

This guide contains brief information about how to operate the SCS PARYLENE Deposition System. Most of known issues and solutions are mentioned here. If you need more detailed instructions, contact the instrument guarantor.

PARYLENE deposition



Figure 1: System description.

Getting started

1. Check your reservation. Account for the time it takes to prepare samples, pump the chamber to vacuum, cold finger to cool, and heat the furnace (up to 1 hour at best). The processing time depends on the dimer mass used (10 g could take half a day to deposit) and how well the rotary pump pumps to vacuum. After the process ends, it takes 1-1½ hours for the system temperatures to decrease for safe unloading and cleaning.
2. **USE NITRILE GLOVES whenever touching any part of the vacuum system.**
3. Clean and dry your samples. If you need better adhesion properties, apply A-174 silane adhesion promoter. **You can find the procedures for applying the solution in Addendum A at the end of the document.**
4. Prepare the dimer boat by shaping one out of thick aluminum foil, or use a dedicated boat, which you still need to line with aluminum foil (see Figure 2).

5. Weigh the required amount of Parylene dimer by zeroing the scales with the boat weight and filling it with dimer from the container with a spoon.
6. Record the process parameters in the reservation logbook (the closest PC is in Filter I.) and also in the paper Logbook in this format:

Date	Name	Parylene type	Deposition pressure	(note if (A174 yes/no)	used dimer mass
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Figure 2: PARYLENE accessories.

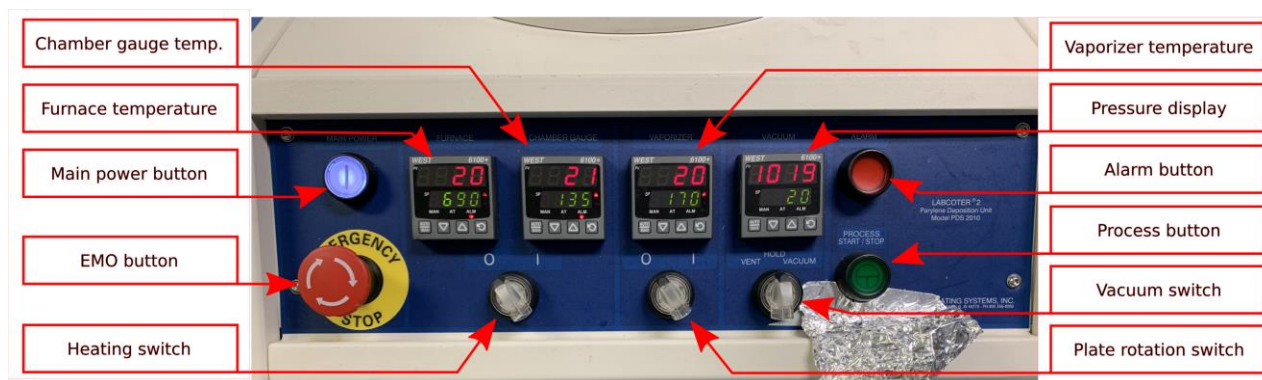


Figure 3: Control Panel Layout.

Sample loading

7. Press the **Main Power Button**, and if nothing happens, turn the **EMO button** clockwise until it springs up. The controller displays should turn on.
8. Open the green valve with argon line above the RV pump and wait for the atmosphere, then close the valve. The **chamber bell** can be removed by pulling it upwards with some force.
9. *You can skip this step if you trust that the previous user treated the cold finger after finishing.* Remove the **cold finger** from the **cold trap** and put it in the holder mounted on the side, as seen in Figure 6a. Then proceed with **step 26**.
10. Open the **Vaporizer** latch, insert the boat loaded with Parylene dimer into the **Vaporizer**, approx. 1-2 cm from the door latch. Before closing the latch, check the seal for debris and clean it with paper tissue soaked in (soap) water if necessary.
11. Wipe clean the **chamber bell** O-ring rubber with (soap) water-soaked paper towel. Clean also the chamber flange surface. Check the O-ring of the **cold trap** as well. If you accidentally peel off a piece of parylene deposit from inside the deposition chamber, you have to **soak the metallic surface with Micro90 soap water**.

