HOMEWORK 2
Evaporating a Thin Metal Film
DUE: Thursday, Oct. 30, 2008

Homeworks may be submitted electronically to
hu@ece.ucsb.edu

Obtain a piece of single-crystal Silicon wafer. The crystallographic orientation and doping of the wafer are not important, but note what the doping is.
PLEASE KEEP YOUR SAMPLES AFTER THIS HOMEWORK IS DONE.

The first goal of this homework is to give you experience in evaporating a thin metal film onto a silicon substrate, using the lift-off technique.
If your thin film adheres to the substrate, **the second goal** is for you to measure the resistance of the film you have deposited.

1. Prepare (clean) the wafer using the standard procedure listed in the Teaching Cleanroom.
2. Samuel Beach and/or Bob Hill will provide an appropriate mask for you to use. Apply photoresist, expose and develop the pattern. (See the process sheets on 'Metal Liftoff').
3. Immerse your sample in 50:1 DI H_2O:HF for 10 seconds.
4. EVAPORATE 100 nm of aluminum, using the information on 'Metal Evaporation'.
5. Use the Dektak to provide information on the thickness of your Aluminum film; and take an optical photograph of your metal-on-silicon pattern.
   a. Measure and record the resistance of your film.
   b. Measure and record the resistance of 2 metal patterns that are close to each other.
6. SINTER the Aluminum film (see process sheet on 'Sintering Contacts'). Measure and record the resistance again.

Write an analysis of the metal patterns that you have produced, including photos and Dektak data in your write-up.

- How would you rate the quality of your patterns? (E.g. did the patterns 'lift-off' well, did the films stick to the silicon, did you achieve the desired thickness of the film?).
- What parts of the process were hard to control?
- Are there any procedures that you would change or concentrate on further the next time you do this procedure?

This homework has more process steps than your first homework. It builds on the optical lithography, and all the critical steps have detailed process sheets (available on Class website) describing the procedures. Again, the main goal of this homework is to give you experience in evaporating a thin film onto your sample. Even if your process and results are not optimal, it is your analysis of your process that is most important to me. As for the first homework, the write-up should be short (~ 2 pages) .

* You will have to be trained and checked-out on all the equipment you will need for this homework, and you will have to sign up for time on the equipment. To save time, you may work in groups to be trained on the equipment, and carry out evaporation of several samples at one time.