

PDS 2010 Labcoter 2
Parylene Deposition System
Standard Operating Procedures



Revision 1

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SCS PDS 2010 Labcoater 2

Parylene Deposition System

Standard Operating Procedures

This system is used to deposit a thin film of parylene, a unique polymer that provides thermal, moisture, and dielectric barriers to any vacuum compatible substrate. It is biocompatible, truly conformal (pin-hole free at 25nm thickness), and has a high mechanical strength. There are several types of parylene with differing levels and combinations of these properties. Details of these properties are found in Appendix D.

Depending on the desired film thickness, a certain weight of parylene is loaded into a vaporization chamber and heated until it sublimates. The vapor passes through a pyrolyzer furnace where it is cleaved into monomer form. It then passes into the deposition chamber—at room temperature—where it deposits as a polymer onto the substrates (and everything else). From there, the effluent travels through a chiller-cooled cold trap, which condenses the remaining parylene. This prevents it from contaminating the vacuum pump which is vented to the house exhaust system.

1.0 Prerequisites for operating the SCS Coater system:

1.1 Obtain a NRF ID (if you do not already have one) by completing the [NRF Lab Use Request Form](#) and safety training.

1.2 Receive “one on one” training and certification from NRF Staff. Discuss your process with a staff member.

2.0 Safety

General Hazards posed by the 2010 include—

- Electric shock
- Thermal burns
- Contact freeze injury by cryogenic apparatus
- Catastrophic loss of vacuum

Material Safety Data Sheets (MSDS) are included in the appendix of this SOP. They should be read and understood prior to operation of the system and cover the following topics—

- Parylene C Dimer, and N Dimer
- Micro-90 Liquid Laboratory Cleaner



CAUTION: The vaporizer and furnace are extremely hot during operation and cool-down. These are enclosed within the 2010 cabinet and should not be touched when the machine is powered or during cool-down after a coating cycle.

A glass viewport is provided to view the substrate and fixturing during the coating process. A viewport that is damaged or improperly installed poses a potential implosion threat while the chamber is under vacuum. Such an implosion would likely cause personal injury.



CAUTION: Do not operate the 2010 if the viewport is cracked or improperly installed. Avoid impacts to the viewport and inspect it prior to loading substrates.

There is a mechanical chiller with a cold probe that is inserted into the cold trap prior to operation. The surface of the probe can reach temperatures below -120°C during operation.



CAUTION: Do not stick your tongue on, or otherwise touch the probe or flexible line when it is cold.



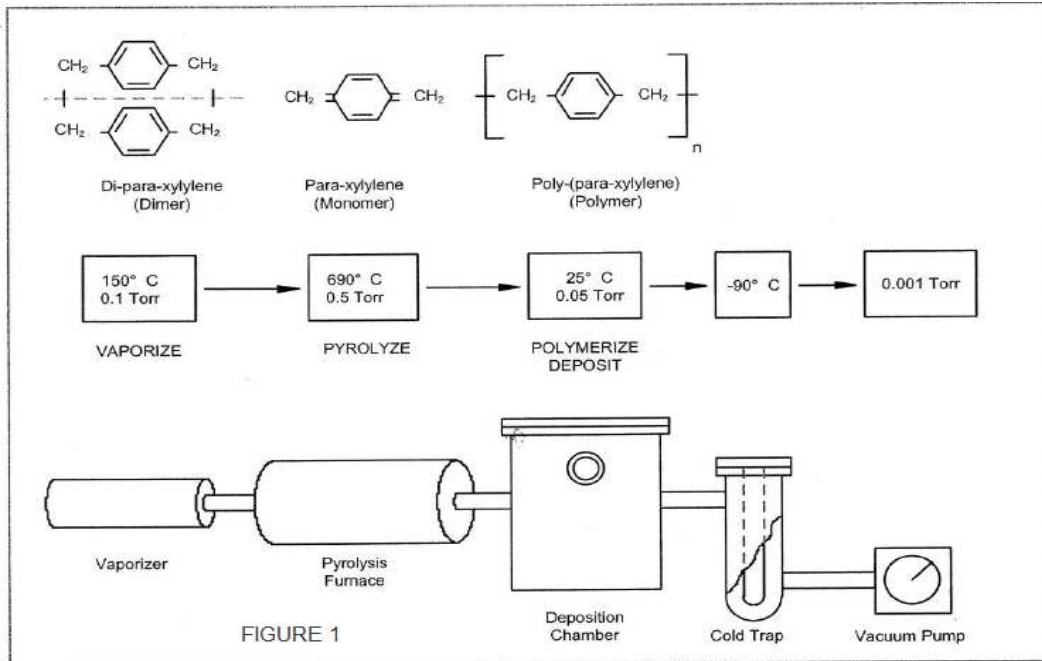
CAUTION: There are exposed live electrical parts within the 2010 enclosure. Users shall not access this enclosure. Repair and maintenance of the 2010 shall be performed by staff only. If there is a problem with the system, contact a staff member.

3.0 Pre-Operation

- 3.1** Tool reservations may be made on the NRF website, reservations page.
- 3.2** Be sure your samples are properly cleaned. If adhesion promotion is required, an HMDS process—by oven or hotplate—is available in the cleanroom. Contact an NRF staff member.
- 3.3** Parylene Dimer types C and N are available at the reception desk. Up to seven grams are included per run. Please return any un-used parylene and the container.
- 3.4** Log into the tool by using the TUMI computer in room.

