PDMS Casting Station Supplies

These are provided by the CNF. Please do not use more than you need. Please do not take extra supplies from the lab. Log onto CORAL each time that you use PDMS and the PDMS Casting Station.

	location
PDMS (Sylgard 184)	Under solvent hood
Glass slides	white cabinet across from laser
Petri dishes and cups	”” ””
Wooden stir sticks	”” ””
Plastic transfer pipets	”” ””
Glass slides	”” ””
Conical tubes and racks	”” ””
Isopropyl alcohol	squirt bottle by the sink or hood
Diluted Dawn detergent	spray bottle by the sink
Razor blades, spatulas, forceps	Drawer by sink marked PDMS supplies
Glass cutter and hole punch	”” ””
Bench wax paper	”” ””

Wear a faceshield and gloves if you are using the solvent hood.

Notify Beth Rhoades or Penny Burke (NBTC) if the PDMS stock is running low.

Clean any spills ASAP with diluted Dawn detergent and water. Throw the wipes away in the regular trash.

Clean the space when you are finished each day. Store things in the user storage areas that are marked with labels.

- Rinse glassware and put it on the dirty dish rack.
- NO UNPOLYMERIZED PDMS SHOULD BE LEFT IN GLASSWARE.
- Polymerize and extra PDMS and dispose of in regular trash

Dispose of any sharps in the red sharps container by the Dimatix printer.

Casting and Assembling PDMS Devices

1. LOG ON TO THE PDMS CASTING STATION.

2. Mix base and curing agent in a plastic cup. (10 parts (weight) base: 1 part curing agent). 45 g is sufficient to cover a wafer in a 150 mm petri dish. Stir thoroughly for 2 minutes.

3. Degas the PDMS.

Option A: Place the cup in the vacuum bell jar. Turn on the gray pump and bleed the vacuum slowly out of the jar every 5-10 minutes until the bubbles are gone. Clean up any spills with the spray bottle of diluted dish soap.

Option B: Seal the container and freeze at -20 °C for 1-21 days. The PDMS will be bubble free upon thawing.

4. Pour the PDMS slowly over the wafer in a petri dish while gently pressing the wafer down to prevent the PDMS from flowing under the wafer.

5. Cure the PDMS. You have several options for temperature and time:

Option A: Use the PDMS vacuum oven for 2-24 hours at 60°C with a plastic petri dish. Do not allow plastic dishes to touch the sides of the oven chamber. They will melt. The PDMS may be tacky at the low end of the time, and leaving it at room temperature overnight will help.

Option B: Use the high-temperature PDMS oven with a glass petri dish.
According to the product information sheet:

~48 hours at room temperature
45 minutes at 100°C (212°F)
20 minutes at 125°C (257°F)
10 minutes at 150°C (302°F)

6. Clean the glass slide with diluted Dawn dishwashing detergent (spray bottle), rinse thoroughly with tap water, then with de-ionized water and finally with isopropyl alcohol. Dry under nitrogen. Do not touch the glass with bare hands.

7. Use a razor blade to cut out the cured PDMS, and use forceps to handle it.

8. Charge the surfaces with room-air plasma. Place the PDMS (channel side up) and the cleaned slide in a glass petri dish. Put the dish in the plasma generator.

-Turn the 3-way black valve to the 'closed' position.
-Hold the door shut while turning on the pump at the power strip. The door should seal.
-Wait 45 seconds.
-Turn on the power to the RF (red switch), and dial the setting to 'High'.
-The residual air should ignite a plasma within 20 seconds.
-Turn the 3-way black valve to 'room air' and adjust the pin valve to tune the plasma to brightest intensity.

-Charge the samples for 30-90 sec.
-Dial the Rf setting to ‘Off’ and flip the Rf power switch to ‘Off’.
-Turn off the pump at the power strip.
-Turn the 3-way black valve to the ‘vent’postion’
-Open the door and remove samples.

9. Adhere the cured PDMS and glass quickly without trapping air in the device. Gently press down to ensure a tight seal. If the surfaces are undercharged or overcharged or not flat they won’t stick strongly.

10. (Optional) Bake for 20-30 minutes at 60 °C to promote bonding.

11. Insert needles and other hardware. To maintain open channels for more than a few hours typically requires loading with de-ionized water.

Low-temperature PDMS Vacuum Oven Instructions

DO NOT OPERATE OVEN HIGHER THAN 60 °C.

Turn the oven on (power switch at the top of the panel). Dial to the approximate desired temperature. Equilibrate the oven for at least 45 minutes using the thermometer in the chamber as the true readout.

