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Oxford PlasmaLab 100 PECVD standard operating procedure

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Keywords

PECVD, PECVD SOP, Oxford PlasmaLab 100 SOP, CVD-01 SOP

Standard Operating Procedure (SOP)

Oxford PlasmaLab 100 PECVD

(CVD-01)

In case of fire or injury please call 911 (511 from campus phones)

If there is an error on the system/tool please report it in IRIS, the staff will take care of it

Please *DO NOT* run diagnosis without a staff member's approval

General safety tips and common mistakes

1) If the system is not running, make sure you are logged into the tool on IRIS.
2) If you get a "gas tolerance error" double check to make sure you are logged into IRIS.
3) Make sure the clean recipe is run by the previous user. If not, report the issue on IRIS.
4) The following materials ***are allowed*** in the chamber:

   Si, SiNx, SiO2, GaN, SiC, Aluminum (Al), Platinum (Pt), Chromium (Cr), Tungsten (W), Molybdenum (Mo), Titanium (Ti), for any other material please consult the staff members. ***Consult the staff for any Indium or Gallium compound material***

5) If allowed materials are deposited at low temperature, PECVD can damage the film. Example: a thin film deposited at 150 °C in ALD could be damaged in PECVD, which operates at 350 °C. ***Contact the staff if you need to run similar processes***.
6) Substrates smaller than 4" MUST be placed on the carrier wafer.
7) DO NOT operate 6" wafers without contacting the staff members for necessary adjustments.
8) DO NOT use Kapton tape to secure your samples, especially small pieces.
9) DO NOT use clamps to hold samples to carrier wafer.
10) DO NOT secure substrates to the carrier wafer using glass slides.
11) You MUST run chamber clean for the amount of deposition time + 15 minutes
12) For the a-Si deposition clean time is the amount of deposition time + 30 minutes
13) DO NOT log out of the tool before the clean process is finished!

Oxford PlasmaLab 100 PECVD

- Primary tool owner: Sam Azadi.
  For questions regarding process development and characterization of film growth
  contact Sam Azadi at: azadi@seas.upenn.edu
  Problems with the tool **MUST** be reported on IRIS. Do not contact primary tool owner
  with tool issues directly.

Tool Policy:

- Not cleaning the tool properly is considered tool misuse.
- Logging out of the tool before the clean recipe is done is considered tool misuse.

Procedure Overview

1) Double check the clean recipe has run
2) Vent the loadlock
3) Load sample(s) and pump the loadlock
4) Choose/modify recipe and run deposition
5) Vent loadlock and retrieve samples
6) Pump the loadlock and run clean recipe

Tool Overview:

Oxford PlasmaLab 100 PECVD is a plasma-enhanced chemical vapor deposition tool that operates at 350 °C. The reactant gases are introduced between two parallel electrodes and the RF power generates the plasma.

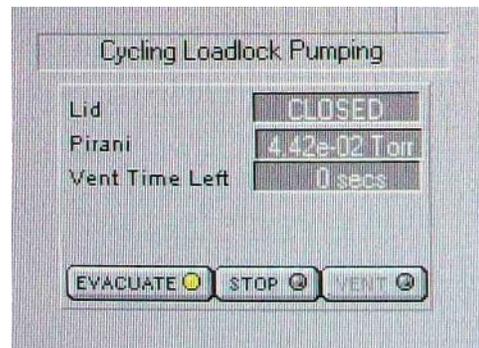A list of characterized recipes and their detailed result can be found *here*

Full procedure:

