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# Protocol

# Fabrication of flexible probes

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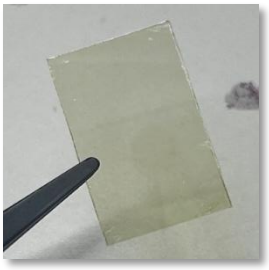
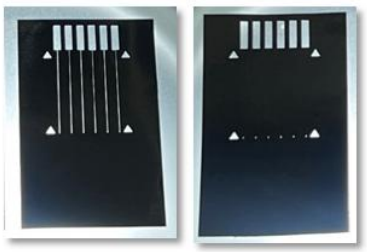
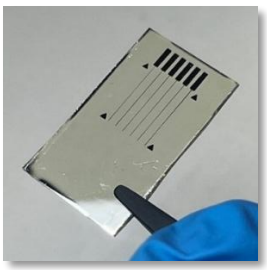
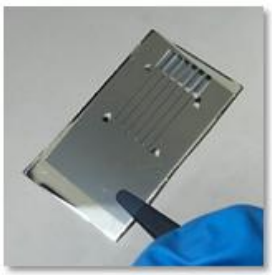
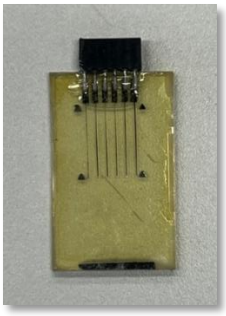
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**Fabrication of polyimide–based flexible microelectrodes**

| | |
|---|---|
| 1. Polyimide (PI) thin film preparation<br>• Spin coating of a thin layer of PI (PI-2610, HD MicroSystems) over a clean glass slide fragment: 4000 rpm for 30 s with an acceleration of 500 rpm/s.<br>• Soft bake in a hot plate: 120 °C for 2 min to evaporate solvent<br>• Curing: stepwise curing profile from 120 °C to 300 °C, with 5 min holds at every 25 °C increment |  |
| 2. Aluminium Stencil fabrication<br>A laser marker is used to fabricate a stencil over Al foil of 40 microns in thickness. Minimum line width obtained ~100 µm. Operating conditions:<br>• Mark loops: 3<br>• Speed: 180 mm/s<br>• Power: 70%<br>• Frequency: 20 kHz<br>• Laser On TC: 150 µs<br>• Laser Off TC: 150 µs |  |
| 3. Platinum sputter deposition<br>- Final Platinum thickness: 125 nm.<br>- Deposition parameters:<br>• Current: 35 mA<br>• Stage working distance: 70 mm<br>• Sample distance: 2 mm<br>• Stage tilt: 20°<br>• Rotation: 5 (speed/action)<br>- Vacuum conditions:<br>• Sputter vacuum: $1.0 \times 10^{-2}$ mbar<br>• Base vacuum: $2.0 \times 10^{-5}$ mbar |  |
| 4. Second application of a PI thin-film for passivation following conditions as in step 1 | |
| 5. Electrode contacts window opening.<br>Reactive ion etching (RIE) with an Al foil stencil hard mask is performed to expose the electrode active contact pads and external contacts.<br>- Etching parameters:<br>• RF power: 150 W<br>• Chamber pressure: 100 mTorr<br>• $O_2$ flow: 15 sccm |  |
| 6. Terminals for the device connection.<br>- The interdistance between the large contacts is selected to match the connector pins pitch of the selected terminal<br>- Conductive silver paste is used to fix the pins to the large contacts.<br>- A UV-cured resin is applied to protect and isolate the connection, and it is cured for 3 min under UV light<br><br>The finished probe can get separated from the glass base by immersion in water (20 - 50 ºC). |  |

**Materials:**

- Glass coverslips
- Diamond Tip Glass Cutter
- Polyimide
- Aluminium foil
- Platinum sputter target
- Electronic connector
- UV-curing resin
- UV lamp

**Techniques:**

- Laser writing
- Spin coating
- Sputtering
- Reactive ion etching