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1.0 Purpose/Scope
1.1 This document covers the procedure that should be followed for normal operation of the Parylene Coater PDS210 for the purpose of vapor deposition of the Parylene polymer onto a variety of substrates for research purposes.

2.0 Reference Documents
2.1 PDS 2010 LABCOTER 2 Parylene Deposition System Operator’s Manual
2.2 CSSER Rules and Procedures Handbook

3.0 Equipment/Supplies/Material
3.1 Aluminum Foil—supplied by user
3.2 Parylene C Dimer—supplied by user
3.3 Silane A-174—supplied by user
3.4 Micro-90 Concentrated Cleaning Solution
3.5 Spray bottle for Micro-90 mixture
3.6 Scale and Plastic Beaker
3.7 Isopropyl Alcohol (IPA)
3.8 Clean Room Wipes


5.0 Set Up Procedures
5.1 Enter your name, date and start time into the log book.
5.2 Turn on the coater by pressing the MAIN POWER button. The displays on the tool should light up. If nothing happens when the button is pushed, then disable the EMO by turning it clockwise to release it.
5.3 Pre-Deposition Cycle
5.3.1 Release Agent Preparation (used for treating and cleaning deposits)
   5.3.1.1 Pour 600 ml of DI water into the designated spray bottle.
   5.3.1.2 Add 12 ml of the Micro-90 concentrated cleaning solution.
   5.3.1.3 Mix solution by shaking bottle for 30 seconds.
5.3.2 Ensure that the chiller probe has been cleaned of all deposits and placed inside of the cold trap.
5.3.3 On the chiller controller, press the green switch ON. This will start the compressor and cool the chiller probe.

NOTE: It is very important to wait 30 minutes for the chiller to cool the probe. The purpose of the chiller probe/cold trap is to protect the vacuum pump from Parylene deposits.
5.3.4 Use the vacuum cleaner to remove any loose flakes from chamber, sample plate and base plate.

5.3.5 Use a clean room wipe and IPA and clean the sealing surface on the base plate.

5.3.6 Clean and vacuum out the vaporizer oven. Also, use IPA to clean vaporizer door seal.

5.4 Dimer boat construction and charging

5.4.1 Start with a piece of aluminum foil approximately 7 inches by 4 inches.

5.4.2 Locate the boat form; it is stored inside the front door of the tool. Form the foil lengthwise along the outside diameter of the boat form. Face the shiniest side of the foil toward the boat form.

5.4.3 Fold one end of the foil over the boat form. Remove form from the aluminum foil boat.

Note: Keep the aluminum foil boat shorter than 7.5 inches. A boat longer than this will stick out directly under the pyrolysis furnace. This could result in premature vaporization caused by heat from the furnace section. By using the boat form, the outer dimensions of the boat will match the inner dimensions of the vaporizer. A boat that matches the inner dimension (of the vaporizer) will provide the best heat transfer to the dimer charge.

5.4.4 Place the beaker on the scale and zero display.

5.4.5 Load the beaker with dimer with the amount desired. A one gram will equal approximately a 2.3 µm thickness. Pour the dimer into the aluminum foil boat.

5.4.6 Place aluminum foil boat inside of vaporizer, close and lock door.

5.5 Adhesion Promotion (If needed)

5.5.1 Silane A-174 is available for adhesion promotion if improved Parylene adhesion is desired. If this is not needed then jump to paragraph 6.1

5.5.2 Adhesion Promotion Solution Preparation

5.5.2.1 Mix equal parts of IPA and DI water, then add 0.5% (1 part to 200 by volume) of the A-174.

5.5.2.2 Stir the solution with a clean stirring rod for 30 seconds and allow it to stand for at least 2 hours (to allow adequate chemical reaction) before using it.

