

Piranha Solutions

Overview

Piranha solutions are used to remove organic residues from substrates, particularly in microfabrication 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, followed by the peroxide.

Piranha solutions are extremely energetic and may result in explosion or injury resulting from chemical and thermal burns if not handled with extreme caution. Piranha solutions may irritate the respiratory tract if vapor is inadvertently inhaled.

URI Policy

A standard operating procedure (SOP) must be prepared by lab users and reviewed and approved by Environmental Health & Safety prior to any experiments or research involving Piranha solutions. Please contact EH&S at srm@etal.uri.edu or 874-7993 for additional information.

Emergency Procedures

In case of skin contact: Flush the skin with copious amounts of water for at least 15 minutes. Seek medical attention.

In case of eye contact: Utilize eyewash station immediately to flush contaminated eye(s) for at least 15 minutes. Seek medical attention.

In case of inhalation: Conscious persons should be assisted to fresh air. Seek medical attention if an exposure is suspected. Symptoms included respiratory irritation, cough, or tightness in the chest. Symptoms may be delayed.

In case of ingestion: Seek medical attention immediately.

Handling

- Always use glass (Pyrex® is preferred) containers. The solution can degrade plastic containers causing failure of containment. Ensure all containers are properly labeled to identify those containing piranha acid solutions.
- Always mix the solution in the hood, utilizing the hood sash as a barrier between you and the solution. Wear appropriate PPE including acid resistant lab coat and/or apron with sleeve covers, gloves (butyl) and chemical splash goggles.
- Always add hydrogen peroxide to sulfuric acid while gently stirring. DO NOT add sulfuric acid to hydrogen peroxide. The hydrogen peroxide concentration should be kept under 30% and should NEVER exceed 50%.
- Piranha solution will become very hot with temperatures exceeding 100°C during preparation. Handle with care to avoid thermal burns.
- Do not mix piranha solution with incompatible materials such as organic acids, organic solvents, or other organic materials. Do not mix with bases (e.g., Photoresist). Mixing piranha with incompatible materials can lead to an explosion.

- Ensure all containers and substrates are rinsed and dried before coming in contact with piranha solutions. Piranha solution is intended to remove residues only.
- When submerging items in piranha baths, place items in the piranha solution slowly and carefully. The solution needs time to stabilize after each item is added. Apply piranha solution to substrates carefully as well.
- NEVER store freshly prepared piranha solution in a closed or partially closed container.
- After use, always allow piranha solution to react overnight in a labeled, open container within a fume hood prior to final disposal.

Storage

The reactive properties of piranha solution do not allow for storage prior to use. Make fresh solution as needed. Excess solution should be disposed of via the below disposal procedures.

Disposal

Piranha solution is only to be collected for disposal after it has fully reacted, cooled and the gases of reaction have had adequate time to dissipate.

The spent, reacted piranha solution should be collected as waste. Under no circumstances should any amount of piranha solution be neutralized or otherwise treated. A clean, recycled sulfuric acid bottle is a good option for collection of the waste. Initially, add only a small amount of the solution to waste container to ensure that there are no residual materials in the container that may cause an adverse reaction. If no reaction is observed, continue to pour slowly. The bottle should be explicitly labeled as containing waste piranha solution. **DO NOT COMBINE ANY OTHER WASTE SOLUTION WITH SPENT PIRANHA SOLUTION.**

Store waste solution in a container equipped with a vented cap available from EHS. Please contact EHS for vented caps and waste tags as needed. EHS can assist with purchase of safety coated jugs that fit the vented caps.



Piranha Solution Waste Label