

Positive Photolithography Process Procedure with Shipley's 1813

Lithography consists of the following basic steps: **Wafer preparation, photo resist Coating, soft baking, exposing to UV light, post-exposure baking, and developing.**

1. Prepare Wafer

I. Simple Cleaning

To remove contaminants from the wafer surface.

- a. Clean all equipment (wafer holders, tweezers, etc.) with acetone to avoid wafer contamination.
- b. Cover the surface of the wafer with **acetone**.
- c. Thoroughly scrub the surface of the wafer with a swab.
- d. Rinse the wafer well with **IPA** (Isopropyl alcohol).
- e. Blow **dry the wafer** with N₂ gun if available.

II. Dehydration Bake

- a. Preheat the oven/hot plate to a required initial temperature *[about 65° C]*.
- b. Transfer wafers to a wafer carrier using acetone treated tweezers.
- c. Dehydrate the wafers for 1 minute on the hot plate or in the oven.
- d. Remove the wafer carrier from the oven using tweezers and keep it out until it cools down.

2. Photoresist Coat

- a. Mount the wafer on the spinner and apply suction via a vacuum pump.
- b. Determine the required spin speed and time with respect to film thickness from the spin curves or process parameters tables.
- c. Set the spinner to spin at the proper speed with acceleration equal to the speed/second (no ramping). This might need to be modified (resist dependent).
[As an example, for only the first test: Set the speed to 100 RPM with acceleration = 1 and run it for 10 seconds, then gradually increase the setting to 800 RPM with acceleration = 5 and run it for 30 seconds]
- d. Apply a quarter sized puddle of photo resist to the wafer all at once. Multiple drops may trap air bubbles which can decrease feature quality.
- e. Spin.
- f. Clean the spinner when done.

3. Soft bake

- a. Determine the soft bake temperature from the process curves or parameters tables *[4 minutes at about 65° C for the first stage backing]*.
- b. Remove the wafer and let it cool down for about 4 minutes.

4. Expose

Turn ON the UV source and let it warm up for 5 to 10 minutes.

I. Clean Mask

- a. Place the mask in the mask cleaning holder.
- b. Apply **acetone** to the chrome surface. Do not allow the mask to dry with acetone on it.
- c. Scrub the chrome surface with a swab.
- d. Rinse the mask with **IPA** and dry it.

II. Expose Wafer

- a. Determine the exposure dose from the swing curve for the photo resist (or from the process parameters tables).
- b. Measure the light intensity of the UV source (~23 mW/second).
- c. Calculate the exposure time (exposure dose / measured intensity).
- d. Place the wafer on the mask aligner and apply suction through a vacuum.
- e. Place the mask on top of the wafer and align it in the desired direction using the assistance of a microscope.
- f. Slide the mask aligner setup to the UV source for exposure.
- g. Set the exposure timer and press expose [*exposure time = 50 sec.*].

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

5. Develop

- a. Get enough developer for the wafer [*Microposit 351 Developer : Water = 1 : 5*]
- b. Determine the required development time from the curves or process parameters table and then set the wet bench timer.
- c. Start the timer when the wafer is placed in the developer bath.
- d. Use a wafer holder or tweezers to maneuver the wafer and agitate gently [*Development time is ~ 2 minutes*].
- e. Remove the wafer from the developer bath and rinse it in DI water bath for 30 seconds using the wafer holder or tweezers.
- f. Place the wafer on a clean room wipe and blow dry with N₂ gun.
- g. Dehydrate the wafer at 50°C for 1 minute

Imaging: View the wafer with an optical microscope or scanning electron microscope (SEM) to visualize the features.

Please feel free to contact us for inquiries concerning Positive photolithography process.

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