



# Oxford PECVD User Manual



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#### **1** Usage Restrictions

- Only trained and certified users allowed
- Prohibited materials include PI (polyimide) tape, photoresist
- No exposed metals allowed
- Sample size is 8" and below including wafer fragments
- Deposition allowed for amorphous-silicon, SiO<sub>y</sub>, and SiN<sub>y</sub>

#### 2 Pre-Use Inspection Checklist

□Process cooling water pressure > 2 kg/cm<sup>2</sup>

After check-in, as shown in Figure 1,

Check the status indicators all green

Check the load lock indicator and pressure < 7 x 10<sup>-2</sup> Torr

Check the process chamber indicators and pressure approximately at 1 mTorr

Check the position of the carrier in the load lock

## Note: Notify the staff immediately if any of the check items fail to meet the initial status!





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Figure 1 Instrument Control Interface





### **3** Standard Operating Procedures

#### 3.1 Introduction to User Interface

Users mainly access the System  $\rightarrow$  Pumping function to monitor the PECVD system, sample carrier position, and pump actions. Entered into other sections shown in Figure 2 is prohibited. If accidentally entered into Service or other sections, please notify the staff immediately.



Figure 2 System Menu

ogo System	🐤 Process 🖳 Utilities
	Process Menu
	🚟 Recipes
	📰 Log View
	믐 Chamber 1
Ľ	

Figure 3 Process Menu

Under Process, users will primarily use two functions: Recipes and Chamber 1, as illustrated in Figure 3. Each function explains as follows:

Recipes: edit, load, and run processes

Chamber 1: chamber status, process control, and carrier temperature adjustment





#### 3.2 Vacuum Venting

STOP  $\rightarrow$  Wafer has finished processing  $\rightarrow \sqrt{OK} \rightarrow VENT$ . The system will introduce nitrogen, purge the entire load lock chamber, then close the mechanical pump valve while maintaining nitrogen flow through the vent valve to conduct a vacuum venting. The total time required is approximately 200s. Counting down to 120s and achieving stable pressure allows the chamber door to be opened (for the initial venting process only; if it's the second process, it's advisable to complete the required venting time).



#### 3.3 Sample Loading

Open the chamber, being cautious of the high temperature of the carrier. Check the carrier position, align it properly with the alignment pin. The maximum size is an 8-inch wafer. PI tape and photoresist are strictly prohibited.

Note: After placing the sample, ensure that the ARM HOME indicator is green.









Figure 5 Alignment pin position in the Load lock



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#### 3.4 Chamber Evacuating

STOP  $\rightarrow$  EVACUATE  $\square \rightarrow$  Enter Wafer Name (OK)  $\rightarrow \lor$ OK



Figure 6 Loadlock Status Diagram

If wafer name is not entered, the system won't display the green carrier position, and automatic process won't be initiated. Pump the vacuum until the pressure reaches less than 7x 10<sup>-2</sup> Torr, and the indicator is on.



Figure 7 Wafer Naming Window



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#### 3.5 Setting up Automatic Process

Process → Recipes → Automatic  $\square$ → Load → Select process → Edit step time → VOK → Run

If selecting another process, the system will be prompt to Overwrite the current recipe. Please click VYes



Figure 8 Recipe Overwrite Window

The process options window will appear. Select the desired process and press VOK to view the complete steps for that process. When selecting steps with the same process name, access the Process Step Editor to edit and modify the required process time (STEP TIME). Process time is determined by the required film thickness (nm) and the deposition rate of the material (Å/s). Table 1 provides the deposition rates of common coating materials.

Note: Users can only modify the process time (STEP TIME), refrain from altering other parameters.





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Recipe Name SiO2-300C Muti Pump Purge SiNx-100C-HF Only SiNx-200C-HF Only SiNx-200C-HF Only SiNx-300C-Dual Frequency SiNx-300C-Dual Frequency SiO2-100C SiO2-200C SiO2-200C SiO2-200C SiO2-200C SiO2-300C-YANG SiO2-300C-YANG SiO2-SINX-SiO2-300C-N&M TimLab N-Rich HF SiNx 250C	Load Recipe					
SiO2-300C          muti       Image: SiNx-100C-HF Only       Image: SiNx-200C-HF Only         SiNx-200C-HF Only       Image: SiNx-200C-HF Only       Image: SiNx-200C-HF Only         SiNx-300C-HF Only       Image: SiNx-300C-HF Only       Image: SiNx-300C-HF Only         SiO2-100C       Image: SiO2-200C       Image: SiO2-200C         SiO2-200C       SiO2-200C       Image: SiO2-300C-N&M         SiO2-300C-YANG       SiO2-300C-N&M       Image: SiO2-300C-N&M         TimLab N-Rich HF SiNx 250C       Image: SiO2-300C-N&M       Image: SiO2-300C-N&M	Recipe Name					
muti         Pump Purge         SiNx-100C-HF Only         SiNx-200C-HF Only         SiNx-280C-HF Only         SiNx-300C-Dual Frequency         SiNx-300C-HF Only         SiO2-100C         SiO2-200C         SiO2-280C         SiO2-280C         SiO2-300C         SiO2-300C         SiO2-300C         SiO2-300C-YANG         SiO2-SiNX-SiO2-300C-N&M         TimLab N-Rich HF SiNX 250C         TimLab N-Rich HF SiNX 250C	SiO2-300C		OXFORD			
TimLab SiO2+SiNx 300	muti Pump Purge SiNx-100C-HF Only SiNx-200C-HF Only SiNx-280C-HF Only SiNx-300C-Dual Frequency SiNx-300C-HF Only SiO2-100C SiO2-200C SiO2-200C SiO2-280C SiO2-300C SiO2-300C SiO2-300C SiO2-300C-N&M TimLab N-Rich HF SiNx 250C TimLab SiNx-250C-HF Only TimLab SiO2+SiNx 300		OK Cancel Delete			

