



Safety Guidelines for Working with a Piranha Solution

Background

Piranha is a very reactive, corrosive and explosive solution presenting a strong oxidizer characteristics. Piranha usually consists of a 3:1 sulfuric acid (H_2SO_4) to hydrogen peroxide (H_2O_2). Basic Piranha solutions contain 3:1 ammonium hydroxide (NH_4OH) to hydrogen peroxide (H_2O_2).

Guidelines for Working with Piranha:

1. **Preparation and work must be carried out in a chemical hood only.**
2. **Never begin working with Piranha prior to receiving training.**
3. **Never work with Piranha solution when you are alone in the lab.**
4. Always wear personal protective equipment:
 - 4.1. Closed, long-sleeved lab coat,
 - 4.2. Closed shoes
 - 4.3. Long trousers,
 - 4.4. Neoprene / rubber gloves
 - 4.5. Neoprene apron,
 - 4.6. Protective goggles.
 - 4.7. A full face shield.
5. Use thick glass containers/ bottles (with special coating to prevent breaking and leakage), preferably Pyrex plastic-coated glass bottles with vented / thread caps
6. Ensure the container is visibly labeled.
7. Always add the hydrogen peroxide slowly and carefully to the acid (and not vice versa)
8. Do not prepare in advance large quantities for several uses. Prepare a daily fresh mixture.
9. Label the bottle clearly, including the date.
10. Special precautions:
 - 10.1. Handle with care. Piranha can reach up to 100°C.
 - 10.2. Ensure that the hydrogen peroxide concentration is always less than half the mixture.
The mixture is potentially explosive when the hydrogen peroxide exceeds 50%.)
 - 10.3. Piranha is highly corrosive. Its acidic vapors can cause significant burns to the respiratory tract
 - 10.4. Never mix Piranha with incompatible materials, such as organic acids, bases and organic solvents such as acetone, isopropyl alcohol, etc.
 - 10.5. Piranha is acidic, therefore in contact with metals it reacts while releasing flammable hydrogen gas.



- 10.6. Ensure all substrates intended for treatment with Piranha are rinsed and dried prior contact with the Piranha solution.
- 10.7. Never seal the solution containers.

Guidelines for Disposing of Piranha:

- 10.8. Never pour solution leftovers down the sink.
- 10.9. Use a separate, dedicated container for the collection of Piranha solution waste. Never add Piranha waste to the acids collection bottle! The container used for Piranha deactivation is the same container used for disposal.
- 10.10. Label the Piranha waste container clearly.
- 10.11. The container containing used Piranha mixture must be left open in the chemical hood for at least an overnight cooling → deactivation for two weeks before disposal with a cap that allows pressure release.
- 10.12. The waste container should never exceed 2/3 of its volume.
- 10.13. Never add additional chemicals to the Piranha solution leftovers.
- 10.14. After two weeks – call the person responsible for chemical waste disposal (Ronen HershKovitz). Close the Piranha waste container and hand it to the waste collector.
- 10.15. Piranha must be discarded and shipped separately of all other chemical waste.
- 10.16. At the chemical waste collection site - store the Piranha waste container with inorganic waste with a half-open cap.
- 10.17.

11. Emergency events guidelines:

- 11.1. Eye/s injury:
 - 11.1.1. Flush eye/s immediately with water using the eye washer for at least 15 minutes.
 - 11.1.2. Seek medical attention.
 - 11.1.3. Notify the PI and the Safety Unit.
- 11.2. Skin exposure:
 - 11.2.1. In case Piranha has splashed on clothes – remove immediately.
 - 11.2.2. Flush with water under tap or in an emergency shower for at least 15 minutes.
 - 11.2.3. Seek medical attention.
 - 11.2.4. Notify the PI and the Safety Unit.
- 11.3. Respiratory exposure:
 - 11.3.1. Evacuate the injured person to a well-ventilated place.
 - 11.3.2. Seek medical attention.



11.3.3. Notify the PI and the Safety Unit

11.4. Piranha Spill Guidelines s:

11.4.1. Alert others and evacuate scene.

11.4.2. Prevent entry of persons to the lab.

11.4.3. Remove materials with a low flash point

11.4.4. Notify the PI.

11.4.5. Small spill -

11.4.5.1. up to 30 ml

11.4.5.2. Wear protective equipment found in the chemical spill kit, including a respirator.

11.4.5.3. Absorb the liquid using vermiculite.

11.4.5.4. Large spill - larger than 30 ml

11.4.5.5. Notify the Safety Unit and request assistance for handling the spill