Log into the tool via IRIS	
If a window shows "Process Complete", click on "**OK**" and if the "YELLOW ALERT" is on, click on "**Accept**". This is just an indicator that the previous process is complete.	
1. Check the chamber is cleaned *Attention!* If the chamber is not cleaned properly report the problem on IRIS. 1.1. From the top left corner of the screen, click on "**Process**" and choose "**Log View**". 1.2. Go to the bottom of the list, by clicking on the most bottom down arrow. The activities are sorted by date. 1.3. Verify the "chamber clean" recipe is run for: *Clean time = the amount of deposition time + 15 minutes* *Clean time for a-Si is = the amount of deposition time + 30 minutes* If chamber clean recipe was not run at these times, report the problem on IRIS.	
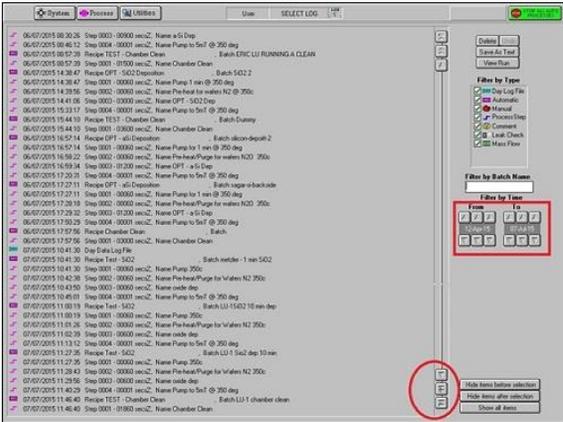
|	
2. Vent the loadlock: 2.1. From the top left corner of the screen, click on "**System**" then choose "**Pumping**".	

2.2. Once the pumping control screen appears click "**STOP**" then "**VENT**". The chamber display will read as follows:
   a) "vent prepump before purging"
   b) "purging loadlock before venting"
   c) "venting loadlock"
   d) "loadlock finished venting"
 	
Caution! *DO NOT attempt opening the loadlock until the vent process is done*
 	
2.3. Once the chamber status reads "*loadlock finished venting*" you may proceed to the next step.	

3. Load wafer and pump the loadlock: 3.1. Open the loadlock lid and place your wafer on the transfer arm with the major flat flush against the 2 wafer stops.	

Wafer's major flat
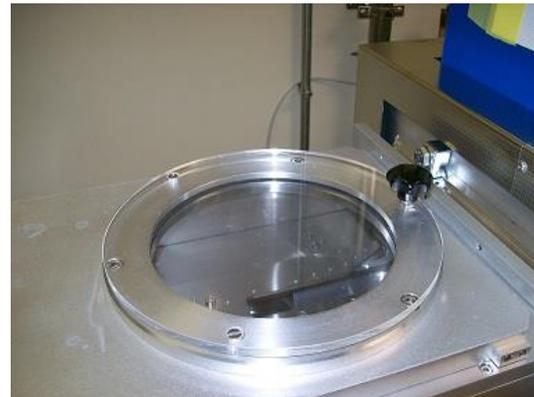
3.2. If you have samples smaller than a 4" wafer, you **MUST** use the carrier wafer next to the tool (shown in picture) to load your sample(s). You can place your sample on the carrier wafer - the pumping is not strong enough to blow your sample away. You can put as many samples on the carrier as long as they sit within the well.

Attention! The thickness of your samples CANNOT be more than 1 mm (tool opening not big enough to slide thick samples in)

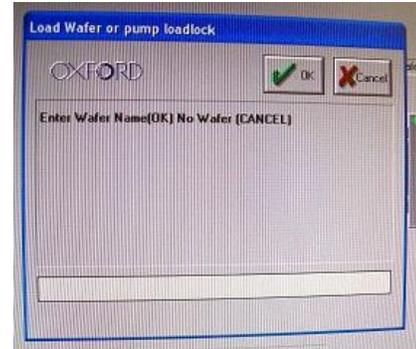*Caution!* Make sure the edges of the wafer don't go over the width of the arm

