

ECEn 555 – Optoelectronics Devices Lab
Week 8
“Metal Contacts for LEDs”

In this lab, you will work with actual III-V material using the techniques you learned last week. Again, you need to be very careful with this material as it very fragile. You will be given a piece of GaAs substrate that has epitaxial layers grown on it specifically to produce LEDs. The epitaxial layers are grown with bandgaps that emit red light. In this lab you will deposit aluminum on the top side of your GaAs chip. The aluminum on the shiny top side of the chip will be patterned using lithography to form active emitters on the front surface.

Major Objectives

1. Lithography on GaAs LED chip. Mount your GaAs chip on a 4” silicon wafers as you did in the previous lab. Place the 4” wafer in the spinner and place a few drops of AZ3030 photoresist on the small mounted piece. Spin the resist to thin it out then bake the resist on a hotplate at 90C for 1 minute. Place the 4” wafer in the aligner together with the LED mask. (***Turn down the pressure on the aligner chuck way down*** so you don’t damage your chip or the mask since you are greatly reducing the surface area in contact with the mask). Expose the resist and develop the pattern.
2. Al Evaporation and Liftoff. Dip the small piece and 4” wafer into BHF to remove and surface oxide and then blow dry with nitrogen. Now do a 30 second O₂ plasma descum in the LFE to remove any surface contamination. Load your small piece and 4” inch wafer into the thermal evaporator along with aluminum wrapped around a tungsten boat. The lab supervisor will show you how to do this. Pump down the chamber, and then evaporate aluminum over the surface (300 nm). After evaporation, remove the wafer and place it in acetone. This will “lift off” Al evaporated onto photoresist and leave only Al that was in contact with the semiconductor. The lithography pattern should now be clearly visible as Al on the semiconductor. Demount the chip by gently pushing it off the 4” wafer.

Your LEDs are now basically done and ready for testing next week.