1. LOG ON TO THE PDMS CASTING STATION.

2. Level the oven shelves with glass slides.

3. Put the sample in the oven and close the door. Avoid touching the sides of the oven with plastic dishes since they will melt.

If you need to apply a vacuum, follow these steps.

4. Turn on the gray pump using the switch on the pump. Open the black valve on the tubing going into the oven.

5. Turn the 3-way valve on the front of the oven to "EVAC" to apply a vacuum to reach target vacuum (typically 15-20 mmHg).

6. Turn the 3-way valve to "CLOSED" to hold the vacuum. Close the black valve on the tubing (perpendicular orientation to the tubing). **Turn off the pump.**

7. To vent the oven, turn the 3-way valve to "VENT" until the door is positively pressurized (rattles with the nitrogen vent). Turn the 3-way valve to 'CLOSED'. Open the door.

   Leave the oven at 60°C and NOT under a vacuum.

CAUTION:

A) Do not run the pump continuously. Prolonged evacuation of heated air could melt the tubing or damage the pump.

B) Do not open the oven door when there is a vacuum. Vent the oven first.

C) Do not operate the oven higher than 60 °C.

Vacuum Bell Jar

This jar is for degassing PDMS. It is hooked up to the same pump that evacuates the vacuum oven. So close the valve on the tubing going to the oven to avoid applying a vacuum to the oven at the same time.

1. LOG ON TO THE PDMS CASTING STATION.

2. Close the black valve on the tubing that leads to the vacuum oven (perpendicular to the tubing).

3. Turn the 3-way valve on the vacuum oven control panel to 'CLOSED'.

4. Place a beta wipe in the bottom of the jar, and put in the sample.

5. Close the lid and turn the red valve to apply a vacuum to the container. Turn on the gray vacuum pump.

6. Periodically vent the jar SLOWLY, by SLOWLY breaking the seal to the tubing. If the jar vents too quickly, the sample will fly around the chamber.

7. When finished, turn off the vacuum pump. SLWLY break the seal. Open the lid. Remove the sample. Throw away any beta wipes that have PDMS on them. Clean any spilled PDMS with the diluted dishwasher liquid (spray bottle).

CAUTION:

A) Do not simultaneously vent hot air from the vacuum oven. This could melt the tubing and damage the pump.

B) Do not switch the pump on and off many times. It will fail. Switch the pump OFF when finished.

Harrick Plasma Generator - processing with room air

1. LOG ON TO THE PDMS CASTING STATION.

2. Place samples with the surfaces to be treated facing up in a glass petri dish.

3. Ensure that the 3-way air valve is turned to the "closed" position (pointing to 6 o'clock) and the pin valve is closed.

4. Turn the vacuum pump on at the power strip. Hold the door shut for a few seconds. Evacuate the chamber for 45 seconds.

5. Turn the RF power switch ON. Dial the RF power to the high setting. A plasma should ignite within 20 seconds if the amount of residual air is sufficient.

6. Turn the 3-way air valve to "room air" (pointing to 9 o'clock). Dial the needle valve (at the top of the 3-way valve) just slightly open (as shown on the tool) to allow a small amount of air to enter. Adjust the needle valve slightly to tune the plasma intensity.

7. Charge for 30 – 90 seconds. More time may be counterproductive.

8. Turn the RF power switch OFF. Dial the RF power setting to OFF.

8. Turn the vacuum pump off at the power strip.

9. Turn the 3-way air valve to "vent" position (pointing to 3 o'clock). Once the pressure is equalized the door will open.

10. Remove your sample and adhere it to the substrate within 2 minutes.

CAUTION:

A) Vent the chamber as soon as you are finished.

B) Do not open the door when the chamber is under vacuum.

C) Under no circumstances should any user attempt any repairs or modifications of the tool. Please see the tool manager if you have any questions or desire any special processing not covered in the instructions.

High-Temperature Curing Oven Instructions

DO NOT EXCEED 200 °C. Do NOT use plastic in this oven

1. LOG ON TO THE PDMS CASTING STATION.

2. Turn On the oven and set to any temperature under 200 °C. Settings for some temperatures are shown on the door.

3. Use the probe thermometer inside the oven to measure the temp.

4. Turn OFF the oven when you are finished.

CAUTION:

A) Do not leave the oven on.

B) Do not use plastics at temperatures greater than 60 °C. And even at this temperature, the sides of the oven are hotter and will melt plastics.

C) Under no circumstances should any user attempt any repairs or modifications of the tool. Please see the tool manager if you have any questions or desire any special processing not covered in the instructions.