3.3. Close the loadlock lid.

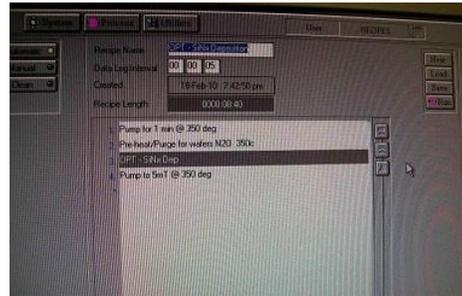*Caution!* The interior of the loadlock may be hot
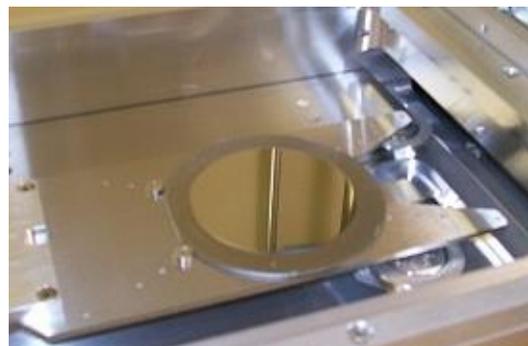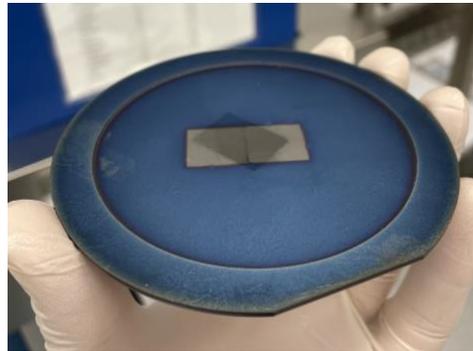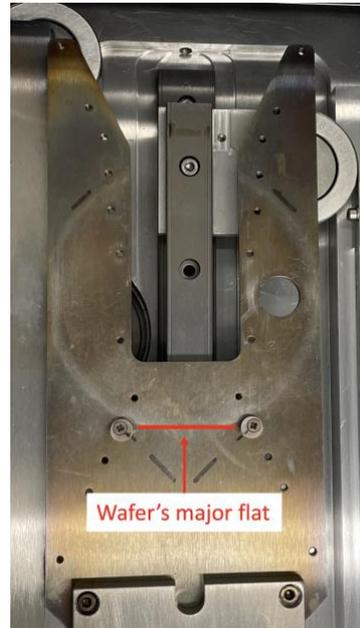
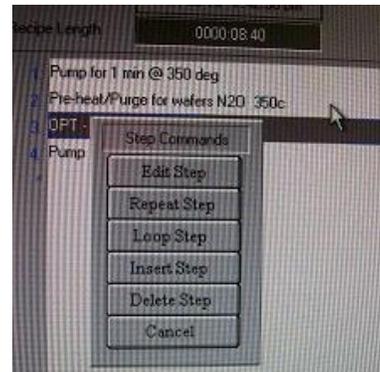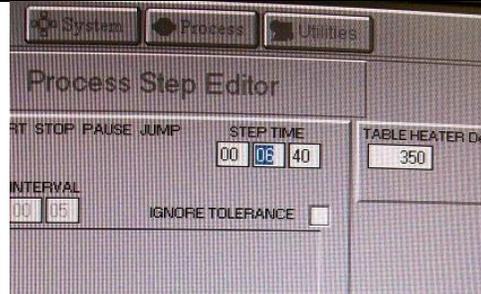|	
3.4. On the pump control screen click "**STOP**" and "**EVACUATE**" 3.5. Enter the name of the process, example: *Azadi_test SiO2 _6min* and click "**OK**" *The wafer name convention is:* *"PennKey_Recipe_Time"*	Cycling Loadlock Pumping Lid — CLOSED Pirani — 4.42e-02 Torr Vent Time Left — 0 secs EVACUATE ⬤ STOP ⬤ VENT ⬤ Load Wafer or pump loadlock OXFORD ✔ OK ✖ Cancel Enter Wafer Name(OK) No Wafer (CANCEL)
4. Choose/Modify recipe and run deposition: 4.1. From the top left corner of the screen choose "**Process**" and click on "**Recipes**". 4.2. Click on "**Load**". The system asks you if you wish to overwrite the currently loaded recipe, choose "**Yes**", and select your desired recipe. 4.3. To modify/check the time on the deposition step: click on the *DEPOSITION STEP* of the recipe and choose "**Edit Step**".	System ⬤Process Utilities Proces[s] Process Menu Recipes RT STOP PAUSE Log View INTERVAL Chamber 1 00 05 Step Commands Edit Step Repeat Step Loop Step Insert Step Delete Step Cancel

