grove 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. What are the differences between positive and negative photoresist (in photochemistry and in process)?
2. What is the wavelength of the UV light and the power density of the UV source on our alignment?

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. Pour **negative photoresist SU-8 2025** from the bottle onto the wafer. Ideally cover 80% of wafer surface.
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. Soft bake the wafer on the hot plate, under the hood for 15 minutes at 65°C then 60 minutes at 95°C.
9. Align the wafer to the SU8 mask.

10. Expose the SU-8 under UV light for 300 seconds.
11. Post exposure bake on hot plate for 10 minutes at 65°C then 30 minutes at 95°C.
12. Develop to remove the unwanted SU-8 and rinse wafers with IPA.
13. Rinse in DI water, dry and place in storage.

III. POSTLAB ASSIGNMENT:

1. The cavity is > 150 um, but the photoresist is only 25 um thick @ 3000 rpm, did we completely fill the V-grove 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 SU-8 photo-epoxy at 65°C first then 95°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, modified Fall 2004, and revised by H. Vo, T. Yeh, M. Ho and A.G. Andreou, Fall 2007.