Lab Project #2

Due Tuesday, 2/5/2019 by 5:00pm

This lab is designed to help you become familiar with oxidation, HF etching, and with some of the measurement equipment in the lab. In this lab, you will first oxidize a piece of silicon (do a wet oxidation) until you have grown around 5000 Å of oxide. Calculate the time required for this oxide thickness, and then measure the oxide thickness using the ellipsometer, the filmetrics, and the color chart. How close are these values to your predicted values? Next, spin a layer of photoresist on the sample, and using Mask 1 of the MOSFET mask set (provided by Bob Hill), expose and develop the sample. The features on the mask should now be exposed (no photoresist), and all other areas on the wafer should still be covered in photoresist. Next, perform an HF etch to remove the oxide in the exposed areas (make sure to overetch a little bit). Then, remove the photoresist and use the DekTak to measure the depth of your etched trenches. How close does this correspond to your previous oxide thickness measurements? Also, make sure to take pictures of your sample during every step of the process. Compare the picture taken before the HF dip (exposed photoresist) to that taken after the photoresist is removed. How does the shape of your trenches compare to your patterned wafer?

Next, spin another layer of photoresist on the wafer, align Mask 2 of the MOSFET mask set to the patern on your wafer, and expose and develop the sample. How closely was Mask 2 aligned to Mask 1 (in both the x- and y-directions)? Use the vernier marks to quantify this as carefully as possible. Make sure to take pictures for your lab report.

EXTRA CREDIT (Note: if doing the extra credit, you will need to schedule a time with the TA in advance in order to get help with the SEM):

> Using the standard ACE/ISO/DI cleaning, remove the 2nd layer of resist that you have just developed. Check under the microscope to ensure that all of the resist has been removed. Then, using the scanning electron microscope (SEM) in the lab, obtain an image of your sample showing the trenches that you etched into the SiO_2. Try to obtain the SiO_2 thickness, as well as the profile of the sidewalls of your etched trenches, from the SEM image.