

Perchloric Acid: Guidance for Laboratories

Perchloric Acid is a clear, odorless liquid that is stable at room temperature. It is highly volatile and requires special precautions when in use, handled, or in the working vicinity. At 150° C and above, or at a concentration greater than 72%, perchloric acid is a strong oxidizer and eventually becomes unstable. At concentrations below 72%, perchloric acid is a highly corrosive. Substitution of perchloric acid with a less hazardous chemical or a dilute solution of less than 48%, if applicable, is recommended. Use of an amount 48% or greater requires close supervision or a knowledgeable, skilled person to perform the work. This document serves as guidance to all users of perchloric acid ensuring proper and safe use within laboratories.

• Hazards

- At a highly corrosive concentration, perchloric acid may cause severe burns to the eyes, skin, and mucous membranes upon contact.
- Many hazards involve potential explosions and/ or fire.
 - When heated, vapors produced can condense within fume hood ventilation ductwork potentially causing dangerous formation of explosive perchlorates.
 - Contact with organic materials such as cotton, wood, paper, etc. may cause an explosion or fire once the perchloric acid dries.
 - Note that clothing is also made of organic material.
 - Perchloric acid must not be distilled in a vacuum as this may form an unstable anhydride causing a spontaneous explosion.
- Many chemicals will produce reactions with perchloric acid including:
 - Acetic anhydride
 - Alcohol
 - Reducing agents
 - Metals such as sodium, calcium, and lithium
 - Incompatible greases

• Protection

- Principle investigators must ensure that all personnel working with or around perchloric acid are properly trained and knowledgeable regarding hazards and safety procedures.
 - Must be familiar with the chemical safety data sheet (SDS). This can be found online (see references section also).
- Personal Protective Equipment includes:
 - Eye protection: Splash-proof safety goggles.
 - Gloves: Polyvinyl chloride (PVC) or neoprene.
 - Face shield: Worn with safety goggles.

- Lab coat
- Ventilation: Fume hood must be designated for use of perchloric acid.
 - Metal-free
 - Shatter-proof glass
 - Procedures using a concentration of 50% or less, **without heating**, may be used in a standard fume hood.
 - Procedures using a concentration greater than 50% with heating **must be used in a perchloric acid fume hood with a wash down feature.**
 - Always lower the fume hood sash when working.
- Laboratory personnel must be familiar with the location and operation of safety features.
 - Eyewash/drench hose
 - Safety Shower
- Perchloric acid quantity within the laboratory should be limited to a one-pound reagent bottle.
 - Should remain in the original glass container and in a glass/ceramic secondary containment tray in case of spills.
 - The reagent bottle should be rinsed with water after use and returned to secondary containment tray.
 - Should be separated from other chemicals, but it can be stored with other corrosive inorganic acids in a corrosive-resistant cabinet.
 - Perchloric acid is incompatible with the following:
 - Organic chemicals
 - Flammable or combustible materials
 - Dehydrating agents such as sulfuric acid
- Use non-reactive plastic or preferably glass when working.
 - **NEVER** use metal.
- Use only glass-to-glass apparatuses and silicon-based lubricants for joints.
 - Do not use rubber stoppers, tubes, or stopcocks.
 - All glass apparatuses should be rinsed with water after perchloric acid work.
- Do not allow perchloric acid to freeze or dry.
- Dispensing and transfer methods:
 - Use a dispensing burette or a reaction flask to measure out the quantity of perchloric acid needed.
 - Always transfer the perchloric acid over secondary containment to catch any spills that may occur.
- In the event of a spill, the following steps should occur:
 - Immediately dilute the spill with large quantities of water

- Spread sodium bicarbonate to isolate the spill. Be careful when utilizing bases to neutralize strong acids. The heat produced can inadvertently cause formation of vapors.
- Mop and rinse with water repeatedly if the spill occurs on a wooden surface.
- A second neutralization with sodium bicarbonate is recommended.
- Do **NOT** use organic materials to clean up the spill such as paper towels, cotton rags, and kim wipes.
 - Organic materials may spontaneously ignite upon contact.
 - If organic materials are inadvertently used, wet the material with water and place into a sealed plastic bag.
- When heating perchloric acid:
 - This should only be performed in a perchloric acid hood, not a standard fume hood.
 - Hot plates, electric mantles, steam baths, or steam-heated sand baths are acceptable means of heating.
 - Gas flames or oil baths should **NOT** be used.
- When disposing of perchloric acid:
 - **NEVER** mix the unwanted waste with other chemical waste.
 - Perchloric acid waste should have a designated waste container properly labeled with hazardous waste labels provided on the UA EHS website.
 - Do not accumulate large quantities of waste.
 - Contact EHS for a chemical waste pick up (see references section).
- **Emergency Procedures for Exposure**
 - Immediately provide first aid based on the chemical SDS instructions.
 - Seek medical attention as soon as possible.
 - A copy of the SDS should be taken with the exposed person for quick treatment.
- **References**
 - msdsproxy?productName=A469500&productDescription=PERCHLORIC+ACID+OPTIMA+500ML&catNo=A469-500+&vendorId=VN00033897&storeId=10652 (fishersci.com) -SDS
 - [Hazardous Waste Labels – Environmental Health & Safety | The University of Alabama \(ua.edu\)](#)
 - [Waste Disposal Request – Environmental Health & Safety | The University of Alabama \(ua.edu\)](#)

- **Training**

- EHS requires in-person training for use, handling, and storage of hydrofluoric acid in laboratories on UA campus.

For further questions, contact the [EHS Laboratory Safety Team](#).