Purpose

1.1. This procedure describes the Piranha clean protocol on how to use and handle in the acid hood.

2. Scope

2.1. This procedure provides processing information on how to use Piranha Clean in the acid hood. The use of this process procedure is for faculty, staff, and outside companies that need access and use of the shared equipment in the OPF laboratory. Internet connection is required to view process procedures.

3. Definitions

3.1. The Piranha clean is a mixture of H_2SO_4:H_2O_2 (3:1), is highly oxidative and removes metals and organic contamination. This clean is suitable for putting samples in a furnace without contamination; however a few guidelines need to be followed. If a sample has a large amount of organic impurities (i.e. photoresist) the piranhas etch will form an insoluble organic layer that can't be removed. It is recommended to follow photoresist cleaning procedure first if photoresist was used on the sample. Another important factor is that the RCA1 step removes most particles strongly attached to silicon wafers by etching underlying Si/SiO_2. Thus the RCA clean is preferred for MOS fabrication. However the piranha clean can be applied to a large number of materials. Due to the self-decomposition of hydrogen peroxide, piranha solution should be used freshly-prepared. Piranha solution should not be stored. Immersing a substrate (such as a wafer) into the solution should be done slowly to prevent thermal shock that may crack the substrate material. Piranha solution can be explosive near or in contact with Acetone, Propanol, or any organic solvents. Mixing the solution is exothermic. The resultant heat can bring solution temperatures up to 120°C. One must allow the solution to cool reasonably before applying any heat. The sudden increase in temperature can also lead to violent boiling, or even splashing of the extremely acidic solution. Also, explosions may occur if the peroxide solution concentration is more than 50%.

4. Responsibilities

4.1. It is the responsibility of the Laboratory Manager to ensure that any users of this process procedure have been trained and understand the use of the acid hood, the chemicals used for this hood and chemical safety protocol.

5. Equipment/Material

5.1. 817 Hood
5.2. DI Water
5.3. Nitrogen Gas
5.4. Squeegee
5.5. Clean room wipers 4x4 and 9x9
5.6. Chemical Apron
5.7. Chemical Gloves
5.8. Face Shield
5.9. Teflon Wafer Dippers and Holders
5.10. Anti-Acid stainless steel Tweezers
5.11. Beaker or crystallization dishes (pyrex or quartz)
5.12. Graduated Cylinder (pyrex or quartz)
5.13. Temperature Thermometer >150ºC
5.14. Sulfuric Acid 98% (H_2SO_4), CMOS
5.15. Hydrogen Peroxide 30% (H_2O_2), CMOS

6. Procedure

Step No.	Description	Equipment	Conditions	Remarks
1	**PPE (Personal Protective Equipment) Gowning Order**			
1.1	Apron			
1.2	Face Shield			
1.3	Acid Gloves	Neoprene		
2	**Acid Hood Protocols**			
2.1	Turn ON DI water	817 Hood	18MOhm/cm^2	Blue valve
2.2	Spray down deck	Spray Gun		
2.3	Squeegee the water towards the drain or exhaust vent holes	Squeegee		Squeegeelocated hanging on the left side
2.4	Select appropriate chemicals	Chemicals	If empty or near empty. Contact laboratory staff	Located either below the acid hood, chemical acid cabinet
2.5	Select Appropriate Waste Container	Hazards Waste Container	If full contact laboratory staff, if staff available leave waste beaker with note and place in the back of the hood	Located in the chemical acid cabinet
2.6	Select Appropriate lab ware	Pyrex Beaker or Quartz Beaker		Located below acid hood Label beaker or write on cleanroom wipe the chemical name, date, contact
2.7	Mixing chemicals		Within blue tape area	
2.8	Return chemicals after mixing			Return chemical back to original location
3	**Chemical Process**			
3.1	3:1 Piranha	817 Hood/ beaker/graduated cylinder	100ml H_2O_2 300ml H_2SO_4	Triple rinse graduated cylinder before measuring out H_2O_2. Always add first H_2O_2 to H_2SO_4. H_2O_2 reacts with H_2SO_4 exothermically. The solution will start to bubble and heat up.

3.2	Piranha Clean	817 Hood/ beaker	20 min	Be careful of dripping.
3.5	Rinse 1 in DI H_2O	817 Hood/Rinse beaker	1 min	Agitate wafer gently back and forth
3.6	Rinse 2 in DI H_2O	817 Hood/Rinse beaker	1 min	Agitate wafer gently back and forth
3.7	Rinse 3 in DI H_2O	817 Hood/Rinse beaker	2 min	Rinse under flowing DI H_2O
3.8	Dry with N_2	817 Hood	Blow dry both side on top of cleanroom wipe	
3.9	Piranha Solution Disposal	817 Hood	Allow Piranha to Cool to room temperature	Dispose in mark waste container

7. Record Retention

7.1. N/A

8. Reference Documents

9.1 N/A