UIC UNIVERSITY OF ILLINOIS AT CHICAGO ENVIRONMENTAL HEALTH AND SAFETY OFFICE
Environmental Health and Safety Office (MC 645)
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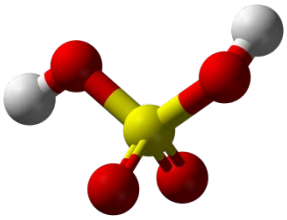
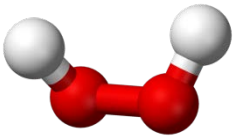


Piranha Solution



Introduction

Piranha solution is frequently used in nano and microelectronics labs to clean photoresist from wafers as well as to make highly hydrophilic surfaces.

There are many different ratios for piranha solutions. The most common piranha solution is a mixture of hydrogen peroxide and sulfuric acid. A typical mixture is 3:1 concentrated sulfuric acid to hydrogen peroxide solution (such as a 30% hydrogen peroxide stock solution not over 30%). Some solutions may use a 4:1 or even 7:1 mixture. A closely related mixture, sometimes called "base piranha" is a 3:1 mixture of ammonium hydroxide and hydrogen peroxide.

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Piranha solution is highly corrosive upon contact with the skin or eyes and is an explosion hazard when mixed with organic chemicals/materials. Only use the solution to remove organic residues from materials. Never work alone when preparing/using this solution.

Required Personal Protective Equipment

- Wear a face shield, neoprene gloves, and an acid (rubber) apron
- Work in a properly functioning fume hood

Preparation

- Always use glass containers, preferably Pyrex.; piranha will melt plastic.
- Always add the hydrogen peroxide solution to the concentrated sulfuric acid. This is a very exothermic reaction and the solution will become very hot.
- Mix the solution in a hood with the sash between you and the solution
- Prepare the solution immediately before use.
- Do not store the solution for future usage in part due to decomposition products.
- Old solution should be disposed of promptly, with a fresh batch being made when required

Immersing a substrate (such as a wafer) into the solution should be done slowly to prevent thermal shock that may crack the substrate material. Cleaning usually requires about 10 to 40 minutes, after which the substrates can be removed from the solution. Anything removed from the solution should be rinsed with a large amount of deionized water. The substrates should now be hydrophilic, which is easily verified by ensuring that the rinse water is wetting (spreading out over) the substrate.

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Finished Piranha Solutions

- Don't add any acids or bases to the solution
- Do not mix with organic compounds, including acetone, ethanol, methanol, and ispopropanol.

Storage of Residual Piranha Solution

- Leave the hot piranha solution in a well labeled, open container until cool (overnight). If you store the hot solution in a closed container, it will explode.
- Once cooled down, the solution can be stored in a closed container.
- It is generally a bad practice to store piranha for long periods of time.

Hazardous Waste

- Label the container with a properly filled out unwanted chemical label and a warning sign declaring that no other material should be added to the container. The label should indicate the percentage of each constituent and that it is corrosive.
- Place the closed, labeled waste container in a secondary containment tray away from organic chemicals.

Emergency Procedures

- In case of a small spill, use the acid neutralizing agent in your spill kit. Do not use combustible or organic materials to clean up the spill. If in doubt, and in case of a large spill, contact the EHSO at 6-SAFE (7233) or 312-996-7233
- In case of skin contact: May cause skin burns. Remove contaminated clothing. 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.