

## Standard Operating Procedures

### Piranha Solutions

#### Overview

Piranha solutions are used to remove organic residues from substrates, particularly in microfabrications labs. The traditional piranha solution is a 3:1 mixture of sulfuric acid and 30% hydrogen peroxide. The solution may be mixed before application or directly applied to the material, applying the sulfuric acid first, followed by the peroxide. Piranha solutions are extremely energetic and may result in explosion or skin burns if not handled with extreme caution. (For this reason, consider using a commercially stabilized version of piranha, such as nanostrip <http://www.cyantek.com/htm/nanostrip.htm>).

#### Emergency Procedures

*In case of skin contact:* May cause skin burns. Remove contaminated clothing and flush the skin with copious amounts of water for at least 15 minutes. Seek medical attention.

*In case of eye contact:* Piranha is corrosive and irritating to the eyes. Flush contaminated eye(s) immediately with copious quantities of water for at least 15 minutes. Seek medical attention immediately.

*In case of inhalation:* May irritate the respiratory tract. Conscious persons should be assisted to an area with fresh, uncontaminated air. Seek medical attention in the event of respiratory irritation, cough, or tightness in the chest. Symptoms may be delayed.

*In case of ingestion:* Not a likely route of exposure.

#### Handling

- Always use glass (preferably Pyrex) containers. Piranha will melt plastics.
- Mix the solution in a hood with the sash between you and the solution. Wear heavy duty acid-resistant rubber gloves, (regular nitrile gloves will not provide sufficient protection) full face shield with eye protection, and an acid apron on top of the lab coat.
- When preparing the piranha solution, **always add the peroxide to the acid very slowly.**

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- Piranha solution is very energetic and potentially explosive. It is very likely to become hot, more than 100 degrees C. Handle with care. **Picking up a beaker that is this hot will be very painful, might melt your gloves, and may cause you to spill it.**
- Leave the hot piranha solution in an open container until cool.
- Never store piranha solutions. Piranha stored in a closed container will likely explode.
- Adding any acids or bases to piranha or spraying it with water will accelerate the reaction. This includes photoresist, which is a strong base.
- Mixing hot piranha with organic compounds may cause an explosion. This includes acetone, photoresist, isopropyl alcohol, and nylon.
- Do not transport chemicals around the room in beakers. Never pour chemicals back into the original container.

### Storage

Do not store piranha. Mix fresh solution for each use. Excess solutions should be disposed as described below.

### Disposal

The primary hazard from storage of piranha etch waste is the potential for gas generation and over-pressurization of the container when the solution is still hot. If you store a hot solution in an air tight container, it will explode.

Therefore, prior to disposal, the piranha solution must be left in an open container in order to cool down for several hours (overnight). It is your responsibility to make sure that the open container is very clearly labeled and left in a safe area in the fume hood for overnight cool down.

Once cooled down, the solution can be transferred into a closed glass container for disposal. Attach the chemical/hazardous waste tag to the container, and clearly label with the name and composition. Transfer the container to the Stockroom for proper disposal.

### Notification of the Use of Piranha Solutions

Please complete this form, sign, and return to the Department of Environmental Health and Radiation Safety. (Box #85)

**Principal Investigator:** \_\_\_\_\_

**Building/Room work will be performed:** \_\_\_\_\_

**Phone:** \_\_\_\_\_ **Department:** \_\_\_\_\_

In accordance with the requirements of the Laboratory Safety Manual (Chemical Hygiene Plan), this document serves as notification to the Department of Environmental Health and Safety of the use of Piranha Solutions. (Please list the chemicals and their percentages, and the volumes expected to be generated below.)

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\_\_\_\_\_  
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**I have reviewed the Standard Operating Procedures for Piranha Solutions and will comply with all applicable requirements and safety procedures.**

**Print Name:** \_\_\_\_\_ **Date:** \_\_\_\_\_

**Signature:** \_\_\_\_\_

**Principal Investigator Name (if different):** \_\_\_\_\_  
(please print)

**Principal Investigator Signature:** \_\_\_\_\_

**Date:** \_\_\_\_\_