

1.0 SCS PDS2010 LABCOTER2 Parylene Deposition System

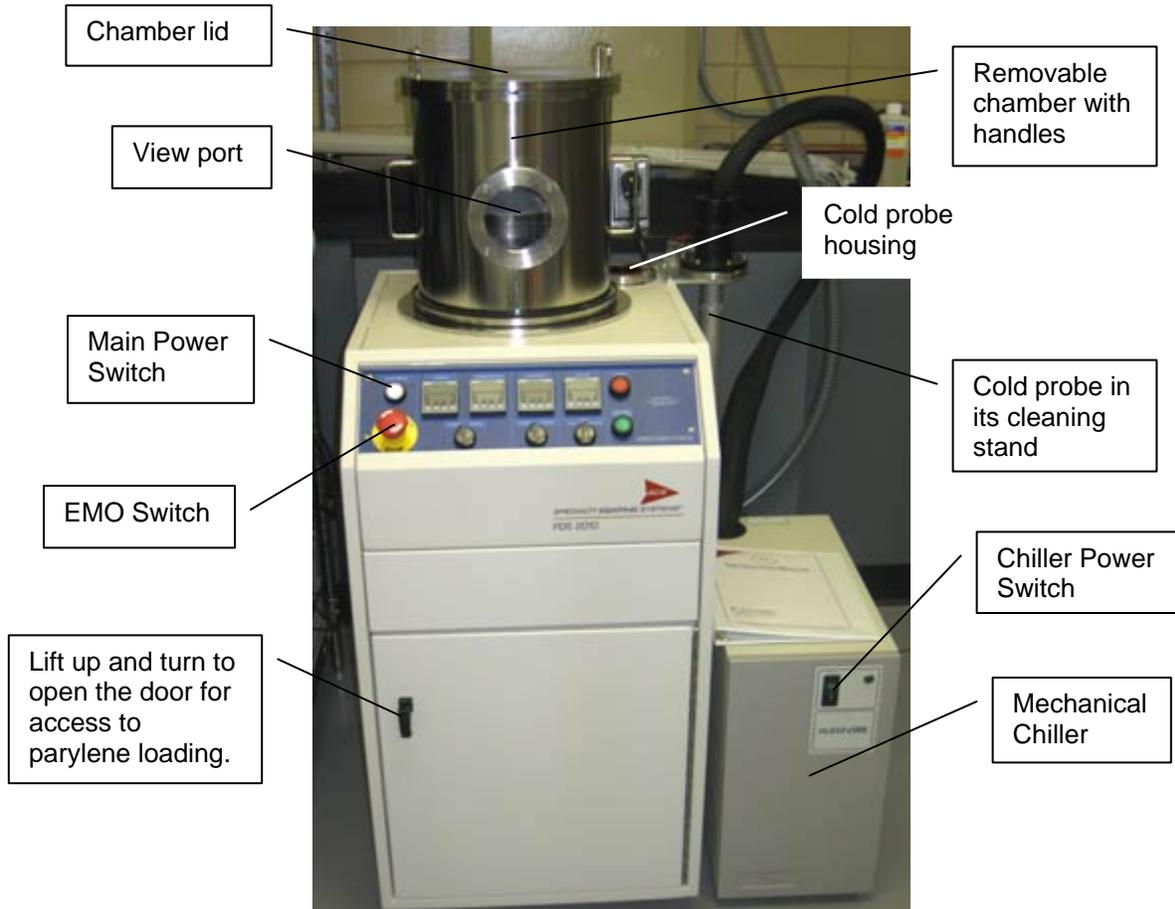


Figure 1: SCS PDS2010 LABCOTER2 Parylene Deposition System

1.1 Introduction

It is a vacuum deposition system. Parylene is deposited at about 35 mT from the vapor phase and hence the coating is conformal. Samples of any shape or form get coated all around.

Parylene in a dimer form is loaded in to the vaporizer zone that heats it up to 175 °C to evaporate it. These vapors then enter pyrolysis furnace that is maintained at 690 °C that converts it into very reactive monomer phase. These monomer vapors enter the chamber and deposit as a polymer on all surfaces including your samples. The cold trap condenses the remaining vapors before they can enter the vacuum pump and damage it.

This system is setup to deposit parylene C provided by NUFAB only. Contact staff before using any other parylene type. Also, please contact staff for approved substrate materials.

Only trained and approved (qualified) users may use this tool.

1.2 Features and Specifications:

- a) Automatic Operation/PLC Control
- b) Programmable Digital Discrete Temperature Controller For Heated Zones

- c) Cold Trap Base
- d) Direct Drive Vacuum Pump - 6.9 CFM @ 60 Hz
- e) Heated Load Door
- f) Fixture Rotation

1.3 Applicable Documents

SCS PDS2010 LABCOTER2 Parylene Deposition and mechanical chiller operation manuals are available.

