R·I·T Title: **Manual Processing Bench #2**

Semiconductor & Microsystems Fabrication Laboratory **Revision**: **C** **Rev Date: 08/05/2008**

Approved by:

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Process Engineer Equipment Engineer

1 SCOPE

The purpose of this document is to detail the use of the Manual Processing Bench #2 for wet cleaning of silicon wafers. All users are expected to have read and understood this document. It is not a substitute for in-person training on the system and is not sufficient to qualify a user on the system. Failure to follow guidelines in this document may result in loss of privileges.

2 REFERENCE DOCUMENTS

- Material Safety Data Sheets for any chemicals that are used.
- Safety Training.

3 DEFINITIONS

DI	-De-Ionized Water
H_2O_2	-Hydrogen Peroxide
H_2SO_4	-Sulfuric Acid
HCl	-Hydrochloric Acid
NH_4OH	-Ammonium Hydroxide
SC1	-First clean of the RCA process
SC2	-Second clean of the RCA process
HF	-Hydrofluoric Acid

4 TOOLS AND MATERIALS

4.1 General Description

4.1.1 The Hotpot is a general use tank intended for cleaning wafers in Piranha, SC1 and SC2. Decontamination cleans may be done in this bench for wafers that have been through KOH etching or CMP. The bench is set up with one quartz temperature controlled tank, a dual cascade and a sink. The remaining area is for general use.

4.2 Wafer Boats

4.2.1 Only Teflon wafer boats and handles should be used for processing on this bench.

5 SAFETY PRECAUTIONS

5.1 Personal Safety Hazards

5.1.1 The Manual Processing Bench uses several hazardous chemicals including HF, sulfuric acid, hydrogen peroxide, hydrochloric acid and ammonium hydroxide. Users should be aware of the unique hazards of the materials with which they are working. If a chemical is spilled, remove clothing and rinse affected area in safety shower for 15 minutes and inform SMFL staff member or lab instructor.

5.1.2 When working at the Manual Processing Bench, always use appropriate personal protective equipment (PPE) including apron, face shield and heavy rubber gloves.

5.1.3 The PPE should not be worn any place other than the immediate vicinity of the Manual Processing Bench. Do not walk away from bench while wearing PPE. If assistance is needed (i.e. to grab a Clean Wipe or timer, etc.), ask for assistance—do not get it while wearing PPE. Do not work at computer or answer the phone while wearing PPE. When finished at the Manual Processing Bench, rinse the PPE, fully dry it and return to hook.

5.1.4 It is imperative that all spills be cleaned up immediately because of the number and variety of materials used at this bench. Please see a staff member for assistance in cleaning up spills.

5.1.5 Keep sash down when processing chemicals.

5.2 Hazards to the Tool

5.2.1 *No metals or metal etchants* may be processed in the heated tank or rinse tank.

5.2.2 No solvents may be processed in the heated tank.

5.2.3 No HF, buffered oxide etch or pad etch may be used in the heated tank.

5.2.4 Never operate the heated tank without the proper fluid level.

5.2.5 Operate the bench controls with clean gloves only. The chemicals used will cause damage.

5.2.6 The tank is breakable, carefully place wafers in it and never bang a cassette on the side.

5.2.7 Do not drain chemicals that are hotter than 30C.

5.2.8 Chemicals must be drained as soon as they are cool or the o-ring can fail and cause a leak.

5.2.9 Do *not* spray the bench top with the sprayer hose.

6 INSTRUCTIONS

6.1 Initial State Check

6.1.1 Verify that there are sufficient amounts of the chemicals that you will need in the chemical storage cabinet. Sulfuric Acid is available from staff members.

6.1.2 Make sure that you have reserved the bench with the Tool Reservation System and that you have swiped in your card on the Card Swipe System.

6.2 Resetting the System

6.2.1 The temperature controller may be reset by cycling the power on and off.

6.3 Operating the Hotpot

6.3.1 On the lower right panel, turn on the **Bench Power Master Switch**.

6.3.2 Make sure that you are wearing safety glasses, a face shield, chemical gloves and a chemical apron.

6.3.3 To drain the old chemicals, wait until temperature is below 30C. Turn on the **Hotpot Drain**. Press and hold the **Water Flow Master Control** until you hear the tank start to drain. Rinse out the tanks with the sprayer and then drain the rinse water. Never drain hot chemicals.

6.3.4 Make sure the **Hotpot Drain** is **Off**.

6.3.5 Turn on the temperature controller on the lower panel and press **Sil** to silence the alarm.

6.3.6 Put up a sign describing the chemistry that you will be using.

6.3.7 To operate the cascade, turn the cascade **On**, press and hold the **Water Flow Master Control** until water flows.