4.0 Process Overview

- 4.1** The 2010 system consists of a series of connected vacuum chambers that sequentially produce parylene vapor, pyrolyze it, deposit it as a polymer, and then capture its effluent. The Vaporizer chamber is a horizontal tube at the bottom of the tool behind the front panel. It has a hinged door that is held in place with a simple latch. This is where an aluminum foil boat with parylene dimer is loaded into the system. The pyrolyzer furnace is a vertical tube connected to the back of the horizontal vaporizer, and is the place that the dimer vapor is broken into monomers in preparation for deposition on the substrates in the deposition chamber. Samples are loaded onto the rotating plate in the deposition chamber which aids with coating uniformity. The exhaust is pumped into a cold-trap by a mechanical pump, then exhausted to the house exhaust system. Figure 1 depicts the parylene chemistry process and the vacuum system schematic.



4.2 System component identification



Figure 2 System Controls



Figure 3 Deposition Chamber

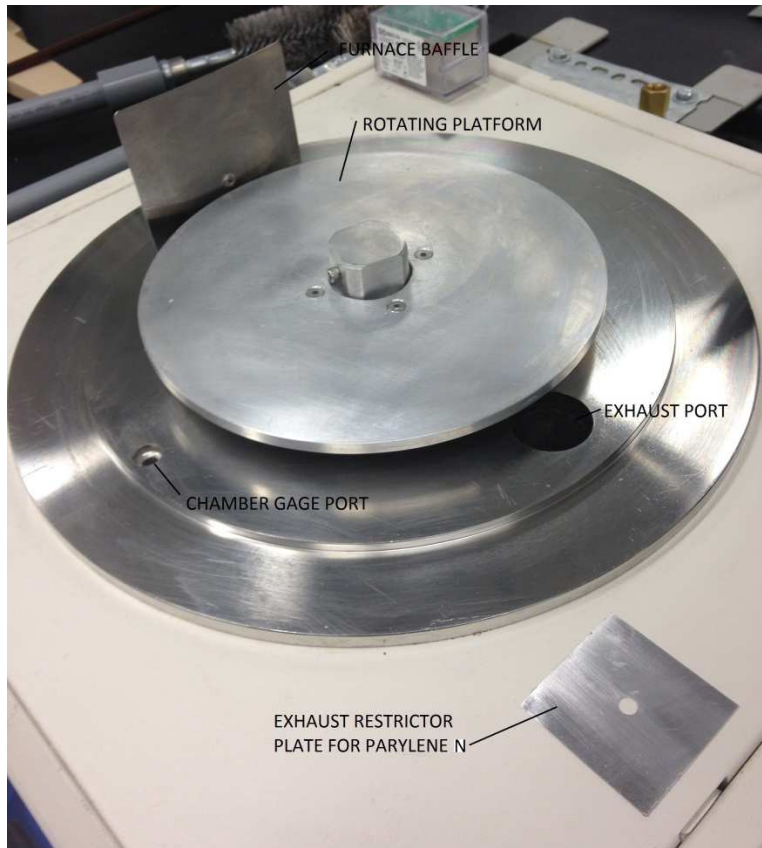


Figure 4 Substrate Loading Platform



Figure 5 Furnace Outlet

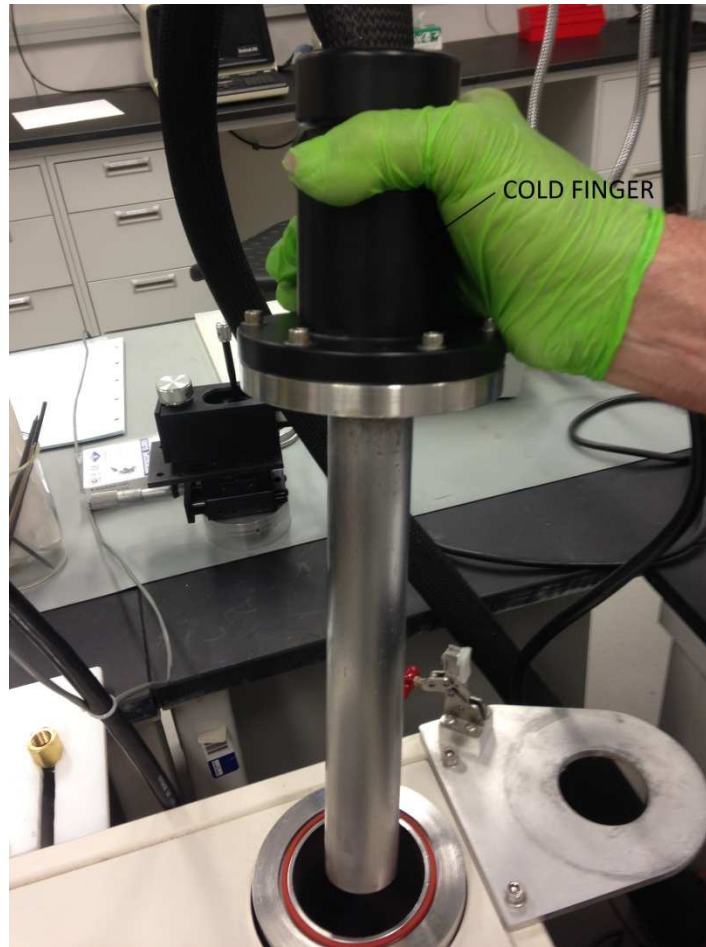


Figure 6 Cold Finger Being Inserted into Vacuum System

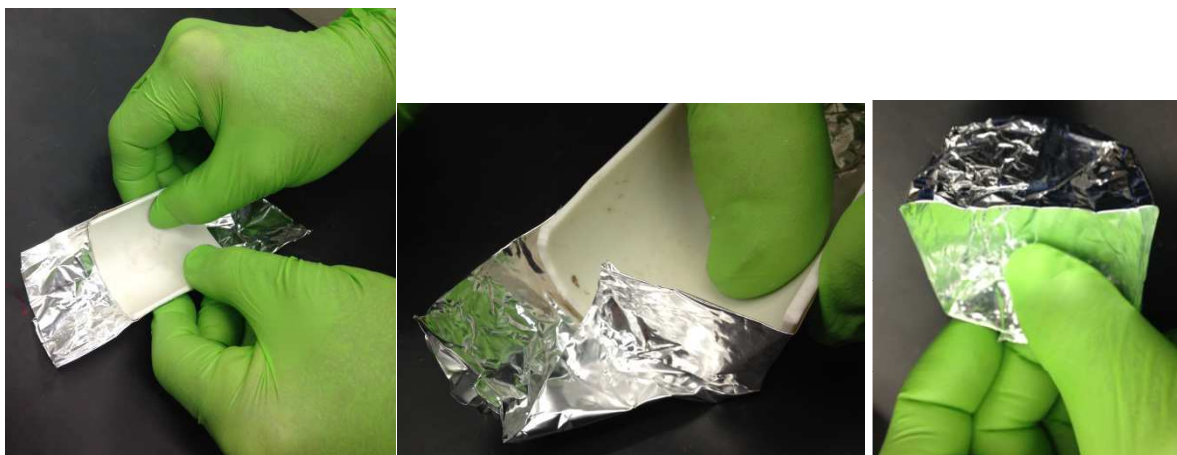


Figure 7 Forming a Dimer boat with aluminum foil



Figure 8 Weighing the Dimer



Figure 9 Loading the Dimer into the Furnace

4.3 Process Controls.

- 4.3.1 Emergency Stop.** This is a rotary type pushbutton. Depressing the Emergency Stop will remove power from the machine, except for the Main Power Pushbutton Light, and the line side of the internal contactors. Rotate the Emergency Stop clockwise to release.
- 4.3.2 Main Power.** Provides power and removes power from the system. To energize the machine, depress the white pushbutton light.
- 4.3.3 Furnace Temperature Controller.** Displays and controls the temperature of the pyrolysis tube heater. The top red numbers are the actual temperature, the bottom green numbers are the set point. The furnace must ramp to temperature before the vaporizer heater is enabled. After reaching temperature, a 20°C deviation from set point will trigger the red alarm light. If the alarm light stays on for longer than 20 seconds the run will be aborted.
- 4.3.4 Chamber Gauge Temperature Controller.** Controls and displays the temperature of the chamber vacuum gauge tube. The gauge tube heater set point is 135°C and should not be changed. Higher temperatures could damage the gauge tube, and lower temperatures could permit parylene deposition on the sensor elements. The top red numbers are the actual temperature, the bottom green numbers are the set point. This heater must be at set point before the vaporizer is enabled. Once at temperature, a 10°C deviation from setpoint will trigger the red alarm light. If the alarm light stays on for longer than 20 seconds the run will be aborted.
