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Wetbench #5 – RCA Cleaning Procedure

Standard Operating Procedure

Revision: 3.0 — Last Updated: Feb.23./2018, Revised by Grace Li

Overview

This document will provide a detailed operation procedure of the RCA Wet Bench. Formal Training is required for all users prior to using the system.

Revision History

#	Revised by:	Date	Modification
1	Grace Li	11/30/2011	Initial release
2	Grace Li	09/07/2012	Update
3	Grace Li	02/08/2018	Update PPE
4			
5			

Document No. 4DSOP000X

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General Information

Rules to Work on this Bench

- **PPE** Request in this Bench*:*

  Wear double gloves and the third layer of Green Nitrile gloves, apron, goggles and full-face shield when work on RCA clean (show as this picture)

- Only 1 user permitted on a bench when RCA work is in progress
- When Bench #2 is busy, and RCA bench (#5) is available, acid and base work can be used on this bench (#5)
- After done your work, remove apron, face shield, green Nitrile gloves (rinse and bake to the original place).
- Remove the outer glove layer when gloves are noticeably contaminated, when moving from one wet bench room to another, or when finished working on the wet benches

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RCA Cleaning

The Standard RCA Clean consists of the following main processes with rinses in between:

1. RCA-1 Clean: Removal of insoluble organic contaminants from the surface of the wafer.
2. Oxide Strip: Removal of a the native oxide layer and any oxidized hydrocarbons from step 1
3. RCA-2 Clean: Removal of metal ion impurities from the wafer surface.

Bench Details

The RCA bench is located in the Clean Room in room 6060.5 (see Figure 1). The RCA clean is typically used as the first step in the device fabrication process. This bench is capable of handling individual wafers or full cassettes of 50 mm and 100 mm wafers. It contains the following features

- RCA-1 Tank: Quartz recirculating heated bath w/lid (H_2O, NH_4OH, H_2O_2).
- QD1 Tank: Dump Rinse w/lid (H_2O)
- HF Dip Tank: Teflon tank w/lid (H_2O, HF)
- RCA-2 Tank: Quartz recirculating heated bath w/lid (H_2O, HCl, H_2O_2).
- QD2 Tank: Dump Rinse w/lid (H_2O)
- N2 and DI spray guns
- DI sink

Restrictions

- Do NOT process wafers or substrates with metal on them
- Do NOT use metal tweezers
- Do NOT operate the system if the liquid level is too low in the tank
- Do not leave the glassware or chemicals on the bench after use
- Do not drain the tanks
- Do not touch the bench controls if the gloves have residual acid or solvent

Operation

Normally the system power and the tank controls are left ON at all times. If the system or tanks are shut down, please consult with staff prior to use.

Solution Preparation

A. Organic Clean solution (RCA-1) – H_2O:NH_4OH:H_2O_2 (5:1:1)

5.5 L DI water

1.1 L NH_4OH (27%)

1.1 L H_2O_2 (30%)

1. Add about 5.5 L of DI water to the RCA-1 Tank
2. Carefully add 1.1 L of NH_4OH to the RCA-1 Tank
3. Press HOLD on the control panel (see Figure 2) to begin heating the solution
4. Press PUMP on the control panel to begin recirculation
   - *Note: If the liquid level is too low and you hear air going through the pump, press PUMP again to stop pumping. Add more liquid prior to continuing.*
5. Wait for temperature to reach 75 °C (~40 min)
6. Add 1.1 L of H_2O_2 to the RCA-1 Tank
   - *Note: This step should be performed just prior to the RCA-1 clean.*

B. Oxide Strip solution – H_2O:HF (50:1)

4 L DI water

160 ml HF (49%)

1. Add 4 L DI H_2O to the HF Dip Tank
2. Slowly add 80 ml HF to the HF Dip Tank and keep it at room temperature.

C. Ionic Clean solution (RCA-2) – H_2O:HCl:H_2O_2 (6:1:1)

5.4 L DI water

900 ml HCl (37%)

900 ml H_2O_2 (30%)

1. Add about 5 L of DI water to the RCA-2 Tank

2. Carefully add 900 ml of HCl to the RCA-2 Tank
3. Press HOLD on the control panel (labeled with RECIRC T2) to begin heating the solution
4. Press PUMP on the control panel to begin recirculation
    - *Note: If the liquid level is too low and you hear air going through the pump, press PUMP again to stop pumping. Add more liquid prior to continuing.*
5. Wait for temperature to reach 75 °C (~40 min)
6. Add 900 mL of H_2O_2 to the RCA-2 Tank
    - *Note: This step should be performed just prior to the RCA-2 clean.*

