PHOTORESIST DEVELOPMENT AND REMOVAL SOP

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This SOP is designed to help with processing your wafer after exposing positive photoresists in the mask aligner. This is only applicable for resist that develop in MF319 (all Shipley and SPR resists). For other photoresist (AZ and SU8) consult the staff for development procedures. For most photoresists, you will see a shadow of the mask visible in the photoresist once you take it out of the aligner. This usually means it was properly exposed. Your next step will be to move on the developer station where we will remove the exposed resist and examine the wafer to see how well the photolithography process went.

Unfortunately, there are an incredible number of things that can commonly go wrong during the photolithography process and will require you to start over. These problems can occur both before or after exposure. This SOP will also cover how to remove all of the photoresist (called stripping) so that you can restart the procedure. Some common problems that you may encounter that will require stripping and reprocessing your wafer: photoresist under or over exposed, photoresist under baked, photoresist not adhering to the surface, bubbles in the photoresist, scratched photoresist, or under or over developed photoresist.

Photoresist Development

1. Locate the development hood in the photolithography bay.
2. Find a glass tray and the bottle of MF319 in the hood. You will need to put a small amount of MF319 in the glass tray. You need only enough so that your wafer will submerge when you place it in the bath.
3. Immerse the wafer into the bath. You should keep the developer agitated by rocking the tray back and forth gently during the process. Most resists are designed to take 1 minute to develop, but make sure that the exposed area of your wafer has stopped changing color before you remove it from the developer.
4. After development is complete, put your wafer inside a wafer holder on the bench and drop it into the **Quick-Dump-Rinse (QDR)**.
5. Place the wafer carrier in **Spin-Rinse-Dryer (SRD)** and press **START**.
6. After completion of the cycle inspect your wafer and if development is incomplete repeat Steps 3 through 5.

Tips and Advices

Under Developed	Over Exposed	Under Exposed	Over Developed
Foggy or rainbow colors in areas that are supposed to be clear of resist	Notching on square corners Bulging in square pits	Foggy or rainbow colors in areas that are supposed to be clear of resist	Rounding of square corners Small features <1micron
Try developing for another couple of seconds If no improvement see under exposure	Decrease exposure time for next wafer	Increase exposure time for next wafer	Decrease developing time for next wafer

7. Perform a post-develop bake or hardbake. This will improve the resist's wet and dry etch resistance by further removing solvents from the developing process and hardening the resist. It is the same procedure as a soft bake, just done after development and usually for 5 minutes.

Photoresist Stripping

This covers resist stripping using a **NMP bath**. If you do not want to use wet chemicals, then you should probably use an oxygen plasma in either the **March RIE** or the **Trion Metal Etcher**. Consult those SOPs for their operation.

Procedure (Wet Strip):

1. Locate the NMP bath in the Lithography Bay. It is on the solvent bench next to the developer bench
2. Place the silicon wafer inside one of the wafer boats located on the Wet Bench.
3. Immerse the wafer boat into the bath and use an egg timer to keep the wafer boat in the solution for at least 5 minutes.
4. When the timer is up, dip the wafer boat into and out of the bath several times to help ensure all the photoresist is removed.
5. Move the wafer boat to the **Quick Dry Rinse (QDR)** and activate it. This bath will automatically rinse the wafer.
6. Use the Nitrogen gun to blow dry the wafer after it has been washed.
7. For many applications, it is recommended to move to the **Spin-Rinse Dryer (SRD)** to ensure a properly cleaned wafer.