

RCA WAFER CLEAN SOP

Revised April 2020

Purpose: To remove all foreign matter from the surface of the silicon wafers (dust, oil, silicon dust, etc.) prior to processing. This procedure entails the use of three solutions, of which, two contain hydrogen peroxide (H_2O_2) to remove residual organic, ionic and metallic contamination left behind by conventional solvents and a BOE cleaning procedure. All solutions should be prepared fresh for each use.

Location to perform process: RCA Wet Bench in the Wet Etch Bay

CHEMICALS AND SUPPLIES

- Buffered Oxide Etch (BOE) 6:1 or 40:1 in DI:HF
- Hydrochloric Acid (HCL) 30%
- Hydrogen Peroxide (H_2O_2) 30%
- Ammonium Hydroxide (NH_4OH) 25%
- DI Water

IMPORTANT: It is important to use RCA cleaned PEEK wafer tweezers to prevent contamination of your wafers during and after the cleaning process. Also, only use the RCA cleaned slingshots to transfer the wafer cassette to all baths, quick-dump-rinses (QDR) and the spin-rinse-dryer (SRD). **DO NOT** touch the wafer cassette or wafers with your gloved hands. Tweezers, cassette and sling shot are typically stored in the black box at the back left of the RCA hood.

GENERAL INSTRUCTIONS AND PRECAUTIONS:

1. Use only wafer carriers labeled for RCA cleaning.
2. Wear all protective gear (gloves, face shield and apron) when mixing and handling the chemicals described below. **Use orange gloves that are specific to RCA bench.** These will be found below the bench. If none are found, then use a new pair and store them below the bench after use. The strong acids (BOE, HCl), base (NH_4OH) and hydrogen peroxide (H_2O_2) in their concentrated forms can produce severe burns. **HANDLE WITH CARE** and mix all solutions at the RCA wet bench. Take particular precautions with BOE or HF solutions. In dilute form, HF can still cause severe burning.

NOTE: NEVER MIX AN ACID AND A SOLVENT!

3. Pour chemicals slowly. Make sure you have the right chemicals.

NOTE: ALWAYS POUR ACID INTO WATER, NEVER WATER INTO ACID.

4. Both hydrogen peroxide solutions will decompose after 1 hour evolving large quantities of gas even when cold. Mix these solutions fresh before each use and do so only at the wet bench. **DO NOT STORE** mixed chemicals in the hood since they have an extremely short life (less than 1 day at room temperature and less than 30 minutes at elevated temperatures which they are used). Once the process is completed dispose of the mixed RCA baths by draining the baths followed by a DI rinse with the DI gun.

PROCEDURE

NOTE: Don't forget to login into your FOM account and login to your session to use the tool.

1. It is important that your wafers are reasonably clean before proceeding with the RCA clean. Removal of fingerprints and other items must be performed using other processes that are not described in this SOP (i.e. NMP bath, use of solvents, Piranha clean or oxygen plasma clean.) Please refer the MNTC staff for information regarding these other processes.
2. **RCA1 is used to remove organic contamination:** Prepare a fresh solution of $\text{H}_2\text{O}/\text{NH}_4\text{OH}/\text{H}_2\text{O}_2$ (6:1:1) as labeled on the top of the RCA1 bath and heat the solution to 70°C . The solution volumes are 4500 mL of DI water+750 mL of NH_4OH +750 mL of H_2O_2 . When you have achieved this temperature place your substrate in the RCA1 bath for 10 minutes.
3. Rinse your substrate in the QDR.
4. **Dilute BOE:** In order to remove the thin oxide layer developed during the "ammonia - peroxide" cleaning procedure, place your substrate in the second bath of DI/BOE (40:1) for 10 minutes. If premixed 40:1 BOE is not available, fill the bath with 5.1l of deionized water and then add 0.9l of 6:1 BOE. The surface of the wafers should become uniformly hydrophobic. Perform the water break test to verify that the substrate is hydrophobic.
5. Rinse your substrate in the QDR.
6. **RCA2 is used to remove ionic and metallic contamination:** Prepare a fresh solution of $\text{H}_2\text{O}/\text{HCl}/\text{H}_2\text{O}_2$ (6:1:1) as labeled on the top of the RCA2 bath and heat the solution to 70°C . The solution volumes are 4500 mL of DI water+750 mL of HCl +750 mL of H_2O_2 . When you have achieved this temperature place your substrate in the RCA2 bath for 10 minutes.
7. Rinse your substrate in the QDR. Perform the water-break test and verify the wafer surfaces again are hydrophilic.
8. Using the horizontal slingshot for the wafer cassette place the wafer carrier in upper SRD (spin rinse dryer) and press **START**.
9. Remove the carrier after the cycle is complete.
10. Make sure you clean up the bench and put everything back where you found it.
11. Logout from the bench in your FOM account.