SOP of Lithography process

Operating Steps

1. Before process

- o Wear the Mask, Chemical Resist Gown, hand gloves, Safety shoes and Eyewear before starting the process.

- o Maintain the laboratory humidity between 40-50 during process

- o Clean all the Petri dishes with DI water before using it.

- o Clean the Spin coater with Acetone before and after the use.

2. **Chemical required**.

- o 2%HF
*The **HF is dangerous** so handle with care. Concentrated **HF** (liquid or vapor) **can cause severe burns**, electrolyte imbalance, pulmonary edema, and life threatening cardiac arrhythmias*

Note: In case of HF is exposed to the skin then hold that part under running water and apply 'Calcium Gluconate' which is available in lab.

- o PPR (Positive Photo Resist)

- o Developer (MF-319)

- o IPA

- o ACETONE

- o TMAH (Tetramethylammonium Hydroxide)

Lithography Setup

Spin Coating PPR
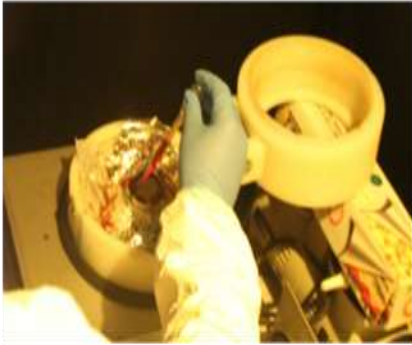
Hot Plate

UV Lamp

3. **Process**

- Connect the Vacuum and GN2 lines of Spin coater. Put Al foil on the inner sides of the spin coater to prevent its contact with the PPR while spinning.
- Wafer cleaning: Rinse the wafer in DI water Dry with the Nitrogen gun, and then spin it at 3000 rpm for 30 sec
- Dehydration: Keep the wafer on hotplate @ 90°C for 10 min.

1. **Switch off the white light and run the further process in yellow light**

- Spin coat: Coat PPR using dropper remove the bubble present on the surface of the sample with the help of dropper. Spin at 3000 rpm for 30 sec and 1000 rpm for 10 sec.
- Pre bake: After spinning pre bake the sample on hotplate @ 90°C for 5 min.
- UV exposure with photo mask: Keep the sample on 'sample holder' of UV lamp. Align the mask and keep it for the UV exposure for 2 min and 30 sec.
- Developing: Develop the sample in MF319 (Desired patterns should be visible on sample.)


2. **Processes in 'fume hood'**

- Switch on the exhaust fan of Fume hood.
- Keep DI water running throughout the process
- HF dip: Dip the developed sample in the HF for 1 min (40 ml of DI water and 4 ml of 2% HF solution) to remove the oxide in (**'Teflon Petri dish'**)
- Dip the sample in DI water after HF dip to remove HF residue
- Remove the PPR from the sample using Acetone (in Petri dish)
- Clean the sample in IPA (in Petri dish)
- Clean the sample with DI water again (in Petri dish)
- TMAH etching at 95°c for the 6 min (using hotplate)
- Clean the sample in DI water.
- Dry with Nitrogen Gun.

Patterned Oxide
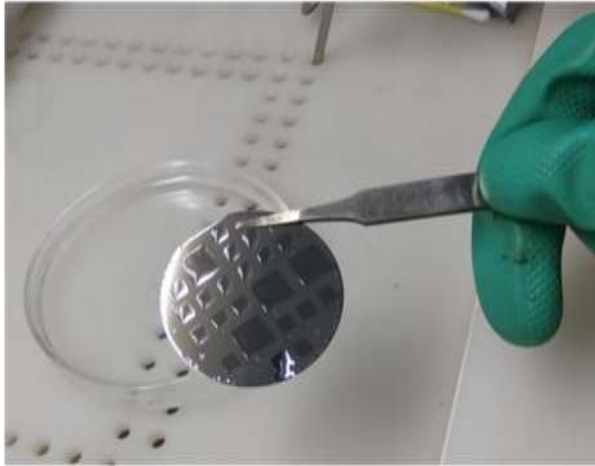
Selectively etching oxide

TMAH Etching
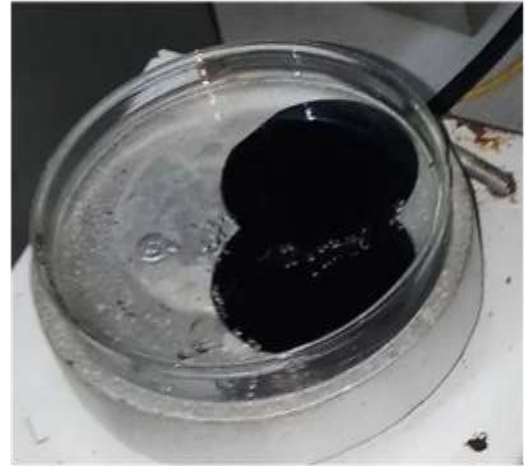
For isolating patterns(or p-n junctions)

3. Post Process

- Keep all the Litho processed wafer in wafer box and then keep it in desiccators.
- Switch On the all normal lights and switch OFF Yellow light.
- Switch OFF Hotplate, Spin coater and UV lamps mains supply.
- Wait for cooling of TMAH solution and then removed in the used TMAH bottle.
- Remove all the chemicals with their respective used chemical labeled bottles / cans.
- At the end of each process add some acetone to clean the spinner chuck, surrounded area of spinner and then wipe with lint free cloth.
- Wash all the Petri dishes with DI water.
- Switch OFF fume hood exhaust fan.

4. Troubleshooting

1. If the spinner is blocked and not holding the sample then pour Acetone to remove the older PPR residual from the chuck of spinner.

2. If patterns are not developed properly it is better to discard PPR and use new PPR. (PPR is usually about a year old)
3. While doing 'TMAH etching' if the bubbles are not coming then check the temperature of Hotplate.
4. If the TMAH is older, then Silicon will not get etched. TMAH will not etch P+ wafers. The Etching rate of Silicon in TMAH is 200nm per minute. The Silicon etching can be measured with the weight loss of wafer and the area of wafer.

5. To avoid white patches and dirt on the sample after 'TMAH etching' follow the process
   a. Do not expose the sample directly to the air.
   b. Around 80% of TMAH should be taken out in to another Petri-dish which can be reuse for another sample.
   c. Pour DI water over the Petri-dish which has 20% of residue TMAH and sample.