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PDMS-PDMS Bonding Protocol - Technics

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Critical factors:

- Set O_2 pressure to 2.16 Torr
- Power to 30W
- Plasma for 30 s
- Wait 20 minutes before testing bond

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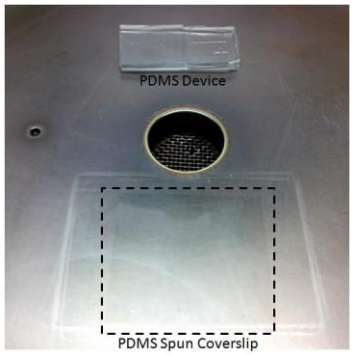
Materials:

- 10:1 PDMS spun glass microscope slides:
  - 2.5 min plasma clean per side (2.16 Torr, 30 W, O_2 flow bob at "97.5")
  - 10g base + 1g cure mix vigorously and degas 1 hour
  - Spin glass coverslides, 10 s @ 500 rpm, 50 s @ 3000 rpm
  - Allow PDMS to level at RT for 2 hrs
  - Cure overnight at 65C
- 20:1 PDMS disks (~10 mm tall, ~12 mm diameter)
  - 10 min sonication in 200 proof EtOH
  - 2X 60 mL rinse in MilliQ water
  - N_2(g) dried

Process Parameters:

- O_2 flow rate value "97.5" (bob between "95" and "100" markings)
- Vacuum (process valve) adjusted until pressure as reported on black box to left of Technics reads 2.16 Torr ± 0.02 Torr
- Power set to 30 W (0.030 kW)
- Plasma distributing plate in place
- Positioning of samples in chamber as follows:



Protocol:

- Prior to loading samples, perform run on an empty vacuum chamber to properly set power supply knob position for desired process parameters.
- Load samples in orientation shown above.
- Reestablish process parameters by *manipulation of process valve only*.
- Perform plasma exposure for specified time.
- Vent chamber.
- Place PDMS in conformal contact with PDMS spun glass.
- Apply gentle but uniform pressure to PDMS for 10s.
    - Note: Extremely thin glass coverslips (#1-#2) will warp if excessive pressure is applied. Gentle and uniformly distributed pressure is only necessary to ensure conformal contact of the PDMS/PDMS interface.
- Incubate PDMS on PDMS spun glass at room temperature for 15 min.
    - Note: If more than one device was bonded, do not leave them in contact with one another at least for a few hours as partial plasma activation could have occurred on the other surfaces of the PDMS.

Tested Parameter Results:

Power (W)	Pressure (Torr)	O_2 Flow Rate "Value"	Treatment Duration (s)	Incubation Duration (min)	Peel Test Outcome
0	2.16	97.5	10 (held at 2.16 Torr w/o plasma)	15	Fail
30	2.16	97.5	5	15	Fail
30	2.16	97.5	10	15	Fail
30	2.16	97.5	30	15	Pass
30	2.16	97.5	120	15	Pass
30	2.16	97.5	300	15	Pass
30	0.70	47.5	5	15	Pass
30	0.70	47.5	10	15	Pass
30	0.70	47.5	120	15	Fail
60	2.16	97.5	10	15	Pass