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PDMS-Glass Bonding Protocol - Technics

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Keywords
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PDMS-Glass Bonding Protocol – Technics

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Critical factors:
Set O₂ pressure to 2.16 Torr
Set power to 30W
Plasma for 15s
Wait 20 minutes before testing bond

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Materials:
- Standard glass coverslides
- 20:1 PDMS disks (~10 mm tall, ~12 mm diameter)
  - 10 min sonication in 200 proof ethanol
  - 2x 60 mL rinse in MilliQ water
  - N₂(g) dried

Process Parameters:
- O₂ flow rate value “97.5” (bob between “100” and “95” markings)
- Vacuum (process valve) adjusted until pressure as reported on black box to the left of Technics reads 2.16 ± 0.02 Torr
- Power 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 empty 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 glass
- Apply gentle but uniform pressure to PDMS for 10s
  - Note: Extremely thin glass coverslips (#1-#2) will warp if excessive pressure is applied. Gently and uniformly distributed pressure is only necessary to ensure conformal contact of the glass/PDMS interface.
- Incubate PDMS on glass at RT 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 or glass.

Tested Parameter Results:

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Pressure (Torr)</th>
<th>O₂ Flow Rate “Value”</th>
<th>Treatment Duration (s)</th>
<th>Incubation Duration (min)</th>
<th>Peel Test Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>2.16</td>
<td>97.5</td>
<td>10 (held at 2.16 Torr w/o plasma)</td>
<td>15</td>
<td>Fail</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>2</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>5</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>10</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>15</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>30</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>60</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>120</td>
<td>15</td>
<td>Pass</td>
</tr>
<tr>
<td>30</td>
<td>2.16</td>
<td>97.5</td>
<td>300</td>
<td>15</td>
<td>Pass</td>
</tr>
</tbody>
</table>