

## **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](https://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 \(ua.edu\)](https://ehs.ua.edu/hazardous-waste-labels)
  - [Waste Disposal Request – Environmental Health & Safety | The University of Alabama \(ua.edu\)](https://ehs.ua.edu/waste-disposal-request)

- **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](#).**