Nazarbayev University Nanofabrication Facility
Oxford PlasmaPro 80 PECVD Standard Operating Procedures

Before Beginning

1. Check that the tool is "Up" on the Nanofab equipment status page;
2. Always sign-up on the QReserve calendar and make sure that you finish all processes in time, including the cleaning recipe (30 min) and heating/cooling recipe. Both should end during your reservation slot without overlapping with the next user's slot;
3. Grace period for reservations is 10 min. If you do not show up at the PECVD within 10 min of your intended reservation start time, other users are allowed to take over.
4. Always log in with your name and password. Each person has different permissions, and it is easy to damage the tool if you end up with more permissions than you realize;
5. **Beware of the hot table!** Typically at 350 C;
6. Always log out when you are done at the tool. Confirm that plasma strikes before logging out.
7. Do not walk away from the tool while you are logged in. You should ALWAYS stay in the cleanroom to check it periodically (not required for the post-process chamber clean);
8. Do not operate if you are in service mode. If you see "Service Mode" on the pumping page, get a staff member to help you. Most people do not have access to Service Mode, because this mode overrides interlocks and can cause serious tool damage, but in case there is a mistake, be aware.

Material Compatibility

1. This system is designed and used to deposit SiO_2, SiN_x and amorphous Si only **to a max thickness of 1000 nm per wafer**. Thicker films require approval from Nanofab. The following recipes are available:
    - SiO_2 using 2% SiH_4 in Ar and N_2O;
    - SiN_x using 2% SiH_4 in Ar and NH_3;
    - a-Si using 2% SiH_4 in Ar;
    - Cleaning recipe using CF_4 and N_2O.
2. The following table temperatures were tested to produce the films: 150, 250, 350 C.
3. Only substrates indicated below are allowed in the chamber:
    - Si, quartz and silica wafers;
    - Other commercially available semiconductor grade wafers that are stable at 350 C;
    - Nanofab approval is required for all other substrates, including microscope slides.
4. Your samples should have thin films that are stable at 350 C, for example, do not undergo phase change or induce considerable strain to the wafer.
5. No photoresist or any other polymers are allowed in the chamber.
6. Your samples should be clean, without any tape or oil residues, and fingerprints, including backsides;
7. Clean small Si pieces can be used to prevent wafer sliding.

Operating

1. When approaching the computer, the software should already be running; If not, check that tool is UP and open the software called "PC4000" from the desktop;
2. To log in go to "System – System Logging". Enter your credentials and press "Verify". Once you your username is registered, click "Ok";
3. Check that that no recipe is running by switching to "Processing – Chamber 1" page;
4. Check current table (hotplate) temperature. If you need a different temperature, cool down or heat up the table by running a corresponding recipe, before loading your sample:
    a. Switch to "Processing – Recipes" page and load "Cool down" or "Heat up" recipe;
    b. Set the desired temperature (150, 250 or 350 C) and time. Heating takes 20 min. Cooling down from 350 C to 250 takes 40 min. Cooling down from 350 C to 150 takes 2 hours.
    c. Start the process. Once the required temperature is reached you can stop the recipe.

5. To vent the chamber for sample loading, switch to “Pumping” page by going to “System” – “Pumping”;
6. The tool should be under vacuum, so first click "Stop", then "Vent";
7. Wait until the screen displays "Venting Finished”;
8. Once venting has finished: on the tool, switch the rotary switch to “Chamber Up” and then simultaneously press and hold both blue buttons marked "Hoist";
9. When the lid is all the way up, load the wafer.
   Make sure to not scratch the aluminum plate while loading!
   Beware of the hot table!
10. Switch the rotary switch to “Chamber Down”. Then, press and hold blue “Hoist” buttons again to lower the lid and continue to hold for a couple of seconds even when the lid appears to be fully down to ensure contact;
11. To evacuate the chamber click “Stop”, followed by “Evacuate”;
12. You will be prompted to enter a sample name: enter a short description of your process or sample;
13. Click “Yes”;
14. Before running a recipe make sure that the system reached base pressure;
15. To prepare the recipe go to “Processing – Recipes”. Click “Load” to load existing recipes;
    a. Please note that changes to recipes should NOT be saved;
    b. If you need to create a new process - contact a staff member.
16. Once the recipe is loaded, you can change the parameters by left clicking on the step name, then “Edit”.
17. Once the step time, pressure, power, temperature and gas flows are correct click “Ok”;
18. Press “Run” to start the process. Confirm that plasma strikes and reflected power stabilizes below 5 W;
19. You should ALWAYS stay in the cleanroom to check the process periodically;
20. If you see a “Red alert” at any time, contact Nanofab staff immediately.
    Never acknowledge “Red alert”, i.e. leave it visible on the screen, unless you know what you are doing.

Unloading

1. Once the end of process is reached, “Yellow alert” will appear, click “Continue” to acknowledge it;
2. Before venting the chamber, confirm that process is finished and “No recipe running” message is displayed on the “Chamber 1” page (to switch go to “Process – Chamber 1”);
3. To vent the chamber for unloading your samples, switch back to “Pumping” page by going to “System – Pumping” and click "Stop", then "Vent";
4. Wait until the screen displays "Venting Finished”;
5. Once venting is finished: on the tool, switch the rotary switch to “Chamber Up” and then press and hold both blue buttons simultaneously to raise the lid all the way to the end.
   Beware of the hot table!
6. Remove your sample. **Make sure to not scratch the aluminum plate while unloading!**
7. If you have more samples to process, load a new sample and repeat steps described previously;
8. If you are done and there are no samples in the chamber, lower the lid by switching the rotary switch to “Chamber Down”. Then, press and hold blue “Hoist” buttons again to lower the lid and continue to hold for a couple of seconds even when the lid appears to be fully down to ensure contact;
9. Click “Stop” – “Evacuate”;
10. You will be prompted to enter a sample name, leave it blank and press “Cancel”. If you press “Yes” this will tell the software that there is a sample in the chamber, which will prevent you from running a cleaning recipe in the next steps. If you pressed “Yes” (instead of “Cancel”), click “Stop” – “Evacuate” and then “Cancel”;
11. Start a 30 min long cleaning process, by running “OPT – Chamber cleaning” recipe.
12. Wait until plasma strikes and observe for a couple of seconds to confirm that the reflected power is < 5 W, then log out by going to “System – System logging”. Leave the username and password fields empty and press “Verify” to log out. You can leave the system now.