5.5.2.3 Shelf life of the solution is 24 hours, so mix only the amount that will be used during this time.

5.5.3 How to use the promotion solution

5.5.3.1 Submerge the sample(s) in the prepared promotion solution for 15-30 minutes.

5.5.3.2 Remove the sample(s) from the solution and allow them to air dry for 15-30 minutes.

5.5.3.3 Submerge sample(s) in IPA for 15-30 seconds.
5.5.3.4 Remove sample(s) and drain adequately (approximately 30-60 seconds).
5.5.3.5 Let IPA evaporate from sample(s) before placing into the chamber.
5.5.3.6 Sample(s) should be coated within 30 hours, maximum. If sample(s) are not coated, then parts must be submerged again.

6.0 Procedure

6.1 Deposition Cycle

6.1.1 Place sample(s) on turntable and place chamber lid on base plate.
6.1.2 Hold chiller probe in place and turn vacuum switch to VACUUM. Listen for leaks and make certain that value on the chamber pressure gauge is dropping. Adjustments to the probe and/or chamber might have to be made to get a good vacuum seal. ??
6.1.3 Turn the furnace and vaporizer switches to ENABLE.

NOTE: It is very important to wait 30 minutes for the chiller to cool the probe and cold trap housing. The purpose of the cold trap is to protect the pump from Parylene deposits.

6.1.4 Ensure that the vacuum gauge is below the set point of 30
6.1.5 Press START and green light will turn on. The FURNACE and CHAMBER GAUGE temperatures will ramp to their set points. The set point of the FURNACE is 690° and the CHAMBER GAUGE is 135°. Next, the VAPORIZER will ramp to its set point of 175°. It takes approximately 45 minutes before temperatures reach set point.
6.1.6 When the vaporizer temperature exceeds 90 degrees the Parylene coating process begins and the chamber pressure rises.
6.1.7 The coating process will continue until all of Parylene dimer is vaporized. At that point, the chamber pressure start to decrease
6.1.8 After base pressure has been achieved again, a five minute bake out timer is enabled. This timer ensures that all Parylene dimer gets vaporized and deposited.
6.1.9 When the process is over, the PROCESS START/STOP button will blink continuously.
6.1.10 Press the PROCESS START/STOP button to turn off the blinking light.
6.1.11 Turn vacuum switch to VENT.
6.1.12 Turn the chiller switch OFF. Wait ten minutes for the chiller probe to warm up and then remove the probe from cold trap.

NOTE: It is very important to wait for the chiller to warm up for 10 minutes. The flex lines that go to the probe are very fragile. But, the probe needs to be removed before the frozen material on the probe does not fall into the cold trap. Try to allow enough time for the flex line to warm before moving, but do not wait so long that the frozen material on the probe begins to melt.
6.1.13 Turn the furnace and vaporizer switches to DISABLE and vacuum switch to HOLD.
6.1.14 After the chamber is vented, use a twisting action to lift the chamber lid off of the base and remove sample from turn table

"NOTE: If another deposition cycle is desired, the chiller probe has to be cleaned and the release agent needs to be reapplied before deposition takes place."

6.2 Post Deposition Clean-Up

6.2.1 Wait until the vaporizer temperature goes below 40°C, then remove the aluminum boat from vaporizer and discard into “Metal” labeled waste container.

6.2.2 Remove the Parylene coating from the chamber and discard into “Parylene” labeled waste container. Use a vacuum cleaner and pick up all other loose particles.

6.2.3 Wait until the chiller probe has warmed to room temperature and clean the deposits from the probe surface. Using the micro-90 release agent during cleaning is helpful.

"NOTE: If the chiller probe is not cleaned the chlorine atom from the Parylene C will attack and corrode the metal surface of the chiller probe."

6.3 Shut Down

6.3.1 Position the clean chamber lid on the base plate

6.3.2 Place the clean chiller probe into the cold trap.

6.3.3 Turn the vacuum switch to the VACUUM position. Allow for the roughing pump to bring the chamber to below 100 millitorr.

6.3.4 Press the red EMO button to turn off power and leave chamber in a vacuum condition.

6.3.5 Enter the end time into the log book.

7.0 Tables-None

8.0 Figures-None

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