- 4.3.5 Vacuum Pressure Controller.** The top red number displays a process value indicating the degree of vacuum in the system. The bottom red number is the set point. It keeps the vacuum at set point by controlling the vaporizer temperature. The transducer is non-linear and has been calibrated to display a value that very nearly represents absolute pressure in milliTorr in the range of 10 to 100 units. As the chamber pressure rises, the display reading is increasingly lower than the actual milliTorr values. For example, when the display reads 500 units, the actual chamber pressure is approximately 2200 milliTorr.
- 4.3.6 Vaporizer Temperature Controller.** Controls and displays the vaporizer temperature. The top red numbers are the actual temperature, the bottom green numbers are the set point.

- 4.3.7 Furnace, Chamber Gauge, and Vaporizer Switch.** In the ENABLE position the switch lever lights illuminate, and power is available to the heaters. In the DISABLE position, the heater power is removed.
- 4.3.8 Vacuum Switch.** A three position switch which controls the action of the vacuum system. In the VACUUM position, the vacuum pump will engage and pump the system down. When the pump is running, the switch lever light is illuminated. In the HOLD position, the pump will disengage and the internal isolation valve in the pump will close to preserve the vacuum in the system. In the VENT position, the pump will remain off, and the vent solenoid will open to vent the system to atmosphere. **After the system is at atmosphere, turn the switch back to HOLD failure to do so may burn out the vent solenoid.**
- 4.3.9 Start/Stop Button.** Pressing the button begins a coating run. The green light will illuminate. Pressing the button again will terminate a run, and the green light will go out. A blinking green light signals that the run is complete.
- 4.3.10 Alarm.** The alarm pushbutton is only illuminated in case of a system fault during a deposition cycle. The audio alarm can be silenced by depressing the alarm pushbutton. The red alarm light will flash a fault code every 5 seconds. If a fault condition is not rectified within 5 minutes, shutdown will occur.
- 4.3.10.1** 3 flashes—Furnace temperature out of range
 - 4.3.10.2** 2 flashes—Gauge tube temperature out of range
 - 4.3.10.3** 1 flash—Vaporizer temperature too high
- 4.3.11 Cold Trap.** Accepts the cold finger which is cooled to below -70°C. This condenses any remaining parylene so it does not contaminate the vacuum pump.