Loading wafers

- Load the 50 mm or 100 mm wafers into a Teflon cassette
- Use the handle to hold the cassette (see Figure 3) and keep the handle ON at all times during cleaning

Cleaning Process

1. Wait for RCA-1 and RCA-2 baths to be at least 75 °C.
2. Ensure both QDR tanks are full of water.
3. Add the H_2O_2 to the RCA-1 bath and wait for temperature to reach at least 70 °C.
4. Place the wafer cassette in the RCA-1 tank (see Figure 4) for 10 minutes.
5. Transfer the wafers from the RCA-1 Tank to the QDR1 tank.
6. Press RUN on the QDR1 control panel (see Figure 5) and let them rinse for 3 cycles.
7. Dip the wafers in HF tank (2% HF) for 15 seconds.
8. Transfer the wafers from the HF Dip Tank to the QDR2 tank.
9. Press RUN on the QDR2 control panel, and let them rinse for 3 cycles.
10. Add the H_2O_2 to the RCA-2 bath and wait for temperature to reach at least 70 °C.
11. Add your wafers to RCA-2 tank for 10 minutes.
12. Transfer the wafers from the RCA-2 Tank to the QDR2 tank.
13. Press RUN on the QDR2 control panel, and let them rinse for 3 cycles.
14. Place wafers into SRD using the H-bar of the cassette (see Figure 6 and Figure 7) and then press start.

Notes: Add the H2O2 just prior to the cleaning steps. The cleaning action continues for about thirty minutes and can be used to clean more wafers. If the reaction of the bath slows or stops, more H_2O_2 needs to be added.

Pictures

Figure 1: Overall view of RCA wet bench.

Figure 2: Control panel for RCA-1 tank.

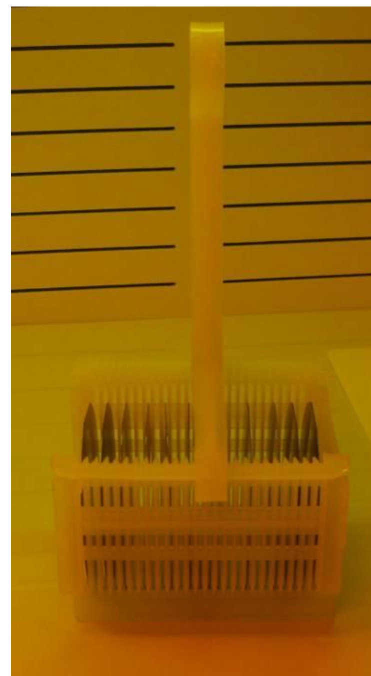

Figure 3: Wafer cassette and handle.

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Figure 4: Wafer cassette in RCA-1 tank.

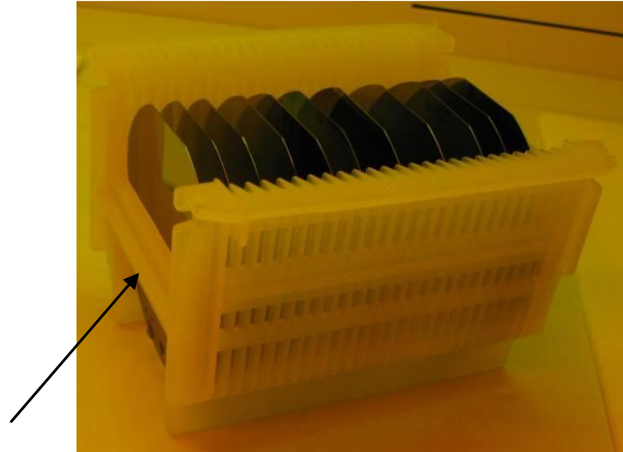

Figure 6: Wafer cassette with H-bar indicated.

Figure 5: Control panel for QDR 1.

Figure 7: Wafer cassette in SRD.

References and Files

LG System 5 ft. Polypro Wet Bench Manual and training notes.

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Contact Information

Questions or comments in regard to this document should be directed towards Grace Li (li@4dlabs.ca) in 4D LABS at Simon Fraser University, Burnaby, BC, Canada.