

**PCL-PR-002 Rev 1**  
**Piranha Etch of substrates**

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**Prepared By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Reviewed By:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**System:** Fumehood, East wet bench

**Procedure Type:** Wet Etch

**1. Scope**

Piranha etch is used to chemically remove organic compounds. Thus it causes severe burns on tissue and the fumes are toxic. This procedure is for the safe use and handling of piranha etch.

A checklist (PCL-CH-002) must be filled out when running this procedure.

**2. Definitions**

Piranha etch is usually a mixture of about 3 parts concentrated sulphuric acid with one part hydrogen pyroxide.

**3. Requirements**

The Users must have been trained in WHMIS (Workplace Hazardous Materials Information System).

The Users must have reviewed the MSDS sheets for hydrogen pyroxide and sulphuric acid.

The Users must have been trained by a competent person and listed on the attached Training Record

**4. Procedure**

**4.1** Get a copy of checklist PCL-CH-002 .

The Technician or Lab Manager must give approval to the user before the use of piranha etch .

Have copy of this procedure (PCL-PR-002) on-hand for referral.

## 4.2 Location

Piranha etch is used only in the fume hood and East Wet Bench in the Cleanroom Lab. The hood or bench must not have the low air-flow alarm sounding.

## 4.3 Permitted Times

**Procedures using piranha must not be attempted out of normal working hours (9 AM to 5 PM).**

## 4.4 Persons on hand

**Procedures using piranha must not be attempted by someone working alone. Users must operate in pairs and the two persons must be in the cleanroom .**

## 4.5 Preparation

Follow Section 4.2 of the checklist. Among the items to check are:

Review the MSDS sheets on sulphuric acid and hydrogen peroxide before use.

Know where the nearest eyewash and emergency shower is located and how to get to them.

Check the spill kit is available and spill wipes.

## 4.6 Personal Protective Equipment

Follow Section 4.2 of the Checklist.

Appropriate personal protective equipment must be worn *i.e.* safety glasses, a face shield, nitrile or Neoprene gloves which are frequently and carefully checked for damage especially pin holes and a chemical proof apron.

## 4.7 Supplies

Follow Section 4.3 of the Checklist.

Use only glass containers, stirring rods, beakers.

## 4.8 General Procedure

Always add hydrogen peroxide to sulphuric acid.

Mix only the minimum amount that you can use.

Mix the two solutions in the wet bench or fume hood. The reaction generates a lot of heat and can foam out of the beaker. If this happens it will burn any organic (plastic, tissue, acetone, alcohol, solvents, photoresist)

Keep squeeze bottles of alcohol, acetone, methanol, organics away from the piranha work area.

Piranha is used to remove small residues, not large amounts clumps, chunks of photoresist or acetone/organics.

Use a large glass tray (12 inch by 15 inch) as a fumehood liner for the piranha work area.

If at all possible, carry out operations involving piranha with one hand (wearing glove). The other gloved hand may then be free for turning on valves in hood area. If gloves become wet or otherwise come into contact with piranha, do not turn on any valves or switches until the gloves are rinsed well with water.

Wash or rinse your hands following the performance of an etch or when moisture that might even remotely contain piranha is contacted in the piranha etch area. If piranha is contacted, immediately quench with water.

Rinse gloves frequently with water.

Leave hot piranha solution in an open container until it is cool. Post a sign indicating "Danger" and when you expect the solution will be cool enough to put away.

Pour the cool piranha into a glass container.

Label the glass container "Danger Piranha solution. Keep away from organics. DO NOT CAP tight (gas build up)".

Do not tighten the Cap. (it will continue to give off some gas).

Work with the utmost caution.

## 5. Emergency Procedures

### Loss of exhaust in wet bench or fumehood

In the event of a loss of exhaust, the alarm on the fumehood and wet benches will start to beep. Unplug any hot plates that are on. Remove any substrates that are submerged in piranha. Lightly (not tight) cover any open containers of piranha.

Do not attempt to transfer any piranha into containers.

Leave a DANGER sign taped to the fume hood or wet bench that there is piranha present.

Close the fume hood or wet bench sash.

Ensure all other users leave the cleanroom.

After leaving the cleanroom, tape a DANGER sign on the two cleanroom entrances that there is piranha fumes present.

**Do not go back in until the exhaust is restored and the fumes have cleared.**

### **Skin or Eye Exposure:**

Immediate washing with large amounts of water. Obtain **First Aid**. Seek medical attention for all exposure to piranha.

Take a copy of the MSDS for hydrogen peroxide and sulphuric acid to the Emergency Ward of the hospital.

Inhalation of fumes will burn the upper respiratory tract. Assist person to an area of fresh air. Coughing or tightness in the chest may occur. Symptoms may be delayed. Seek medical attention.

### **Spills**

- **For large spills** use “Caution” tape to cordon off the Lab so that no one enters. Contact the University Police 8 2222 and a spill management team with proper respirators, suction equipment will respond. This is especially required for spills that go under the raised lab floor.
- **Small spills** can be neutralized with acid neutralizer and wiped up with high absorbent wipes. Gloves, apron, and face shield must be worn. The wipes have to be carefully double bagged and taken away for special disposal.

## **6. Waste management**

- **Disposal** - spent piranha is to be bottled in glass.
- **The principal hazard from piranha waste is over pressurization of the container because the piranha is still hot and gas generation. Allow the piranha to cool off in an open container several hours.**
- Post a Danger sign near the open container stating the hazards.
- **Do not store in an air tight container.**
- Clearly label the waste as Piranha and warn not to add any other type of chemicals to the waste.

- Traces of acid left over in beakers and glassware must be rinsed slowly to a copious flow of water running down a drain. The total volume of water should be at least three times the volume of the glassware.

Wipes, swabs, gloves that have been used must be doubled bagged in plastic and placed in the fume hood for special disposal.

After use of piranha, contact the Technician or Lab Manager who will do a safety check (storage, cleanup, disposal) of the area with you.

## 7. References

(adapted from Columbia University CEPSR Cleanroom )

## 8. Revision Information

Rev. 0          Nov. 25/04    Initial procedure development

H. Lee

Rev. 1          March 15/05    R. Linklater revisions

## 9. Training Record

The following is a list of the qualified Users and User training record:

<u>Person Trained</u>	<u>Training by</u>	<u>Date</u>	<u>Authorization</u>
Henry Lee	Henry Lee	Nov. 25, 2004	
R. Linklater	R. Linklater	Feb 2005	
S. Garcia	R. Linklater	Feb 2005	
Y. Zhou	H. Lee	July, 2005	