

Microfluidics Lithography 6: High Microchannel Thickness (500 μm)

Seyfullah Yilmaz, C. Yunus Sahan, Serhat Sevli

Abstract



Nehir Biyoteknoloji Ltd. www.nehirbt.com

This protocol describes the extreme high height microfluidic channel fabrication. In this case the height of the channels is 500 μm and this required some modifications on the previous protocol.

Citation: Seyfullah Yilmaz, C. Yunus Sahan, Serhat Sevli Microfluidics Lithography 6: High Microchannel Thickness (500 μm). **protocols.io**

[dx.doi.org/10.17504/protocols.io.g9tbz6n](https://doi.org/10.17504/protocols.io.g9tbz6n)

Published: 04 Mar 2017

Before start

This protocol is derived from

[Reference: Processing guidelines for permanent epoxy negative photoresist SU8 2025, SU8 2035, SU8 2050 and SU8 2075, MicroChem company]

Protocol

SpinCoater Instrument adjustment

Step 1.

Dispense 1ml of resist (SU8 2050) for each inch (25mm) of substrate diameter.

Spin at 500 rpm for 10 seconds with acceleration of 100 rpm/second.

Spin at 1000 rpm for 30 seconds with acceleration of 300 rpm/second.

Expected results:

170 μm film thickness with 1000 rpm spin of SU8 2050

Run the spin coater

Step 2.

Place the wafer in the spin coater and run the device

Microscope slides, Si/SiO₂ wafers and glass/PMMA wafers are alternatives

Soft baking of SU8 coated wafer

Step 3.

Soft Baking should be done regarding the thickness of the SU8 film.

For 170 micron thickness; 30 minutes of baking at 40°C, 7 minutes of baking at 65 °C and followed by 30 minutes of baking at 95 °C are applied.

Reaching 500 μm thickness of SU8 film

Step 4.

The above 4 steps are repeated 2 more times on the previous film.

Three times spin coating over and over provides required height as assumed thickness at each repeat gives the same.

To use the SU8 coated wafer later

Step 5.

Put the wafer in a petri plate and cover with aluminium foil.

This can be used in a month.

Continue with UV exposure

Step 6.

Most of the microfluidics laboratories use mask aligners for patterned UV exposure on photoresist coated wafers.

NehirBT uses maskless UV laser lithography device made by local friend companies.

For high thickness, the laser power is increased +1mA.

* Expected result:

By current application, the minimum feature size becomes one-third of the photoresist thickness.

Post UV exposure baking

Step 7.

Post exposure baking is done depending on the thickness of the film.

Wafer is heated on heater plate device.

Our maskless lithography technique takes some time for UV exposing all structures so during this time the SU8 coating intrinsically.

For 500 micron thickness; 1 minute of baking at 65°C and 3 minutes of baking at 95°C are applied and observed as enough.

*Warning

For those who uses mask aligner during UV exposure should apply longer time at 95°C and optimize according to their design.

***Warning**

Longer durations of baking causes lift-off of SU8 mold during or after development process.

SU8 mold development process

Step 8.

Wafer is left to cool down for a few seconds and then developed with SU-8 developer chemical. Development is performed at room temperature inside foom hood and within a suitable glass plate.

For 500 micron thickness; SU8 mold development time is more than 2 hours. During longer duration, the microchannel structures should be observed or the wafer should be kept longer.

If the design has well or pit like structures, the developer chemical must be flushed inside these structures by pipetting. Otherwise, SU8 remains inside these well or pit like structures and midevelopment occurs.

* Reagent

NehirBT prefers 'Propylene glycol methyl ether acetate' as SU8 mold development chemical.

*Warning

Please learn well about the hazards of SU8 development chemicals.

Washing

Step 9.

Wafer is washed with isopropanol and then dried with nitrogen gas.

Wafer is heated at 95°C for 10 minutes and then left to cool down for a few seconds.

Microfluidics mold is ready for PDMS chip preparation; put in petri dish and label by all appropriate information.

Warnings

- * All the related steps must be done in a clean room classD (minimum) and under yellow or red light.
- * All spin coating procedures must be performed inside the fume hood.
- * Please learn well about the hazards of SU8 and SU8 development chemicals.