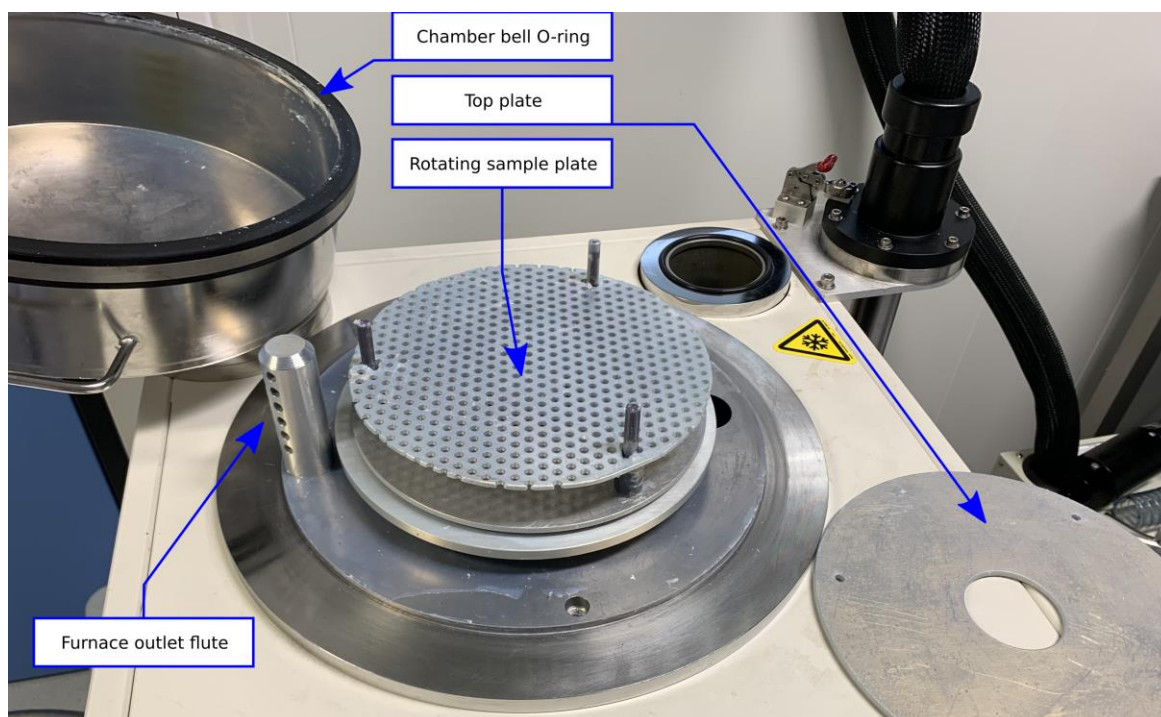


Figure 4: Rotating table for sample placement.

12. Put your samples onto the rotating table. The samples can overhang the table by a maximum of 1 cm (The table can fit three 4-inch wafers). You can turn table rotation ON with the **Plate rotation switch** to check this, and if your samples are hitting the furnace outlet flute (Figure 4), reposition your samples.
13. *Skip if you skipped step 9.* When the **cold finger** dries, insert it into the cold trap.
14. *If needed, apply the silane A174 according to one of the procedures in Addendum A.*
15. Close the **chamber bell** (turn it slightly side to side to make sure it sits properly), check the **Vaporizer** latch door, hold the cold finger in place, and switch the **Vacuum switch** to the VACUUM position. The pump makes a noise but should quiet down to hum after a few seconds, and the Vacuum controller number should quickly decrease. If not, re-check the seals. **Turn the chiller on after a few minutes of pumping.**

Deposition setup

16. Below is the standard deposition setpoints (SP) table for **Parylene C (default)** and **Parylene N**.

Material	T _{Furnace} [°C]	T _{Cham_gauge} [°C]	T _{Vaporizer} [°C]	P _{Vacuum} [units]
PAR C	690	135*	175	25†
PAR N	650		160	55†

* DO NOT change this value!

† DO NOT set pressure to ≤6 units!



Figure 5: Setpoint controller explanation.

17. To change deposition SPs, select the **function key** on the controller (Figure 5) until the letters “SP” appear and select the desired value with the **arrow keys**. Pressing the function key two times again displays the new setpoint value.

Note: You can change pressure SPs for different results. Generally, lowering the pressure SP value increases deposition time and improves film uniformity. On the other hand, increasing the pressure SP decreases the deposition time, but the uniformity worsens.

18. If the green chiller light is ON and the pressure drops to 1 (or 2 max), turn the **Furnace switch** and the **Vaporizer switch** clockwise and press the **green Process button**.

