PHOTORESIST COATING SOP

This SOP is dedicated to all the processes used to coat the surface of our wafer with photoresist. This is done through three basic parts: a dehydration bake, spin coating, and a soft bake.

The purpose of the Dehydration bake is to remove condensation from the surface of the wafer. Wafer on the surface will make adhesion of the photoresist much more difficult so a dehydration bake is advised. It is recommended to perform the bake immediately before spin coating the wafer, as the longer it is at room temperature the more moisture will condense from the air. If you perform a dehydration bake but still have difficulty with adhesion, consult the **Adhesion Promotion SOP** in the Additional Photolithography Processes section of the website.

The purpose of spin coating is to apply a thin film of photoresist evenly across the wafer. This is done using a spinner that rotates the wafer at a high speed allowing a small amount of liquid photoresist to spread to an even thickness. The speed and duration of the spin may change depending on the type of photoresist being used, but **Recipes 1 and 2** are preset on each of the spinners for the most commonly run processes. Check out the signs next to the spinner displays to see if you will need to write a custom recipe or if one of the presets should be adequate.

The final process is soft baking. When the wafer finishes the spinning process, the photoresist coating is still in liquid form. This means that we will have to bake it so that it becomes solid and usable in the mask aligner. The soft bake process outlined here will be for the hotplates located next to the spinners, but vacuum ovens can also be used if the user wants to. The SOP for vacuum ovens in the photolithography bay are located in the Additional Photolithography Processes section of the website.

Dehydration Bake for Photolithography

1. One of the hotplates located past the spinner benches in the photolithography bay should be set at 115°C for wafer dehydration.
2. If the Hotplate temperature needs to be changed find the controller located next to the heating surface. The **"UP"** and **"DOWN"** arrows can be pressed to change the goal temperature (the green value). Wait until the measured temperature (red value) matches the goal temperature before proceeding.
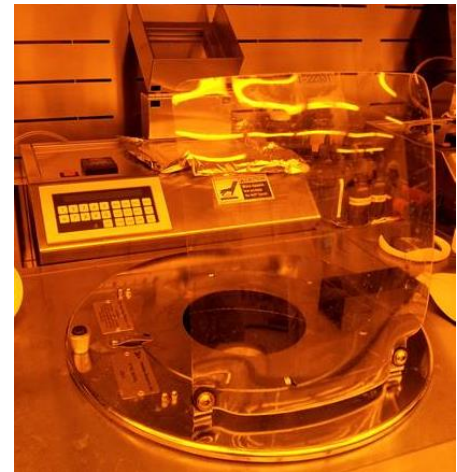
Procedure

1. Place the silicon wafer face up on the hot plate in soft contact.
2. Use one of the egg timers located in the photolithography bay and let the wafer sit for at least 1 minute on the hotplate.
3. Using tweezers, remove the wafer from the hotplate surface.
4. Place the wafer on a towel and wait for at least 1 minute for the wafer to cool to room temperature before moving on to the spinning process.

Spin Coating Photoresist

The Headway Spinners can be found at 2 bench locations in the cleanroom; the Photolithography bay and the Thermal bay along with hotplates. Photoresist can only be applied with the spinners in the photolithography bay, but the same procedures are used in both areas.

Procedure

1. Log in to any of the spinners in FOM. Check to see that your spinner has power and the display is on.

2. Also, make sure the others spinners have wafer covers placed over the chucks, as that will prevent them from drawing vacuum away from yours and lower the chances of your wafer flying off.

3. Programming or verifying a programmed spin:

   a. We have tried to leave preset spin programs in labeled at each spinner, but anyone can change them so you need to at least go through and **REVIEW** the **STEPS** meet your spin parameters.

   b. Press **"RECIPE"** and type in the desired recipe number 0-9. If you know that this recipe is correct, you can move on to loading your sample and spinning. If you are not sure, you can verify or change your recipe by modifying the individual steps in the recipe.

   c. You can see the number of **STEPs** in a recipe by looking at the LCD on the control console.

   Example: A **"-3"** means this recipe has 3 steps programmed.

4. To review or change a Program, press the **"STEP"** button and press **"1"** to see the first step of the program. The LCD will read "1-3" for the first step of a 3 step program.

a. Press the **"SPEED/RAMP"** button to toggle between the respective **SPEED** and **RAMP** parameters. If you need to change a parameter, type in the new value you want and press **"ENTER"**.

<u>Example:</u> with **SPEED** showing type "500", press **"ENTER"**. Keep all **RAMP** parameters below 2000 rpm/sec.

b. Press the **"STEP TERMINATE"** button to view the time the spin parameter will be held. Again, if you need to change a parameter, type in the new value and press **"ENTER"**.

<u>Example:</u> 2 sec, press **"ENTER"**

c. Press the **"STEP"** button and the next **STEP NUMBER** to complete your review or programming of the Spinner program.

NOTE: Please remember to end your program with the last step at **SPEED=0 RPM** and a RAMP rate (Example: 2000 rpm/sec) and with **Time=0.0 s** on the **"STEP TERMINATE"**.

d. Close your review or programming by Pressing **"STEP"**, **"0"**, and **"ENTER"**.

5. Load your Substrate

Make sure your substrate will stick to the chuck with Vacuum. Center your wafer on the chuck and press the **"Vacuum ON/AUTO"** button at the control console so that it reads **VACUUM "ON"** at the LCD. Try to adjust your substrate on the chuck, if it seems to stick well you can move on to a test spin.

6. Spinning

a. Make sure your substrate is loaded, centered and that the vacuum holds substrate.

b. Make sure the lid is down so you don't get hurt if the substrate flies off.

c. Get Ready for a TEST SPIN! This is where you spin the substrate with no material applied, just to make sure you really have vacuum.

Press the **"GREEN"** foot peddle button to start the program. You can press it again to skip to the next **"STEP"**, if you would want to. The **"RED"** is an **EMERGENCY STO**P; it will stop your wafer fast!

7. Remove your substrate

a. Make sure your vacuum setting is showing **"AU"** or change it from **"ON"** to **"AU"** by pressing the **"VACUUM"** button on the control console.

b. Remove your substrate from the chuck and move on to Soft Bake.

8. Changing chucks

There are a number of chucks at the bench depending on your substrate. We have chucks for 4" and 2" wafers, along with a "glass" chuck with a single hole drilled in it for very small die.

Just place this glass chuck on top of the 2" wafer chuck and use it as an interface for your die and small pieces.

9. Common reasons for vacuum failure:

    a. Your substrate is dirty or the chuck is dirty.

    b. One of the spinner controllers is off at your bench.

    c. Someone left the **VACUUM "ON"** at one of the spinners.

    d. During a chuck change someone lost an O-ring that goes inside the chuck.

Soft Bake for Photoresist

1. Soft bake will use the same hotplates we used for dehydration. You may end up using the same 115°C hotplate as before, or one of the others. Check the datasheet for your chosen photoresist to find out temperature and timing

2. If the Hotplate temperature needs to be changed find the controller located next to the heating surface. The **"UP"** and **"DOWN"** arrows can be pressed to change the goal temperature (the green value). Wait until the measured temperature (red value) matches the goal temperature before proceeding. Don't change the temperature of the 115°C hotplate, but the other two can be changed.

Procedure

1. Place the silicon wafer face up on the hot plate in soft contact.

2. Use one of the egg timers located in the photolithography bay and let the wafer sit for at least 1 minute on the hotplate

3. Using tweezers, remove the wafer from the hotplate surface.

4. Wait until the wafer is cool before continuing to the next process.