RCA WAFFER CLEAN SOP

June 2013

Purpose: To remove all foreign matter from the surface of the silicon wafers (dirt, scum, silicon dust, etc.) prior to processing. This procedure entails the use of three solutions, of which, two contain hydrogen peroxide (H$_2$O$_2$) to remove residual organic, ionic and metallic contamination left behind by conventional solvents and a BOE cleaning procedure.

Location to perform process: RCA Wet Bench

Chemicals and Supplies:

- Buffered Oxide Etch (BOE)
- Hydrochloric Acid (HCL)
- Hydrogen Peroxide (H$_2$O$_2$)
- Ammonium Hydroxide (NH$_4$OH)
- DI Water

!!! It is important to use RCA cleaned non-metal wafer tweezers to prevent contamination of your wafers during and after the cleaning process. Also, only use the RCA clean 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 with your gloved hands !!!

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. The strong acids (BOE, HCl), base (NH$_4$OH) and hydrogen peroxide (H$_2$O$_2$) 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.
3. NEVER MIX AN ACID AND A SOLVENT!
4. Pour chemicals slowly. Make sure you have the right chemicals. ALWAYS POUR ACID INTO WATER, NEVER WATER INTO ACID.
5. NEVER heat acetone or any other solvent on the same hot plate with a peroxide solution. The heated solvent produces a vapor that will burn readily while the peroxide provides copious quantities of oxygen - a situation ready for an explosion or fire.
6. 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:

1. If fingerprints or other heavy residue appears on the wafer surface, swab it clean with a Q-tip dipped in methanol. (This step can be omitted with new wafers.)

2. On the solvent bench immerse your wafer in acetone for 3 minutes.

3. On the solvent bench immerse your wafer in methanol for 3 minutes. This rinse removes the acetone residue.

4. Do not allow the methanol to dry and rinse in the QDR.

5. **RCA1 is used to remove organic contamination.**

   Prepare a fresh solution of H₂O/NH₄OH/H₂O₂ (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 NH₄OH+750 mL of H₂O₂. When you have achieved this temperature place your substrate in the RCA1 bath for 10 minutes.

6. Rinse your substrate in the QDR.

7. In order to remove the thin oxide layer grown during the "ammonia - peroxide" cleaning procedure, place your substrate in the second bath of DI/BOE (40:1) for 10 minutes. Perform the water break test to verify that the substrate is hydrophobic.

8. Rinse your substrate in the QDR.

9. **RCA2 is used to remove ionic and metallic contamination.**

   Prepare a fresh solution of H₂O/HCl/H₂O₂ (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 H₂O₂. When you have achieved this temperature place your substrate in the RCA2 bath for 10 minutes.

10. Rinse your substrate in the QDR. Perform the water-break test and verify the wafer surfaces again are hydrophilic.

11. Using the horizontal slingshot for the wafer cassette place the wafer carrier in upper SRD and press **START**.

12. Remove the carrier after the cycle is complete.