

Microfluidics Lithography 4: PDMS Microchannel Bonding on Glass

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Abstract



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Before start

This protocol is derived from "soft lithography" literature and can be modified by user freely.

Protocol

PDMS microchannel is ready

1. PDMS is cut with a razor blade and carefully removed from the wafer of SU8 mold.

Inlet and outlet points are visible by mold so the holes are formed by puncher 1mm, 1.5mm, 2mm punchers. These size or wider holes can be chosen regarding experimental needs.

After removal, the PDMS film is directly washed with isopropanol and then dried with nitrogen.

Oxygen Plasma Exposure

2. PDMS is placed inside the dessicator in a microwave.

Glass microscope slide is placed inside the dessicator in a microwave without touching the PDMS film. Glass petri dishes and/or glass cell flasks can also be used for PDMS bonding if their size is usable inside dessicator.

The lid of dessicator is closed.

The vacuum pump is run for 1-2 minutes to remove air inside the dessicator and to secure low vacuum level. Then the microwave is turned on for 5-6 seconds after purple oxygen plasma waves are generated inside dessicator.

The plasma exposed PDMS is put on plasma exposed glass and both will bond by themselves.

* Warning #1

There are standard oxygen plasma devices commercially available. We are using a home-made oxygen plasma generator modified from a kitchen microwave oven.

A kitchen type microwave oven is modified by including a dessicator inside and opening appropriate holes for vacuum tubing. Also in order to form vacuum inside dessicator, appropriate tubing is connected with a vacuum pump.

Please, do not try to make a similar modification yourself if you are not expert on electronic devices.

Do not use any kind of metal inside microwave oven when it is on or off.

*Warning #2

The purple plasma waves should not touch PDMS otherwise it burns.

*Warning #3

The duration of plasma exposure depends on the power of plasma, volume of dessicator, size of PDMS film and etc. So an optimisation step is required for all different setups. If the duration of plasma exposure is too low the the surfaces of PDMS and glass will not be clean enough to be bonded. On the other hands, if the plasma exposure time is long, the surface of PDMS will be scorched and will not bond on glass again.

Final heating and ready

3. The final chip is heated at 120-150°C for 10-20 minutes on a heating plate.

***Warning #4**

Do not forget to cool down before use.

Stock of PDMS chips

4. The prepared chips can be stored at room temperature inside a closed box and be used anytime.

***Warning #5**

If the PDMS chips are left uncovered, dust on air will stick on it very soon.

Warnings

- * All the related steps must be done in a clean room classD (minimum) with appropriate clothing.
- * All oxygen plasma generation procedures must be performed carefully and not alone.
- * Please learn well about the hazards of oxygen plasma devices and PDMS material.