



Introduction

"Piranha solution" is a substance that is used to remove organic residues from substrates. There are two different solutions that are used:

- 1) Acid Piranha (most common): is a 3:1 mixture of concentrated sulfuric acid (H₂SO₄) with hydrogen peroxide (H₂O₂).
- 2) Base Piranha (least common): is a 3:1 mixture of ammonium hydroxide (NH₄OH) with hydrogen peroxide (H₂O₂).

Piranha solution must be prepared with great care. It is highly corrosive and an extremely powerful oxidizer. Always read the instructions for use when preparing/working with the solution.

Personal Protective Equipment

The handling of Piranha solution requires special protection equipment including, but not limited to:

- 1) A full-face shield,
- 2) Heavy-duty rubber gloves (regular Nitrile gloves will not provide sufficient protection), and
- 3) An acid apron to wear on top of the lab coat. Check for pinholes in the gloves before putting them on.

The protective gear should be stored according to the following rules to avoid contamination:

- Aprons should be returned to the hanging posts with the clearly designated "front side" facing the wall. (This should be distinguished by a notice or sticker that is posted by the hanger). This procedure prevents the potential of chemicals being spilled onto an apron, and then the contaminated side being used as the inside of the apron inadvertently.
- Gloves should be stored in plastic bags. Only ONE pair of gloves belongs in each bag. Please dry the gloves as much as possible prior to storing them following each use.

Close-toed shoes must be worn at ALL times, and bare legs must be covered by wearing a cleanroom suit.

Piranha Solution Handling Tips

Piranha solution, as with any corrosive or hazardous substance, requires the presence of a second knowledgeable user at all times.

Whenever handling Piranha, only use glass containers. Piranha can melt and even attack plastic containers. Containers used during the experiment must be labeled and have a warning sign visible to anyone working nearby.

Be sure to mix the solution in a fume hood with the sash lowered to separate you from the solution.

When preparing the piranha solution, always add the peroxide (H₂O₂) to the acid very slowly.

Piranha solution is likely to become hot, more than 100 degrees Celsius. Handle with care.

Mixing hot piranha with organic compounds may cause an explosion. This includes acetone, photoresist, isopropyl alcohol, and nylon.

Storage and Waste 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.

Leave the hot piranha solution in an open container until cool (typically overnight) or an explosion may occur.

When sufficiently cooled, store the piranha solution in a glass bottle with a vented cap.

The container must be clearly labeled with the solution name and composition and include a warning sign not to add any other types of chemicals.

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Emergency Response Procedure

In case of inhalation, move the affected person to an area with fresh, uncontaminated air. Seek medical attention.

In case of contact with the skin, immediately rinse the affected area with large amounts of water for at least 15 min as the Piranha solution may cause skin burns.

In case of contact with the eye, irrigate the eye for at least 30 minutes keeping the eyelids open during irrigation.

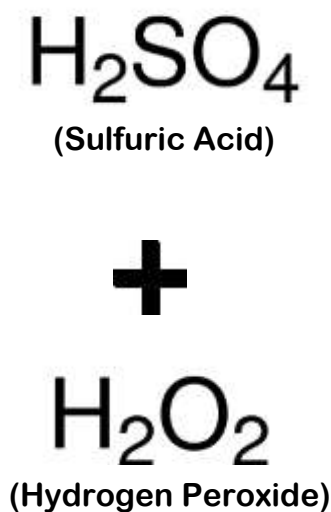
In case of exposure over a large area of the body, the victim should be removed from the contaminated area and placed under a safety shower while 9-1-1 is contacted. All contaminated clothing should be removed immediately with appropriate gloves and safely discarded.

Spills should be neutralized with an acid neutralizer (or base neutralizer in the case of $\text{NH}_4\text{OH}/\text{H}_2\text{O}_2$ solutions) before cleanup. Do NOT use paper towels, rags, or other organic material to absorb a spill as they may spontaneously ignite.

Vented Cap for a Piranha Waste Bottle

Piranha waste MUST be stored in a glass bottle with a VENTED CAP. EH&S has a supply of vented caps that fit the stock 2.5L sulfuric acid bottles, or other bottles that accept the 38/439 thread cap. EH&S recommends the use of empty sulfuric acid bottles for storing piranha waste. If other bottles are used, laboratory personnel must ensure the vented caps securely fit the bottles prior to adding piranha.

NOTE: EH&S will not remove piranha waste bottles with contents exceeding 2.5L in volume or without vented caps.



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