1.4 Safety

- a) High electrical power sources are present. Do not open any panels or defeat interlocks.
- b) Do not touch hot parts like vaporizer or pyrolysis furnace when hot. These can cause burns. These are inside the cabinet.
- c) Do not touch the cold probe of mechanical chiller when cold. It can cause burns.
- d) Press EMO button if there is an immediate danger to personnel or the equipment and inform the staff.

1.5 Precautions

- a) Do not scratch or put any metallic objects on the vacuum seal surfaces.
- b) Only clean samples that do not outgas are allowed in this system. Consult staff for approved materials.

1.6 Operating Procedure

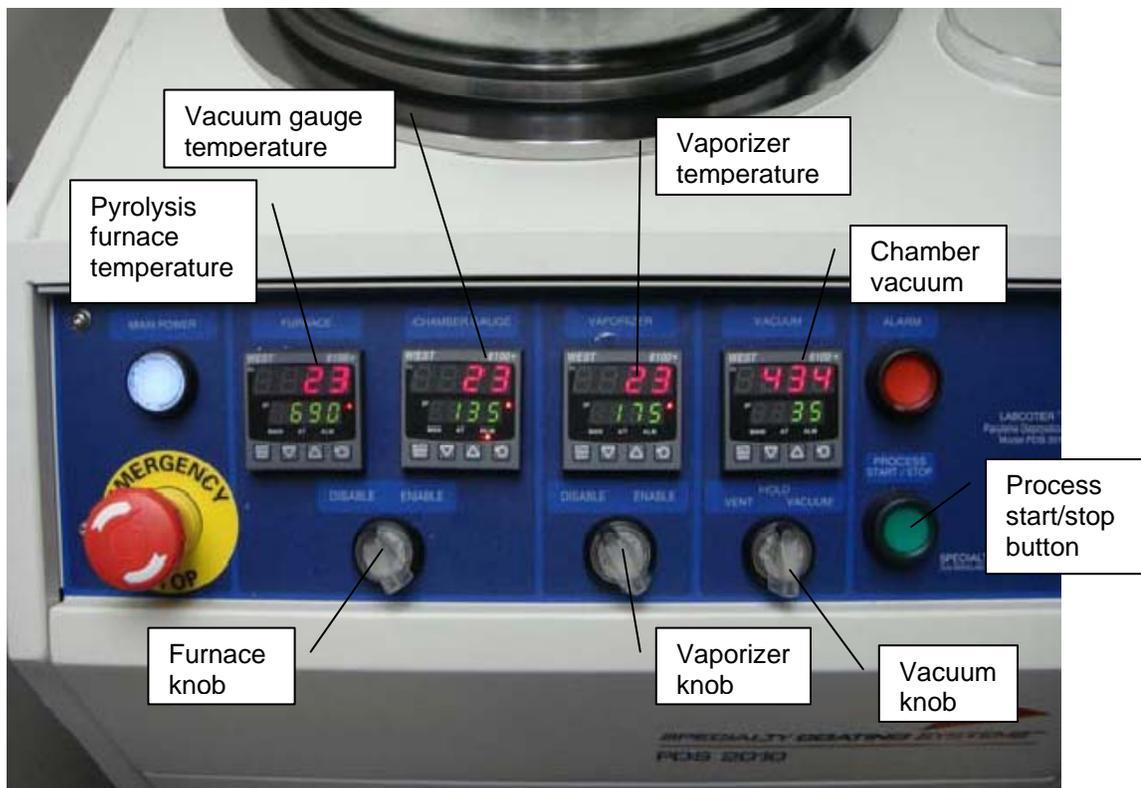


Figure 2: System controls.

1.6.1 System Start Up

- a) Activate the equipment in FOM.
- b) Turn the EMO switch clockwise to release it.
- c) Press the Main Power switch (Figure 1) to turn the system on.

1.6.2 Substrate Loading

- a) Turn the vacuum knob to vent.
- b) Lift the chamber lid with two handles, flip it over and place it handle-side down on a table (Figure 3). Note that it is heavy. Do not scratch or damage the O-ring vacuum seal. If parylene is peeling off from the lid or fixture, follow the chamber cleaning section.
- c) Remove the rotating fixture and place on the table and load your samples on it (Figure 4).
- d) Remove the inlet baffle and make sure it is taped as shown in the picture (Figure 4). Install it back with holes facing away from the chamber (towards its wall).
- e) Place the rotating fixture back in the chamber.
- f) Carefully place the lid on the chamber and center it.