Finishing

19. After the process finishes, the **Green process button** starts flashing and pressing turns it off. Turn the **Furnace switch**, the **Vaporizer switch** anti-clockwise, and the **Vacuum switch** to the HOLD position.

20. **Switch off the chiller and wait 20-30 minutes for the flex line to heat up.**

21. **IMPORTANT: The user is only allowed to open the chamber lid and vaporizer door if the FURNACE temperature is <200 °C and the VAPORIZER temperature is <50 (takes about one hour to one and a half hour).**

22. Vent the chamber until you can remove the **cold finger** from the **cold trap** and put it in the mount on the side. Stop the venting!

23. Lift the **chamber bell** and remove your samples. Wipe any debris around the **rotating table** and from the **chamber bell O-ring**, then close the chamber.

Switching back to normal state

24. Set the temperature and pressure controllers to **DEFAULT** values (for Parylene C).
25. If the **cold finger** is defrosted and dried, use the provided **translucent Scotch tape** to remove the yellowish Parylene build-up on the finger and clean it with a IPA-soaked cleanroom wipe until no polymer residue is left (Figure 6a,b).
26. Spray the entire surface of the **cold finger** (below the rubber seal) with Micro 90 **soap water** while holding the cold finger above a trash can (Figure 6c). Set the towel on the floor to catch dripping water from the **cold finger** and let it completely dry. This step makes cleaning the finger from polymer build-up easier after the deposition.
27. The **cold finger** should not be returned inside of the chamber if there is any residual ice on it! You can defrost the **cold finger** as seen in Figure 6d.
28. Open the **Vaporizer latch** and remove the **dimer boat**, remove the aluminum lining.
29. If the **cold finger** is dried up, insert it into the **cold trap** and make sure the **Vaporizer latch** is closed, then pump the system to vacuum. Turn the **Vacuum switch** to the HOLD position and press the **EMO button** to shut down the system.