6.3.8 **Changing the temperature set point**

6.3.8.1 Press **Prog** on the controller

6.3.8.2 You will be prompted for a **Code**. Use the arrow keys to go to **312**.

6.3.8.3 Press **Prog** until **PS** (process set point) is displayed under the time field.

6.3.8.4 Use the arrow keys to change the temperature set point.

6.3.8.5 Press **Save**.

6.3.8.6 Press **Reset**.

6.3.9 Piranha Clean

6.3.9.1 To do a Piranha Clean, fill up the tank with the correct amount of Sulfuric Acid. Next add the Hydrogen Peroxide and allow chemicals to sit 10 minutes before turning on the heater. Since the chemicals will self heat, this will prevent the temperature from overshooting. When the 10 minutes is up, stir well. Finally turn on the heater.

6.3.9.2 For **4 Inch** wafers use: 4000mL Sulfuric Acid
1000mL Hydrogen Peroxide

6.3.9.3 For **6 Inch** wafers use: 4800mL Sulfuric Acid
1200mL Hydrogen Peroxide

6.3.9.4 A piranha clean is typically done for 15 minutes at 126°C± 10°C and followed by a 5 minute rinse. The set point may be verified by pressing Set point on the temperature controller.

6.3.10 Decontamination Clean following KOH or CMP

6.3.10.1 To do a decontamination clean, fill up the tank with the correct amount of DI water. Next add the Hydrochloric Acid. Finally top off with the Hydrogen Peroxide. Add the chemicals slowly and carefully stir. Be sure to label the chemicals.

6.3.10.2 For **4 Inch wafers** use: 3500mL DI water
700mL Hydrochloric Acid
700mL Hydrogen Peroxide

6.3.10.3 For **6 Inch wafers** use: 4500mL DI water
900mL Hydrogen Peroxide
900mL Hydrochloric Acid

6.3.10.4 Allow the mixture to heat up to 70C.
6.3.10.5 Soak the wafers to be cleaned for 20 minutes in the solution using a Teflon cassette; *do not use one of the dirty KOH cassettes*.
6.3.10.6 Rinse in the cascade for 5 minutes and put wafers in the rinser/dryer.

6.3.11 SC1 Clean

6.3.11.1 Mix 4500mL DI water, 300mL Ammonium Hydroxide and 900mL Hydrogen Peroxide. Carefully stir.

6.3.11.2 Allow the mixture to heat up to 75°C.
6.3.11.3 Soak the wafers for 10 minutes.
6.3.11.4 Rinse in the cascade for 5 minutes and put wafers in the rinser/dryer.

6.3.12 **SC2 Clean**
6.3.12.1 Mix 4500mL DI water, 300mL Hydrochloric Acid and 900mL Hydrogen Peroxide. Carefully stir.
6.3.12.2 Allow the mixture to heat up to 75°C.
6.3.12.3 Soak the wafers for 10 minutes.
6.3.12.4 Rinse in the cascade for 5 minutes and put wafers in the rinser/dryer.

6.4 Shutdown
6.4.1 Turn off the **Bench Power Master Switch**. The rinse tank is on a timer and will shut off automatically.
6.4.2 Swipe out on the card swipe system.

6.5 Errors during Run
6.5.1 If the controller does not turn on, make sure that the bench power is on and the tool is swiped in.
6.5.2 If the controller alarms or does not heat, an interlock may be tripped. Contact an SMFL staff member for assistance.
6.5.3 If a wafer falls out or breaks, do not attempt to retrieve it. Contact an SMFL staff member.
6.5.4 If the rinse tank will not operate, press the **Rinse Tank Enable** button again.

7 Appropriate Uses of the Tool

7.1 The heated tank is intended for Piranha cleaning, decontamination cleaning of silicon wafers, SC1 and SC2 cleaning.
7.2 Solvents are not allowed in the heated tank.
7.3 No metal etchants or wafers are allowed in the heated tank.
7.4 No HF or HF mixtures allowed in heated tank.
7.5 Someone must be in lab while the hotpot is in use.
7.6 Only Teflon wafer cassettes are allowed.

REVISION RECORD

Summary of Changes	Originator	Rev/Date
Original Issue	Sean O’Brien	A-05/19/2005
Modified decontamination clean chemical ratios	Sean O'Brien	B-02/22/2006
Modified 5.1.4, added 5.2.9, 6.3.8	Sean O'Brien	C-08/05/2008