Figure 3: Chamber lid shown on table with handles down.

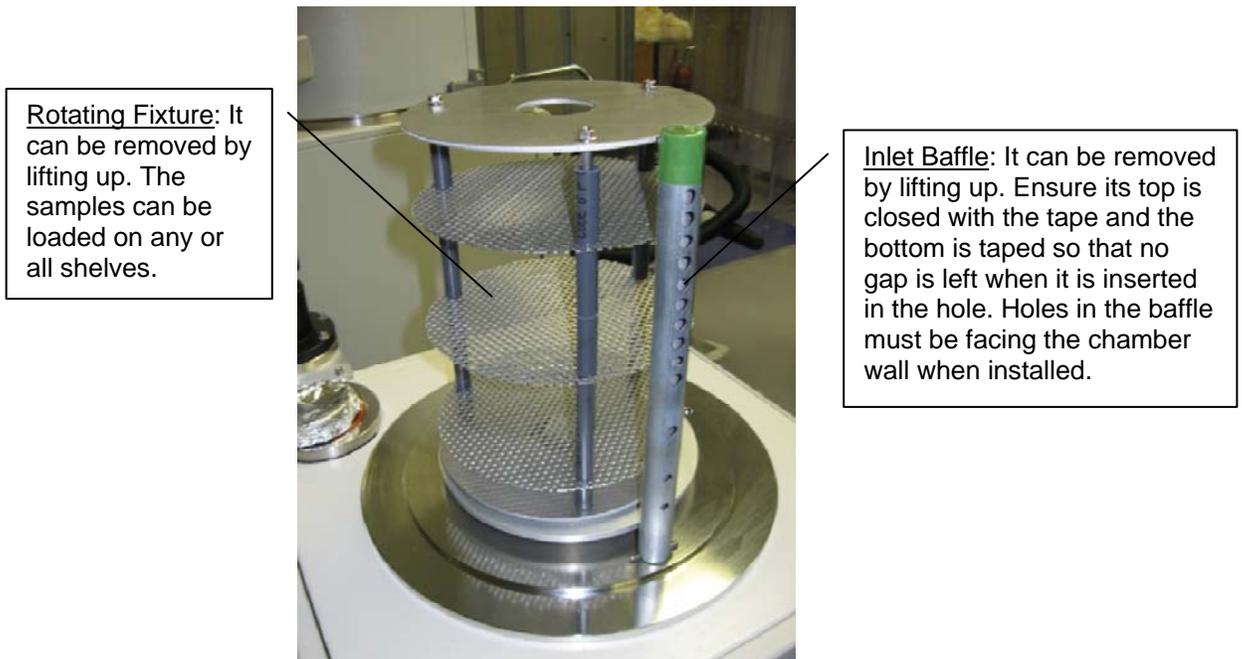


Figure 4: Chamber case removed to show rotating fixture and baffle. Do not remove the chamber case for normal use. Both fixture and baffle can be removed and installed without removing the case.

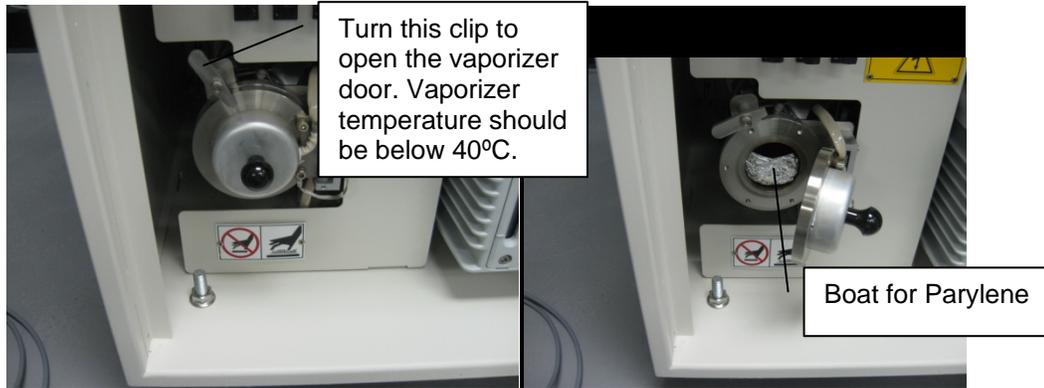


Figure 5: System front door open to show the vaporizer.



Figure 6: Boat form and the aluminum boat.



Figure 7: (L to R) Parylene C, boat form, concentrated Micro release agent, and 2% release agent.

1.6.3 Parylene Loading

The only parylene allowed to be used in this system is Parylene C provided by NUFAB and is available at the system.

