



Version 2

Aug 22, 2021

Microfluidics 5: PDMS Microchannel Bonding on Glass/PDMS V.2

Serhat Sevl¹, C. Yunus Sahan¹¹Nehir Biyoteknoloji Ltd. www.nehirbt.com

1 Works for me

Share

dx.doi.org/10.17504/protocols.io.bxkhpkt6**NehirBT**
Tech. support email: bilgi@nehirbt.com.tr

Serhat S

ABSTRACT

Microfluidic chips, made of PDMS, are one-side open when fabricated. Another layer of glass, PDMS, or etc is needed. Liquid seal is provided by complete covalent bonding between layers or by external forces like threads, magnets or similar factors. This protocol describes the covalent bonding of PDMS on glass by air plasma technique.

DOI

dx.doi.org/10.17504/protocols.io.bxkhpkt6

PROTOCOL CITATION

Serhat Sevl, C. Yunus Sahan 2021. Microfluidics 5: PDMS Microchannel Bonding on Glass/PDMS.

protocols.io<https://dx.doi.org/10.17504/protocols.io.bxkhpkt6>

Version created by Serhat S

KEYWORDS

microfluidics, PDMS, oxygen plasma

LICENSE

———— This is an open access protocol distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited

CREATED

Aug 21, 2021

LAST MODIFIED

Aug 22, 2021

PROTOCOL INTEGER ID

52585

MATERIALS TEXT

Glass slide; Standard sizes microscope glass preferably Marienfeld Microscope Slides 1000000
PDMS material; Dow Corning, Sylgard 184

SAFETY 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 plasma devices and PDMS material.

BEFORE STARTING

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

Cured PDMS manufactured at previous steps using lithography or 3D printed molds are cut or removed from the mold^{10m} and put inside a clean petri dish. Since PDMS is vulnerable to surface adsorption of dust, each must be clean and performed inside cleanroom facilities.

NehirBT's air plasma generator is a homemade setup of microwave instrument in which there is a glass vacuum desiccator.

PDMS microchannels can be bonded on a glass microscope slide, glass petri dish, or another PDMS layer according to the necessities of the application.

The glass and PDMS materials are placed inside the desiccator inside the plasma generator system without touching each other. Glass Petri dishes and/or glass cell flasks can also be used for PDMS bonding when their sizes fit inside the desiccator.

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

The plasma exposed PDMS layer is put on plasma exposed other glass or PDMS layer and both will bond permanently with covalent bonding.



There are standard oxygen plasma devices commercially available. We are using a homemade air plasma generator modified from a microwave oven which is modified by including a desiccator inside and opening appropriate holes for vacuum tubing. Also in order to form a vacuum inside the desiccator, appropriate tubing is connected with the vacuum pump.

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



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

The purple plasma waves inside the instrument must not touch PDMS otherwise PDMS burns and bonding is not possible.



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

Oxygen/Air Plasma

custom-made microwave incl. glass vacuum chamber

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

25m



Do not forget to cool down the final chip product before touching and using it.

Hot Plate

Electromag LB.EM.M4060

The prepared chips can be stored at room temperature inside a closed clean box or petri dish after sealing the top and down of channels with scotch tape and they can be used anytime.



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