4.4. Type in your desired time and click "**OK**".
- The time is HH:MM:SS


Caution! *We encourage you to clean the chamber after 5 µm of deposition. This helps with your process's repeatability. Long depositions also cause buildup of material inside the chamber wall and may result in flaking and particulates to fall onto your wafer during deposition*
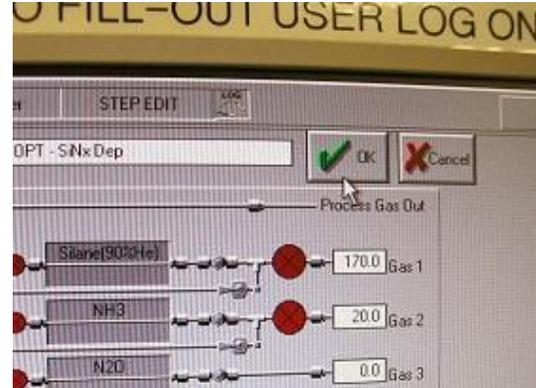
4.5. To run the recipe, click "**Run**".

Note:
a) If the chamber is not completely evacuated yet, the process is kept on hold until the pressure reaches the acceptable range, and the process automatically starts.
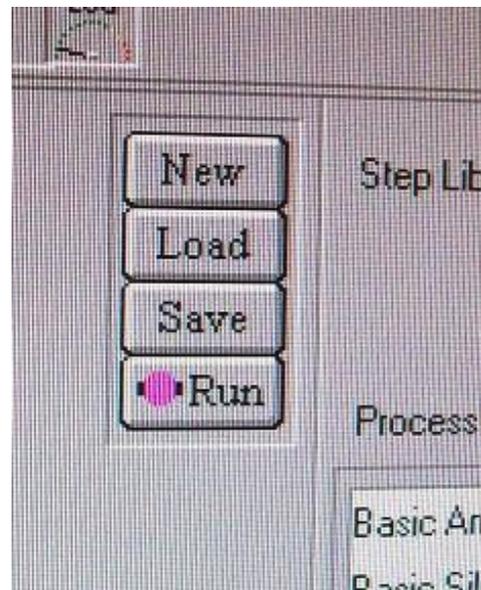
5. Vent the loadlock and retrieve wafer

   5.1. Once the recipe is completed, the transfer arm brings the wafer out.

   5.2. Two popup windows appear on the screen:

      a) Click "**OK**" on the popup window with "Process Completed OK" message.

      b) The yellow alert appears. Click "**Accept**"

Attention! Wait until both windows appear, otherwise you may cause an error

   5.3. The system should bring you back to the pumping screen
- In case the system did not automatically bring you back to the pumping screen; From the top left corner of the screen, click on "**System**" then choose "**Pumping**".

   5.4. Once the pumping control screen appears click "**STOP**" then "**VENT**".

Caution! DO NOT attempt opening the loadlock until the vent process is done

   5.5. Once the chamber status reads "loadlock finished venting" open the lid and retrieve your wafer.

Caution! The wafer may be very HOT

6. Pump the loadlock and run clean recipe: 6.1. On the pump control screen click "**STOP**" and "**EVACUATE**" 6.2. Type in the clean wafer name as follows: "PennKey_Chamber clean_time" *Clean time = the amount of deposition time + 15 minutes* ***Attention!** Clean time for a-Si deposition is = the amount of deposition time + 30 minutes* 6.3. Click "**OK**" on the "Load Wafer or pump loadlock" popup. 6.4. From the top left corner of the screen choose "**Process**" and click on "**Recipes**". 6.5. Click on "**Load**". The system asks you if you wish to overwrite the currently loaded recipe, choose "**Yes**", and select "Chamber Clean" recipe. 6.6. To modify/check the time on the clean, click on the clean step of the recipe and choose "**Edit Step**". Type in <u>the clean time</u> *Clean time = the amount of deposition time +15 minutes* ***Attention!** Clean time for a-Si deposition is = the amount of deposition time + 30 minutes* and click "**OK**" 6.7. Click "**Run**" to run the clean recipe Attention! DO NOT log out of the tool before the clean process is complete! Logging out on IRIS shuts off all gas supply to the tool and throws the tool into a halt with an error	
Log out of the tool via IRIS once the pumping is done	

Feel free to contact the staff members with any questions about your process and the tool.