



Negative Photolithography Process Procedure with SU- 8-100 -Tight Spacing (50 μm - μm 100)

Lithography consists of the following basic steps: **Substrate Preparation**, applying the **photoresist coat**, **soft-baking**, **exposing to UV light**, **post-exposure baking**, and **development**.

1. Prepare Substrate

I. Simple Cleaning

- a. Clean all equipments (wafer holders, tweezers, etc) with acetone to avoid wafer contamination.
- b. Clean the substrate with **diluted detergent** in ultrasonic bath.
- c. Clean the substrate with DI water, followed by IPA(Isopropyl alcohol)
- d. Clean the surface of the substrate with **Acetone**.
- e. Thoroughly scrub the surface of the substrate with a swab.
- f. Again rinse well the wafer with **IPA** (Isopropyl alcohol).
- g. Blow **dry the wafer** with N_2 gun if available.

II. Dehydration Bake

For silicon and glass substrates,

- a. Preheat the oven/hot plate to a required initial temperature [*about 65° C*]
- b. Transfer the substrate using acetone treated tweezers.
- c. Dehydrate the substrate for 5 minute on the hot plate or in oven.
- d. Remove the substrate using tweezers and keep it until it cools down.

For PET (**polyethylene terephthalate**) substrate,

- a. Preheat the oven to a required initial temperature [*about 45° C*]
- b. Transfer substrate using acetone treated tweezers.
- c. Dehydrate the substrate for 2 hours in oven.
- d. Remove the substrate using tweezers and let it cool down.

2. Photoresist Coating

- a. Mount the substrate on the Spinner and apply suction via vacuum pump.
- b. Determine the required spin speed and time with respect to film thickness from the spin curves or Microchem's Process Parameters Tables.
- c. Set the spinner at that speed with acceleration equal to the speed/second (no ramping). This might need to be modified (resist dependent).
[Just for the First test, Set the speed to 100RPM with acceleration = 1 and run it for 30 seconds, and then change the setting to 2000 RPM and run it for 45 seconds].
- d. Apply a quarter sized puddle of photoresist to wafer all at once. Multiple drops may permit air trap and decrease feature quality. For SU8-100 (height>50 μm), you may want to use (0.1% to 0.5 %) photo-initiator to enable deeper UV light penetration. Note: Photo-initiator reduces the viscosity of SU-8 100.
- e. Spin
- f. Clean the spinner when done.

3. Soft-bake

- a. Determine the soft-bake temperature from Michrochem's Process curves or Parameters Tables. *[15 minutes at about 65°C to 95°C with gradual ramp up for the first stage baking].*
- b. Continue keeping it on the hotplate/oven for *10 minutes at 95° C.*
- c. Keep the substrate on the hotplate/oven and turn-off heating to allow gradual cooling to room temperature (usually 10-15 minutes).

4. Expose

Turn ON the UV source; it takes 5 to 10 minutes to warm up

I. Clean Mask

- i. Place the mask in the mask cleaning holder.
- ii. Rinse the mask with **IPA** and DI Water.
- iii. Dry mask with Air Blow Gun.

II. Expose

- i. Determine the exposure dose from the swing curve for the photoresist (or from the Process Parameters Tables).
- ii. Measure the light intensity of the UV source (*~7 mW/second*).
- iii. Calculate the exposure time (Exposure dose / Measured Intensity)
- iv. Place the substrate on the mask aligner and apply suction/vacuum.
- v. Then place the mask on top of the wafer and align it at the desired direction with the help of microscope.
- vi. Slide the mask aligner setup to the UV source for exposure.
- vii. Set the exposure timer and press expose. *[Exposure time = 40 sec.]*
- viii. Take out the wafer and move to post exposure baking.

Caution: Avoid looking at the UV light directly while exposing the wafer.

5. Post Exposure Bake

- a. Determine and set the bake temperature from the curves or Process Parameters Tables. *[bake it for 30 minute at 65 °C to 120 °C and keep baking on 120 °C for 10 minutes]*
- b. Place the substrate on the hotplate, start timing.
- c. When the time is up, remove the substrate and cool it down.

6. Development

- a. Get enough developer solution for the substrate. (25 ml for 1 cm X 1cm substrate)
- b. Determine the required development time from the curves or Process Parameters Table and then set the wet bench timer.
- c. Start the timer. Place the substrate in the developer bath (using the wafer holder/tweezers) agitate gently. *[Development time is ~ 2 minutes]*
- d. Remove the wafer from the developer bath and rinse it in IPA solution or DI water bath for 30 seconds (using the wafer holder or tweezers).
- e. Place the wafer on a clean room wipe. Blow dry with Air gun.
- f. Dry the wafer holder.

Optional: Bake the wafer at 65°C for 2 minutes.

Imaging: Place the wafer under the microscope or SEM and visualize the features.

Please feel free to contact us for your information inquiries or concerning any comments and recommendations that could improve feature quality by photolithography process.

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