- a) Weigh the parylene to get the amount needed (2 grams results in about $2\mu\text{m}$ film).
- b) Open the front door of the system by using the handle (Figure 1) and then open the vaporizer door by sliding the clip that holds it shut (Figure 5). Remove the boat from the vaporizer. Note:

Make sure vaporizer temperature is below 40 °C before opening its door or loading parylene for successive runs.

- c) Place the parylene at the end of the boat. If the boat has a lot of black residue, discard it and make new one following the relevant section.
- d) Slide the boat back in the vaporizer with the parylene end first. Don't push the boat in too much; it should be flush with the vaporizer door when it is closed.
- e) Close the vaporizer door and slide the clip over it. Close the system door.

1.6.4 Running the Process

- a) Make sure the cold probe is clean (Figure 1). Cold probe must be cleaned after every deposition as described in the cleaning section.
- b) Take a clean wipe and moist it with the release agent (2% Micro soap solution) and apply a thin film of it on the cold probe.
- c) Lift the probe up from its stand and insert in the cold trap housing carefully.
- d) Turn the vacuum knob (Figure 2) to Vacuum position. This will start pumping the chamber down. If there is a leak around the probe, hold the probe down with its stainless steel base until the vacuum takes over.
- e) Turn the chiller by flipping its power switch (Figure 1). It will light up green.
- f) Wait at least 45 minutes for probe to cool down.
- g) Make sure the set points (in green) on the control panel are:
Pyrolysis Furnace: 690°C
Chamber Gauge: 135°C
Vaporizer: 175°C
Vacuum: 35 mT
Chamber vacuum gauge is heated to prevent parylene deposition on it.
- h) Turn the Furnace and Vaporizer knobs to Enable.
- i) Press the Process Start/Stop button (Figure 2) to start the process. The process works automatically by turning the heaters on and controlling the vacuum to 35 mT. When all the parylene in the vaporizer is used up, the process stops and the green light on Process Start/Stop button starts blinking. The process may take from 30 minutes to many hours to complete depending on the parylene amount.
- j) Press the Start/Stop button to turn off the blinking green light.
- k) Turn off the mechanical chiller.
- l) Turn the furnace and vaporizer knobs to Disable.
- m) Wait from 10 to 15 minutes (but no longer than that) for chiller probe to warm up a little.
- n) Turn the vacuum knob to vent and wait for a few minutes for system to reach atmospheric pressure.
- o) Lift the cold probe from its housing and insert in its cleaning stand. Do not touch it since it is still cold.

1.6.5 Unloading the Substrate and System Shutdown

- a) Lift the chamber lid and place on a table with its handles down.
- b) Remove the fixture if needed to remove your substrates.
- c) Remove the substrates and install the fixture back.
- d) Close the top lid.
- e) Wait for cold probe to reach room temperature and then clean it using the Scotch Brite and the release agent. Wipe it off really clean and then apply the release agent with a clean wipe.
- f) Insert cold probe back in to the cold trap housing.
- g) Turn the vacuum knob to vacuum and wait until vacuum reached below 35 mT.
- h) Turn the Vacuum knob to Hold to hold the vacuum in the chamber.
- i) Turn off the system by pushing EMO switch in.
- j) Logout from the system in FOM.

1.6.6 Cold probe Cleaning

Cold probe should be cleaned in its cleaning stand. It should be at room temperature before cleaning. Moist Scotch Brite with release agent and scrub it clean all-around. Wipe it off with the release agent and then apply the release agent film with the clean wipe. Insert it back into the cold trap housing and pump down the chamber.

1.6.7 Chamber Cleaning

Chamber cleaning should be performed under staff supervision or after separate training for chamber cleaning. When the parylene film thickness deposited on the chamber walls reaches 25 μm or if the films are peeling off, it is time for cleaning chamber. Grab the film from the edges and peel it off. Do not use any sharp objects or blades to scrape it off. Do not use Scotch Brite for chamber walls. Let the staff know if it does not peel off easily. Cleaning should include:

- a) Deposition chamber
- b) View port
- c) Inlet baffle
- d) Chamber inlet and exit ports
- e) Cold trap housing internal surfaces.

The release agent must be applied on all the cleaned (bare) chamber surfaces. Do not apply agent between depositions.

1.6.8 Parylene Boat Forming

- a) Cut a rectangular piece of aluminum foil to 11" x 5".
- b) Face the shinier side of the foil toward the boat form (a piece of pipe) and wrap around it. Bend the edges. Boat length should be 7.5". (Figure 6).

1.6.9 Adhesion Promotion

If parylene is not sticking to your samples and if those do not outgas, adhesion promoter can be used. Consult staff for proper procedure to use it.