4.4 Parylenes

- 4.4.1 Parylene N.** The basic member of the Parylene series. It is poly-P-xylylene, a completely linear, highly crystalline material. Parylene N molecules are extremely elastic, and will bounce around many times before depositing and polymerizing. This form has the highest penetrating power of all the parylenes, providing the best coverage into small openings and spaces. It is a primary dielectric, exhibiting a very low dissipation factor, high dielectric strength, and a dielectric constant that is invariant with frequency. ***The exhaust restrictor plate must be installed over the exhaust port when using N.*** As shown in Figure 10, it is held down with two pieces of mylar tape to keep it in place when the

system is vented. The plate also causes extended run time. While a sub-gram run can take 2-3 hours, a 10 gram run will take in excess of 8 hours to complete. More detailed specifications are found in the Appendix.

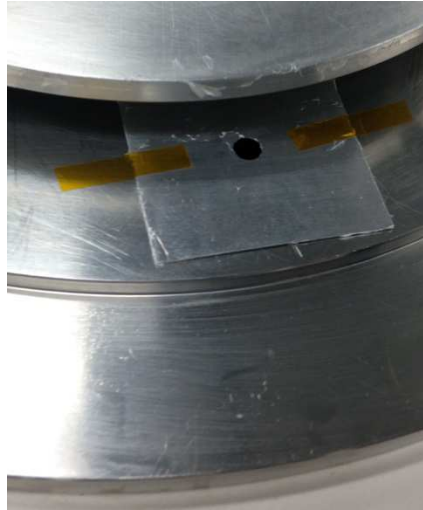


Figure 10 Parylene N Restrictor Plate

4.4.2 Parylene C. Another member of the series, is produced from the same monomer modified by the substitution of a chlorine atom for one of the aromatic hydrogens. It has a useful combination of electrical and physical properties plus a very low permeability to moisture and other corrosive gases. Along with its ability to provide a true pinhole free conformal insulation, Parylene C is the material of choice for coating critical electronic assemblies. A typical 'C' coating run takes 2-3 hours. More detailed specifications are found in the Appendix.

4.5 Deposition Considerations.

4.5.1 Amount of Substrate. Consider the total amount of surface area when determining the amount of dimer needed to achieve a given coating thickness. In addition to the substrate, the chamber walls, baffle, and fixturing are part of the total surface area. Therefore, doubling the substrate does not double the area being coated. In fact, if the substrate load is increased from 40 in² to 80 in² the total area is increased approximately 5%. So roughly 5% more dimer would be added to achieve the same thickness.

4.5.2 Type of Substrate. The type of substrate being coated has little effect. Parylene will coat onto any type of substrate that is vacuum compatible. If the material exhibits abnormally high outgassing, an extended pumpdown will be required to reduce the number of interfering gas molecules that could affect even deposition.

- 4.5.3 Orientation of the substrate.** It is best to distribute the substrate evenly within the deposition chamber. Relatively large spaces with little or no surface area will tend to result in a cloudy coating. When a large amount of substrate is to be coated, position them to minimize the shadowing effect that individual parts may have on one another. It is recommended to maintain at least ½” between parts. The rotation of the fixture helps distribute any non uniformity over the entire fixture, however, it does not help in distribution variances from the top to bottom of the chamber.
- 4.5.4 Placement of substrate on rotating platform.** Place substrates around the rotating platform the same distance radially out from the center. The film thickness is approximately 8% thinner in the center (next to the spindle) than out towards the edge of the platform.
- 4.5.5 Deposition Rate and Thickness.** The proper deposition rate will give an acceptable coating in the shortest possible time. Generally, the slower the deposition, the more uniform and clear the parylene will be. From the standpoint of coating quality, you cannot deposit too slowly, but coating too quickly can cause cloudy and uneven coating thickness. For Parylene C, the deposition rate is typically 0.0002” per hour; for Parylene N, 0.00003” per hour. The deposition rate is indirectly controlled by regulating the pressure in the deposition chamber. Figure 11 shows film thickness and associated dimer weight, characterized with flat substrates on the rotating fixture.

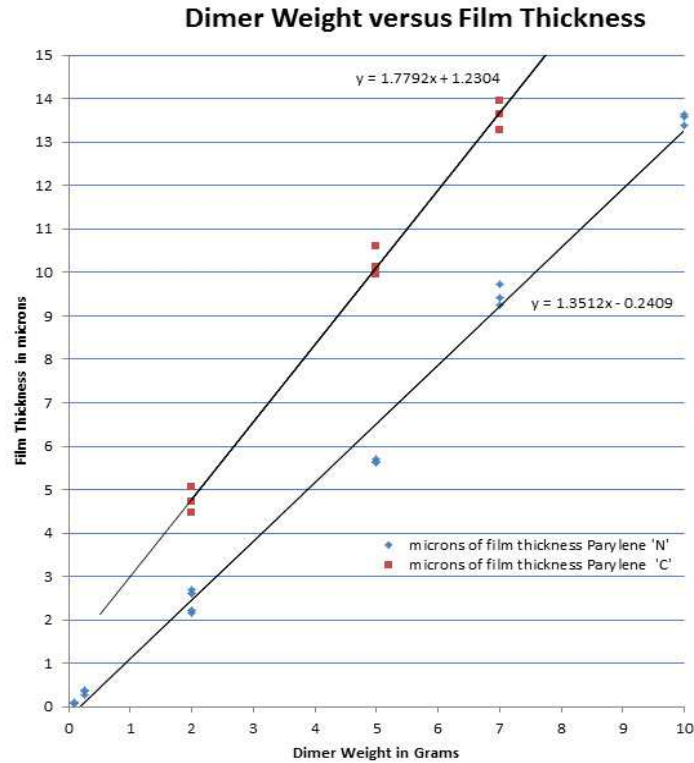


Figure 11 Dimer Weight versus Film Thickness

4.6 Process Controls Setup. The process control parameters are set in the four West 6100 controllers shown in Figure 2. The recipe settings for parylene 'C' and 'D' are given below in Figure 12. These are the **only** values to change. **Do not change any other settings.** All of the factory Setup mode values are given below in Figure 13 for your reference. Understand there is a difference between 'Set point' and 'Set up'.