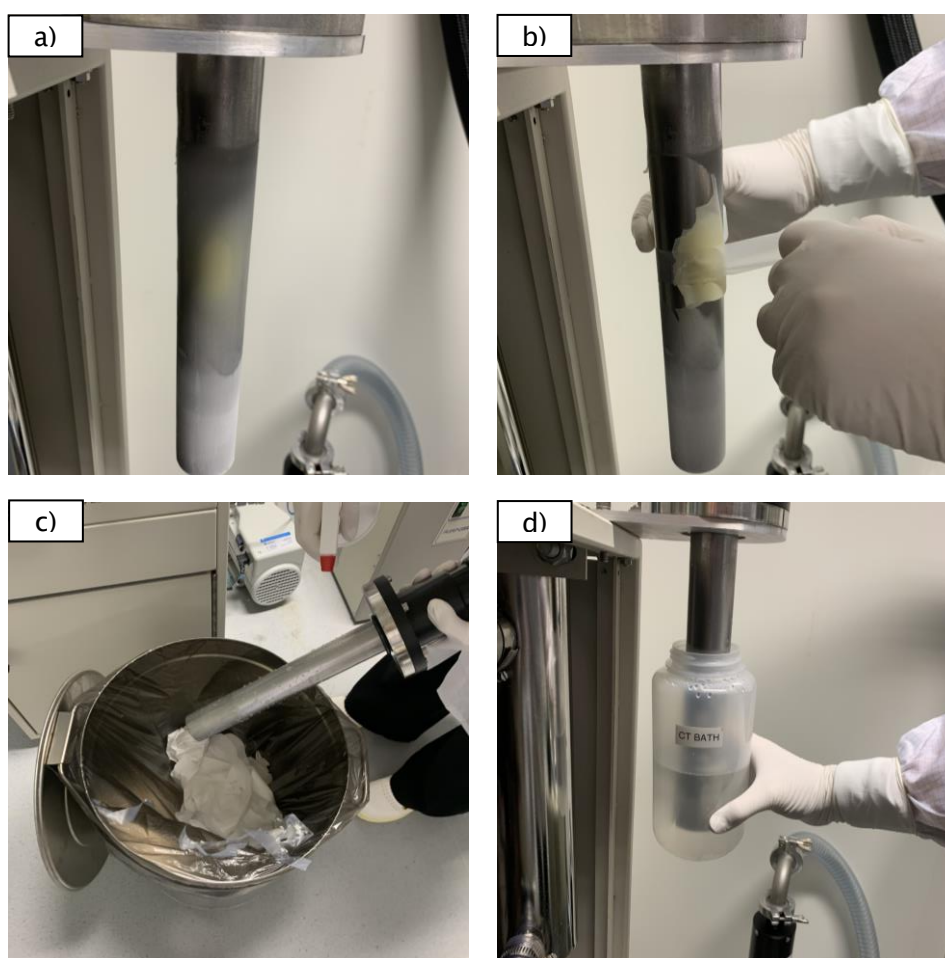


Figure 6: a) Cold finger mounting before cleaning. b) Removing the polymer build-up with tape. c) Defrosting with a CT bath. d) Spraying with Micro 90 soap water above the trash can.

Troubleshooting

- When you find the **Alarm light** flashing, press it and if it continues flashing, contact the guarantor.
- Pressure issues, process is not ending/starting
 - .It is recommended to monitor the pressure value while the furnace is heating up. If the pressure is rising rapidly, the system is not properly sealed or
 - Contact the guarantor. This usually means that the system is too dirty (too much of parylene deposited on the chamber) which increases the value of the hot base pressure close or above your deposition pressure – hence the process will never start/finish. Cleaning necessary in this condition, usually should be done after 100-150 g.
- If you notice black particles on your substrate, the furnace probably needs cleaning. Contact the guarantor.
- Before using any outgassing samples, you should contact the guarantor, the pump down will take longer.
- for the adhesion promoter silane A174 to work properly, the substrate has to be activated (the silane needs binding sites to react with)

ADDENDUM A – A-174 silane treatment option 1

1. This part describes an optional pre-treatment of the PARYLENE deposition chamber and **MUST BE DONE** just before the system is all ready to be pumped down (as the LAST step).

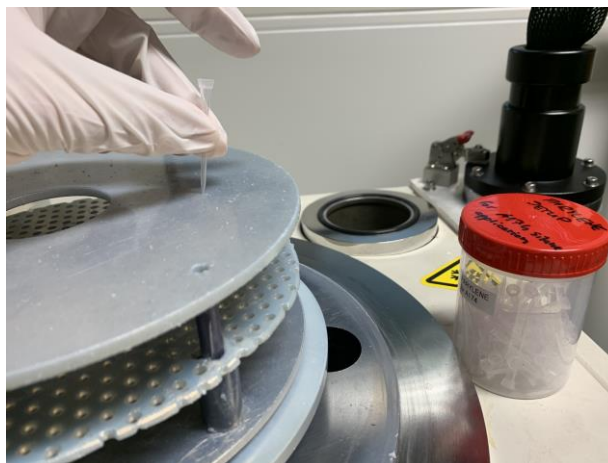


Figure 7: Draw the A-174 from the bottle and tap the tip filled with the silane on the plate as shown in the image.

2. Take a pipette tip (1-10 uL or 20-200 uL), and dip it in the aliquot of A-174 silane in the fridge. This takes about 7-10 uL by capillary forces and then tap the tip on the top plate a few times to leave a droplets (see Figure 7).
3. Continue with step 15. (close the chamber bell and pump as soon as possible).
4. If you had to vent the chamber bell again to, i.e., readjust the samples, it is necessary to re-apply the silane from the pipette.

A-174 silane treatment option 2

Note: The promotion solution is made of 99% pure isopropyl alcohol (IPA), deionized water (DI), and A-174 solution.

1. Mix equal parts of IPA and DI, then add 0.5% (1 part to 200, by volume) of the A-174. **The shelf life of the solution is 24 hours**, so mix only the amount that will be used during that time.
2. Stir the solution with a clean stirring rod for 30 seconds and allow the solution to stand for at least 2 hours (to allow adequate chemical reaction) before using it.

Remember: Storage life of the promotion solution is 24 hours. Discard all solution after this time has elapsed and mix a new batch.

Treating the samples using the solution:

1. Submerge the parts in the prepared promotion solution for 15-30 minutes.
2. Remove the parts from the solution and allow them to air dry for 15-30 minutes.
3. Submerge the parts in IPA for 15-30 seconds. Agitate the basket of parts up and down several times.
4. Remove parts and drain adequately (approximately 30-60 seconds).
5. Dry parts per requirement before you start the coating operation.
6. Parts should be coated within 30 hours, maximum. If parts are not coated within this time, parts must be re-promoted, repeating this process.