ASRC Standard Operating Procedure:

Piranha Clean

Table of Contents

Principle of Operation

To clean organic residues off substrates.

Danger: Piranha waste involves oxygen gas which can pressurize and break sealed containers. Do not store mixed Piranha in a sealed container. It is very important that you reset and start the Piranha waste timer on the fume hood whenever you dump Piranha waste in the acid carboy so the cleanroom staff can determine whether or not the Piranha waste is safe for disposal.

Material Requirements

Equipment:

substrate, two Pyrex bath containers, graduated cylinder, wafer boat, thermometer and stainless steel tweezers

- *<u>Warning</u>: Pirahna attacks organics, including most plastics. It will react violently with polyethylene and polypropylene tweezers and containers. It will also react violently with organic solvents such as acetone and isopropanol.*

<u>Chemicals</u>:

Sulfuric Acid (H_2SO_4 96%) and Hydrogen Peroxide (H_2O_2 30%)

- Chemical Hazards
    - Liquid or vapors are serious health hazards and cause severe burns

<u>Personal Protective Equipment</u>:

Trionic gloves on top of nitrile gloves, apron, safety glasses and face-shield

Procedure

Piranha Clean

1. Rinse all beakers with DI water prior to beginning the process.
2. Stand the beaker to be used for rinsing on a few fab wipes in the hood and fill it with DI water so that the water level will cover the entire substrate.
3. Get a glass beaker that will fit your samples for processing - you should find one labeled “Piranha” on the shelves. Place it on fab wipes in the hood.
4. Put your samples in the empty container and determine how much solution you will need to cover them.
5. Determine the ratio of sulfuric acid and hydrogen peroxide you will be using for the Piranha clean and the required volumes of each to completely submerge your sample. Typical Piranha ratio is 3 parts Sulfuric Acid and 1 part Hydrogen Peroxide.
6. Measure out the necessary volume of Sulfuric Acid and pour into the Piranha beaker.
7. Measure out the necessary volume of Hydrogen Peroxide and <u>carefully</u> pour into the Piranha beaker. **<u>The solution will heat up and start to bubble.</u>**
8. Load sample/wafer boat and thermometer into Piranha beaker. Thermometer should read >80°C for optimal cleaning temperature. If <80°C, place Piranha beaker on hot plate.
9. Allow your samples to sit in the Piranha clean for 10-20 minutes to remove all organics.

DI Water Rinse

1. When the Piranha clean is complete, carefully transfer the sample/wafer boat into the DI water beaker.
2. If you used tweezer to move the sample, make sure you leave them in the rinse beaker as well.
3. Let the samples and tools soak in DI water for 5 minutes.
4. Remove the samples and rinse them with the DI water gun over the hood sink.

Sample Dry

1. After the water rinse is finished, blow the sample dry with the N_2 gun.

Cleanup

1. Allow the hot Piranha to cool to room temperature before disposing of the solution. If you are going to leave the mixture unattended, make sure it is properly labeled before doing so.
2. Dump the Piranha solution into the carboy designated for acids.
3. Rinse the container once with DI water, and dump it into the same carboy.
4. Rinse the beakers used to measure the chemicals with DI water, and dump them into the acid carboy.
5. Dump the rinse water beaker into the acid carboy.
6. Rinse all containers again with DI water over the hood sink.
7. Return all cleaned/dried labware to its proper location. The beakers can drip dry on fab wipes in the hood; however, remember to move them back to their storage location once dry.
8. Wipe up any drips in the area with chemical wipes and dispose of them in the proper trash.
9. Store the Sulfuric Acid in the acids cabinet and store the Hydrogen Peroxide in the oxidizers cabinet.
10. Inspect all of the PPE to ensure it did not come into contact with the chemicals before returning them to its storage location.

Accident Procedure

Contact

- Skin: Remove contaminated clothing, wash skin with soap and water. **If there is any irritation, get immediate medical attention.**
- Eye: Immediately flush with water for at least 15 minutes while lifting upper and lower eyelids occasionally. **Get immediate medical attention.**
- Ingestion: Do not induce vomiting. **Get immediate medical attention.**
- Inhalation: Remove to fresh air. Resuscitate if necessary. Take care not to inhale any fumes released from the victim's lungs. **Get immediate medical attention.**

Spills

If a small, contained spill occurs, such as inside the hood, wipe it up with chemical wipes and dispose of them in the proper trash container. If a large spill occurs, evacuate the area and notify the cleanroom staff.

Revision History:

- Version 0.0 – Created September 8th, 2017
- Version 1.0 – Revised May 22, 2025