| TYPE | FURNACE SET POINT | CHAMBER GAGE SET POINT | VAPORIZER SET POINT | VAPORIZER SET UP PARAMETER PhA2 | VACUUM SET POINT |
|------|-------------------|------------------------|---------------------|---------------------------------|------------------|
| C | 690 | 135 | 175 | 174 | 25 |
| N | 650 | 135 | 160 | 159 | 55 |

Figure 12 Recipe Settings

Setup Mode

| Parameter | Furnace | Chamber Gauge | Vaporizer | Vacuum |
|-----------|-----------|---------------|-------------|-----------|
| FiLt | 2 | 2 | 2 | 2 |
| OFFS | 0 | 0 | 0 | 0 |
| PPLJ | read only | read only | read only | read only |
| Pb_P | 1.0 | 1.0 | 5.0 | 0.5 |
| ArST | 2.37 | 0.41 | 2.00 | 3.00 |
| rAtE | 0.39 | 0.10 | 0.30 | 1.40 |
| biAS | 25 | 25 | 25 | 25 |
| SPuL | 720 | 140 | 180 | 100 |
| SPLL | 0 | 0 | 0 | -4 |
| OPuL | 100 | 100 | 100 | 100 |
| Ct 1 | 32 | 32 | 32 | 32 |
| bAL 1 | 20 | 10 | --- | --- |
| PhA 1 | --- | --- | 200 | --- |
| PLA 1 | --- | --- | --- | 15 |
| AHY 1 | 1 | 1 | 1 | 1 |
| PhA 2 | --- | --- | C-174/N-159 | --- |
| AHY 2 | --- | --- | 1 | --- |
| APt | diSA | diSA | diSA | diSA |
| PoEn | diSA | diSA | diSA | diSA |
| SPr | diSA | diSA | diSA | diSA |
| rP | | | | |
| SP | 690 | 135 | 175 | 35 |
| Sloc | 10 | 10 | 10 | 10 |

Figure 13 Factory Settings

4.6.1 Changing Set Points. The top red display on the Wet 6100 controllers show the actual value and the smaller green display shows the setpoint—or the parameter if the controller is in Set Up mode. The Set points are changed using the Function and Arrow Keys, shown in Figure 14.



Figure 14 West Controller Keys

To change a controller Setpoint—

- 4.6.1.1 Press the Function key once. The green display will show 'SP' and the red display will show the current Set Point.
- 4.6.1.2 Use the Arrow keys to adjust the red display to the desired value.
- 4.6.1.3 Press the Function key two times. The green display should display the new setpoint.
- 4.6.2 **Changing Setup value PhA2 on the Vaporizer Controller.** This value should be either 159 for parylene N, or 174 for parylene C.
 - 4.6.2.1 Press and hold the Function key and press the Up Arrow key. The upper display will read OPtr and the lower display will read SLct.
 - 4.6.2.2 Press the Up Arrow key once. The upper display will show SetP.
 - 4.6.2.3 Press the Function key once. The lower display will show Uloc.
 - 4.6.2.4 Use the Up Arrow key to increment the upper display until it reads 10—the unlock code. Press the Function key. The 'Man'

light will come on and the display will read the first parameter in the Setup Mode menu.

4.6.2.5 Press the Function key 13 times. The lower display should read PhA2. Use the Arrow keys to increment to the desired value.

4.6.2.6 Press and hold the Function key and press the Up Arrow key to return to Select Mode.

4.6.2.7 Use the Down arrow key to select Optr and press the Function Key to return to Operator Mode.

4.6.3 Process Flow. With the controls properly set the internal PLC will automatically sequence the system thru a deposition run. Figure 15 is a flowchart showing the process flow and logic.