Figure 9 List of Recipes

- System Proces	s 🖼 Utilities	Manager	RECIPE
Automatic O Manual Ø Clean Ø	Recipe Name         Si02-300C           Data Log Interval         00         00         05           Created         21-Dec-22         4:43:04 pm           Recipe Length         00000:21:30           1.         Pump           2.         Preheat           3.         Sto2-4		
	4. Pump * Edit Step Repeat Step Loop Step Insert Step Delete Step Cancel		

Figure 10 Edit Step





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🖕 System 🕒 Process 🔚 Utilities	
Process Step Editor	Step
START STOP PAUSE JUMP STEP TIME	TABLE HEATER Deg.C 300
LOG INTERVAL 00 00 05 IGNORE TOLERANCE	

Figure 11 Edit Step Time

Reference Information :

	Deposition Rate (Å/s)
Amorphous Silicon (a-Si) @300 °C	30
Silicon Oxide 300 °C	14.6
Silicon Nitride 300 °C	4.6

Table 1 Deposition Rates of Common Materials

#### 3.6 Adjusting table Temperature

Follow the steps in Figure 12~13 to raise the table temperature. If a lower temperature process is required (below 300°C), please inform the staff in advance before the appointment, as the temperature takes longer to decrease. The procedure for changing the carrier temperature is shown below:

SET TABLE HEATER DegC  $\rightarrow$  START  $\rightarrow$  Table temperature not in tolerance  $\rightarrow$  Stop

→YELLOW ALERT →Accept





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Figure 12 Enter desired temperature and begin temperature adjustment



Figure 13 Adjustment begins, msg box shows temperature not in tolerance





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🤹 System 🕐 Process 🔛 Utilities	Manager CHAMBER 1
Process Control	Base pressure reached Load complete, wafer is in Loadlock
START STOP RAUSE JUMP STEP TIME TA LOG INTERVAL 00 00 05 Ma	ABLE HEATER Deg.C 100 200 Accept Next Cancel Continue Accept 02 10 sccm Accept 02 10 sccm Accept 02 10 sccm Accept 02 10 sccm Accept 04 04 05 05 05 05 05 05 05 05 05 05
Alarm active at 26	6/12/2022 15:12:55

Figure 14 End of process window

#### 3.7 Setting up Chamber Cleaning Process

Before setting the cleaning process, manually move the tray to the process chamber. Click on the green tray in the load lock; a yellow arrow pointing right and a blue path will appear. Click on the end of the path indicating the process chamber, then the tray will start moving towards the process chamber.



Figure 15 Click on the green tray showing the path to process chamber

Once the transfer is completed, the green tray will be shown in process chamber in Figure 16.





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Figure 16 Tray moved to the process chamber.

process, proceed to:

Process → Recipes → Clean → Load → Clean-300°C → VOK → Run Be noticed that the clean process needs to be performed at 300°C. Therefore, if a non-300°C process was run previously, increase the table temperature to 300°C before running the cleaning process.

Load Recipe	
Recipe Name	
Clean-300C	OXF <b>O</b> RD
.Clean-300C 01 Clean-200C Clean-300C	OK Cancel Delete

Figure 17 Clean process list

After completing the cleaning process, follow the same steps to manually move the tray back to the load lock.







Note: During cleaning process, do not check out; violators will be fined 10 times the usage fee!



Figure 18 Click the green tray showing the path to the load lock.

#### 4 Post-Use Inspection Checklist

Before check-out, restore to the initial status

Check all status indicators are green.

 $\Box$ Check the load lock indicators and pressure <7 x 10<sup>-2</sup> Torr.

Check the process chamber indicators and pressure around 1 mTorr.

Check if the carrier manually returned to the load lock

Once everything is confirmed to be in order, you can check out!

#### Version History 5

Version	Time	Author	Note
1.0	April, 2023	Yu-Ta Chen /	
	-	Jheng-Ru Wu	