

INFORMATION ON PIRANHA SOLUTIONS



Piranha solutions are strong oxidizers used to remove organic residues from substrates. As such, piranha solutions are extremely corrosive, reactive, and potentially explosive. The most commonly used of these solutions is the acid piranha, typically a 3:1 mixture of concentrated sulfuric acid (H₂SO₄) and 30% hydrogen peroxide (H₂O₂). Ratios of 4:1 or 7:1 are also used.

EXPOSURE CONTROLS

• **Engineering Controls:** All work involving piranha solution must be done inside a chemical fume hood to prevent inhalation exposures. Label fume hoods with signage such as “Caution: Piranha solution in fume hood, highly reactive and corrosive.”



• **Personal Protective Equipment:** Wear proper laboratory attire (lab coat, long pants, and closed-toe shoes), neoprene or rubber gloves, neoprene apron, safety goggles, and a face shield.

SAFE HANDLING

- Consult with your PI/laboratory supervisor prior to initial use of piranha solutions. Consultation should include discussion regarding special hazards of working with piranha solution and proper safety precautions.
- Develop a written Standard Operating Procedure (SOP) for laboratory activities involving piranha solutions. For instructions on creating an SOP, refer to: <http://chemtoolkit.stanford.edu/TemplateSOP>
- Only use glass or Pyrex containers; piranha solutions are not compatible with plastic.
- **Piranha solution is very reactive and corrosive:**
 - When preparing acid piranha solution, add the peroxide to the acid very slowly to prevent violent boiling. *This addition is very exothermic.*
 - Prepare small batches of fresh solution for each application. *Do not store solution for reuse.*
 - Handle with care, solution may self-heat up to 100 °C.
- **To prevent potential explosion:**
 - Always add peroxide to acid.
 - Always use a 30% or less solution of H₂O₂.
 - Ensure that the proportion of peroxide does not exceed the recommended ratio.
 - Do not mix with incompatible materials such as acids, bases, and organic solvents (acetone, isopropyl alcohol, etc.).
 - Ensure all substrates are rinsed and dried before placing them in a piranha solution.
 - Do not use airtight containers for storage of piranha solution.

WASTE STORAGE AND DISPOSAL

• After use, cool down solution in an open container inside a fume hood that is clearly labeled with a piranha solution warning. Solution must be cooled down to room temperature prior to storage as waste.



- Do not store piranha waste in an airtight container. Hydrogen peroxide will naturally decompose into oxygen and water, and the oxygen produced can over-pressurize the container.
- EH&S provides 4-liter plastic-coated glass bottles with vented caps. Contact EH&S at 723-0448 to request these bottles.
- Label waste bottles with waste tags generated at: <http://wastetag.stanford.edu>. Additionally, ensure waste bottle is clearly labeled “For Piranha Solution Disposal Only, Do Not Add Other Types of Chemicals.”

EMERGENCY PROCEDURE

- Ensure detailed emergency procedures are included in the SOP.
- **Eye/ Skin Contact:** Flush contamination from eyes/skin using the nearest emergency eyewash/shower for a minimum of 15 minutes. If one eye is affected, be careful not to flush contaminated water into the other eye.
 - Remove any contaminated clothing.
 - If medical attention is required, immediately call 9-911 from SU phones, 911 from non-SU phones, and 286 from School of Medicine phones.
 - When seeking medical attention, bring along a copy of this fact sheet and your lab’s SOP.
 - Notify your supervisor and EH&S.
- **Spills:** Notify personnel in the area and your supervisor. Restrict access and eliminate all sources of ignition.
 - **Small spills** (<30 mL) may be absorbed with wet paper towels. Keep towels wet and collect for disposal.
 - **Large spills:** Immediately call EH&S at 725-9999 (286 from School of Medicine phones) to report a piranha solution spill that is health threatening, greater than 30 mL, or will take longer than 15 minutes to clean up.



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