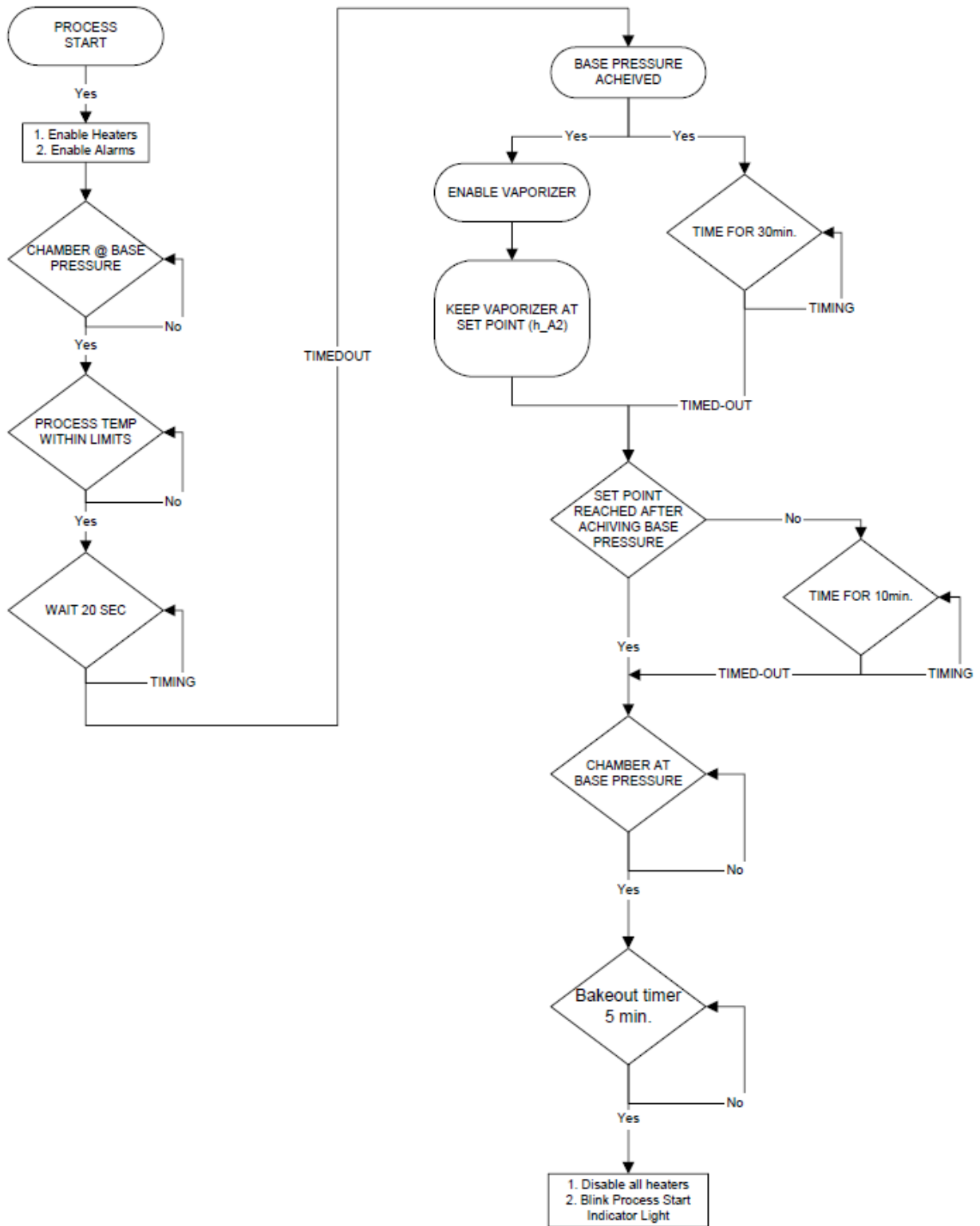


Figure 15 Process Flow Overview

5.0 Equipment Operation Steps.

- 5.1 Seven gram vials of parylene C or N can be picked up at the reception desk. One vial is included per coater run.
- 5.2 Log onto SCS Parylene Coater on the TUMI system. The Main Power button should illuminate.
- 5.3 Press the Main Power button. The controllers should begin to initialize.
- 5.4 Turn on the Acculab scale. It takes a bit to 'warm up'.
- 5.5 Record the vacuum level from the red display on the vacuum controller on the log sheet.
- 5.6 Turn the vacuum switch to 'Vent'. Watch the vacuum reading rise, it should stabilize at 1000-1010 vacuum units.
- 5.7 Turn the vacuum switch to 'Hold'. The system is now vented.
- 5.8 Using the two handles, remove the chamber lid—Figure 3. Turn it upside down and gently place the viewport side on the work bench.
- 5.9 ***Wear nitrile gloves when handling anything that will be exposed to system vacuum.*** Inspect the chamber and accessories for proper cleaning and preparation per Section 4. Ensure the rotating platform is properly seated and the furnace baffle is properly installed (figures 4 & 5). Inspect the chamber lid gasket for cleanliness, tears or cracks, and proper installation.
- 5.10 If using Parylene 'N' install the restrictor plate over the exhaust port hole. Secure it with two pieces of mylar tape. If it is not taped down it will blow out into the deposition chamber during venting and possibly damage your samples.
- 5.11 Lift the cold finger from the cold trap (Figure 6) and inspect for proper cleaning. Look down into the cold trap itself and ensure it is clean and free of debris. Inspect the cold trap o-ring for cleanliness, tears or cracks, and proper installation.
- 5.12 Set the cold finger back into the cold trap.
- 5.13 Using the plastic form, fashion an aluminum dimer boat as shown in Figure 7.
- 5.14 Place the boat onto the scale. Wait until the stability symbol on the display lights (Figure 8—top symbol on left side of display). Press the zero button on the scale.
- 5.15 Weigh in the desired weight of parylene dimer into the boat. If you spill any, clean it up. Turn the scale off when done.
- 5.16 Open the front door of the coater cabinet and open the vaporizer door. Inspect for cleanliness, especially the door and door seal. Load the dimer boat into the vaporizer, push the boat in approximately ½ inch past the opening. Close the vaporizer door.
- 5.17 Load cleaned and prepared samples onto the rotating platform, using considerations discussed in section 2.5. Reinstall the chamber lid.

- 5.18** Using one hand, hold the cold finger centered and flat on the gasketed cold trap. Ensure the flexible tubing to the chiller is bent in a smooth arc and not stressed in any way. Using the other hand, turn the vacuum switch from 'Hold' to 'Vacuum'. In a few seconds the vacuum should hold the cold finger in place. The vacuum units display should begin to drop. If not, turn the vacuum switch to 'Hold' and inspect for leaks.
- 5.19** When the vacuum units gauge reached 300 units, turn on the chiller using the green switch. Turn on the Omega Thermometer by pressing the green button. It displays the temperature of the cold finger in °C.
- 5.20** Set the appropriate process settings as discussed in Section 2.6. Be sure to check the SET UP parameter PhA2 on the Vaporizer controller.
- 5.21** Turn the Furnace/Chamber Gauge and Vaporizer switches to 'Enable' and press the green Start/Stop button. The system will now begin an automated deposition run.
- 5.22** Approximately 10 minutes after turning the chiller on the green Cool light should come on, signaling that refrigerant is beginning to flow through the cold finger. The temperature on the Omega Thermometer should begin to drop.
- 5.23** Chiller temperature profiles for cool-down and heat up are shown below in Figure 16. ***It is imperative that the chiller cold finger be below -75°C before the vaporizer begins to heat.*** The vaporizer will begin heating when the Gauge Tube and Furnace have reached Set Point.
- 5.24** The cold finger captures the remaining parylene in the exhaust stream. If parylene vapor enters the vacuum pump, it will cause pump failure. ***There is no interlock to prevent this, so it is up to the operator to monitor the temperature and process flow and abort the run manually if needed.***

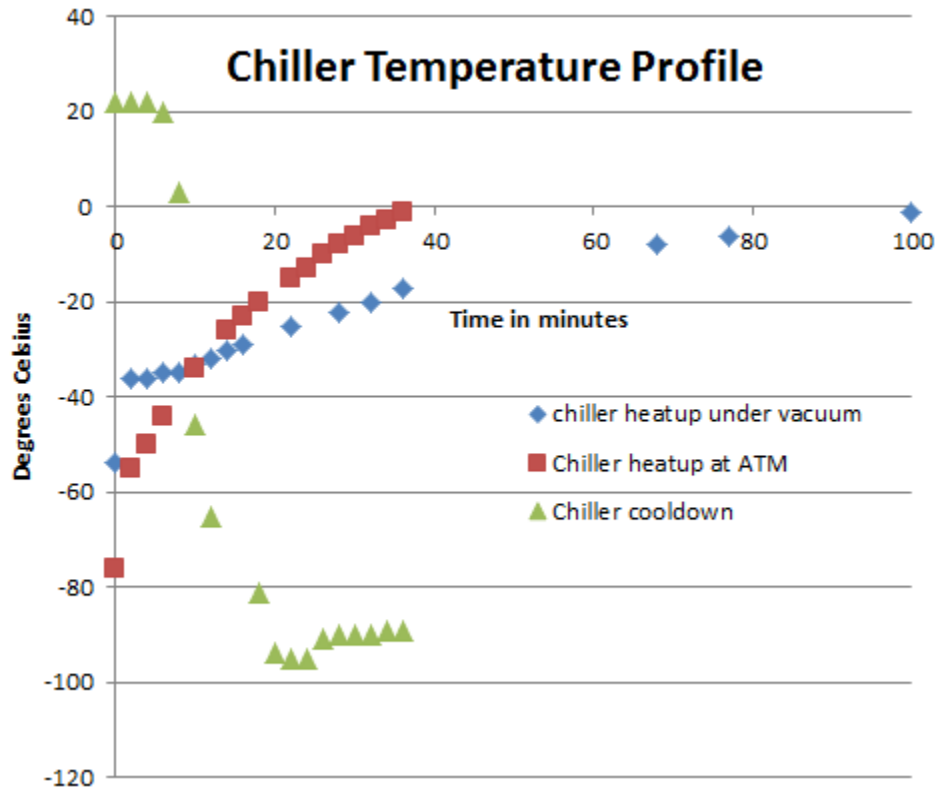


Figure 16 Chiller Temperature Profile

- 5.25 The furnace and gauge tube heaters will begin to ramp up to temperature once the run is started. ***As the temperatures approach setpoint, watch the readout on the cold finger thermometer. If has not reached at least -75°C abort the run by turning the vaporizer switch to 'Disable' and contact staff.*** This usually happens long before the furnace reaches temperature.
- 5.26 Once the furnace and gauge tube heaters have reached set point, and the vacuum has reached base pressure of 15 vacuum units or less, the vaporizer will begin heating the parylene dimer. When the vaporizer reaches 90°C the dimer begins to sublime and the coating begins. As the vaporizer continues to heat, the dimer sublimates faster, sending more molecules into the chamber. This causes the vacuum pressure to rise above setpoint. The control system will then lower the vaporizer temperature to maintain vacuum set point. As the dimer is depleted, the vaporizer temperature will continue to rise, but the vacuum will begin to fall to base pressure since no more dimer molecules are being added to the system. This indicates that all the dimer has been consumed.
- 5.27 After a 5 minute 'Bake out' elapses, the run is complete. The green Start/Stop button will begin to blink.

- 5.28 Press the green Start/Stop button to turn off the blinking light.
- 5.29 Turn the Furnace/chamber gauge and vaporizer switches to 'Disable'.
- 5.30 Turn the chiller off using the green switch.
- 5.31 Turn the vacuum switch to 'Vent'. When the vacuum reading stabilizes above 1000 vacuum units turn the vacuum switch to 'Hold'
- 5.32 Note The Chiller heat up curve in figure 16. **After the chiller is shut off, the cold probe and flex line are frozen and very brittle. Moving them can cause hairline cracks in the tubing and subsequent chiller failure. If too much time elapses before the cold figure is removed, the frozen material will melt and drip/fall into the cold trap and migrate into the vacuum pump.** When the cold finger thermometer reads -20°C gently place the finger into the holding bracket and lock the clamp.
- 5.33 Remove chamber lid and retrieve samples. As the parylene has coated the chamber gasket and base, it may be necessary to lift on one side of lid to break the parylene seal.
- 5.34 **After the vaporizer has cooled to below 40°C**, the door can be opened and the aluminum boat removed and discarded.
- 5.35 If successive runs are desired, **the cold trap must be cleaned prior to another run.** See Section 4.

6.0 System Post Run Cleaning. The system must be cleaned after making a process run. The furnace, vaporizer, and cold finger must be at ambient temperature prior to cleaning. The cleaning tools are provided, shown below in figure 17 & 18. Do not use any sharp metal objects to clean the system. This will scratch the surfaces, making it harder to clean and could cause vacuum leaks. The flue brushes are used to clean the furnace tube, vaporizer, exhaust port, and cold trap. The plastic scraping tools, scotchbrite, and Micro-90 cleaning solution are used to clean the remainder of the exposed parts.



Figure 17 Flue Brush Storage Behind System



Figure 18 Cleaning Supplies

6.1 Micro-90 Solution. This solution both helps in removing the parylene coating and works as a release agent for subsequent coating runs.

6.1.1 Use the 100 ml graduated cylinder stored in the rack above the sink. Pour approximately 2ml of the Micro-90 solution into the cylinder. There is a black line marking 2 ml. Fill the cylinder to 100ml using DI water (grey plastic faucet).

6.1.2 Pour the mixture into the blue spray bottle and gently swirl to mix.

6.2 Cold finger. The cold finger needs to be thawed out prior to cleaning. The surface may be wet with condensation. Release the finger from the holder and carefully move it to the edge of the table. Do not stress the flexible line. Place the trash can under the area.

6.2.1 Use the acrylic plastic scaping tool to gently force the condensed parylene off the finger. The majority of the parylene should strip off easily.

6.2.2 Using a scotchbrite pad and the Micro-90 solution to scrub the remaining film off the finger.

6.2.3 Wipe the finger clean with a clean lint-free wipe sprayed with the Micro-90 solution.

6.2.4 Leave it wet with the Micro-90 solution, as when it dries, it serves as a release agent for the next parylene coating.

6.2.5 Place the cold finger back into the holder.

6.3 Deposition Chamber. The inside of the deposition chamber lid and viewing port should be cleaned when the coating becomes excessively heavy, blisters, or separates from the surface. **Do not** use a razor blade or other metal objects to remove the coating. This will scratch the surface and possibly cause vacuum leaks. **Do not** attempt to remove very thin coatings and do not apply Micro-90 solution over an existing coating that will not be cleaned. Attempts to clean thin coatings may cause flaking dispersion and consequent particle contamination on subsequent runs.

6.3.1 A 'cleanable' coating will mostly peel off by hand. The plastic scraping tool and/or scotchbrite and Micro-90 solution can be used in stubborn areas. **Do not use scotchbrite on the viewport as it will leave scratches.**

6.3.2 Wipe clean with a lint-free cloth and Micro-90 solution.

6.3.3 When clean, spray interior surfaces with Micro-90 and wipe with clean cloth, leaving it wet as a release agent for the next run.

6.3.4 Only use isopropyl alcohol to clean the chamber gasket. Do not use Micro-90 solution.

6.3.5 Remove the rotating platform by lift it straight up.

6.3.6 Remove the furnace baffle.

6.3.7 Follow cleaning procedures 6.3.1 thru 6.3.3 to clean all exposed surfaces.

6.4 Furnace Tube and Vaporizer. Open the vaporizer door and insert vacuum hose with the vacuum running. Insert the furnace flue brush into the furnace hole, push it down into the vaporizer and pull it all the way back out. Do this several times. Vacuum out deposits that have fallen into the vaporizer. Use the vaporizer flue brush to clean the vaporizer in the same manner. Vacuum out the vaporizer. Be sure the vaporizer door and seal are cleaned. Do not apply Micro-90 solution in any of these areas.

6.5 Exhaust port and Cold trap. Peel as much deposit from the exhaust port as possible by hand or with the plastic scraping tool. Use the exhaust port flue brush as well. It is not possible to clean all of the exhaust port as it curves and enters the cold trap. Use the cold trap flue brush to clean the cold trap. Vacuum out any particulates. The gasket can be cleaned by hand, or with a lint free cloth and isopropyl alcohol. Do not apply Micro-90 solution in these areas.

6.6 General and Reassembly. Vacuum floor and work surfaces. Be sure all surfaces in the interior of the chamber are coated with Micro-90 solution. The surfaces should be wet, but not dripping.

- 6.6.1** Replace rotating platform. Be sure it is fully seated on the spindle.
- 6.6.2** Replace the furnace baffle as shown in figure 4.
- 6.6.3** Replace the chamber lid. Be sure the gasket is seated on the base all around.
- 6.6.4** Place the cold finger into the cold trap. Center the finger and hold it flat with one hand. Turn the vacuum switch from 'hold' to 'vacuum'. When the vacuum readout reads 300 or less, turn the vacuum switch to 'hold'.
- 6.6.5** Fill out the SCS Coater Log Sheet.
- 6.6.6** Log off TUMI system.

