DEPARTMENT OF
ENVIRONMENTAL SAFETY,
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Perchloric Acid Fact Sheet

This fact sheet is for general safety awareness. Individual SOPs for all experiments and processes involving perchloric acid must be developed by the laboratory.

PROPERTIES & HAZARDS

Aqueous solutions of perchloric acid up to 72% do not have significant oxidizing power at room temperature, however, the oxidizing power increases with concentration and temperature. Heating perchloric acid solutions increases the ability to oxidize. Perchloric acid with concentrations higher than 72% readily oxidize at room temperature. Anhydrous perchloric acid (>85%) is highly unstable, can explode upon contact with organic material, and may explode spontaneously at room temperature. Aqueous solutions do not form anhydrous perchloric acid by evaporation, however, dangerous anhydrous perchloric acid can form when an aqueous solution is subjected to strong dehydrating conditions, such as exposure to concentrated sulfuric acid, acetic anhydride, or phosphorous pentoxide. At elevated temperatures, vapors from perchloric acid can condense on surfaces in the ductwork of the chemical fume hood, where they form perchlorate salts that are often highly shock-sensitive and that pose a significant explosion hazard. Reactions with alcohols and certain other organic compounds form highly unstable and explosive perchlorate esters.

In Section 2 – Hazard Identification of the safety data sheet (SDS), or on the chemical bottle, the following hazard classifications, pictograms and hazard statements will be listed. More information on material hazards can be found in complete hazard and precautionary statements in the SDS or chemical bottles.

Hazard Classification and Category	Pictogram	Hazard Statement
Oxidizing Liquids – Category 1		May cause fire or explosion, strong oxidizer
Acute Toxicity, Oral – Category 4		Harmful if swallowed
Skin Corrosion – Category 1A Serious Eye Damage – Category 1 Corrosive to Metals		Causes severe skin burns and eye damage Causes serious eye damage May be corrosive to metals
Specific Target Organ Toxicity, Repeated Exposure – Category 2		May cause damage to organs (thyroid) through prolonged repeated exposure

CONTROLS

Engineering Controls

- Chemical fume hood with wash-down system (if subjecting perchloric acid to high temperatures)
- Safety shower and eyewash station (within 55 feet of work area)

Personal Protective Equipment

- Perchloric acid resistant gloves; for assistance choosing gloves contact ESSR
- Splash goggles
- Lab coat
- Clothing that leaves no exposed skin on legs or feet
- Closed-toe shoes that fully cover the top of the foot

Training

- Laboratory Specific Training must cover all processes using perchloric acid and include information on safe use and emergency response.

STORAGE

- Store perchloric acid with other inorganic acids and away from organic chemicals (including organic acids) and reducers. The containers should be stored in secondary containment preferably made from glass, porcelain, ceramic, or other non-absorbing, non-combustible material.
- Limit stored quantities to what is needed for the next 6-12 months; do not store perchloric acid over extended periods.
- Do not store anhydrous perchloric acid. This solution must be diluted before disposal.
- Dispose of bottles with discolored perchloric acid solutions immediately.
- Do not touch bottles that appear to have crystals have formed around the neck and cap. Call ESSR for immediate assistance.

USE

- Use the minimum amount of perchloric acid necessary to complete work.
- Do not handle perchloric acid on a wooden surface, and do not let it come into contact with oxidizable materials such as cloth, paper towels, or grease. Such materials can become highly flammable and may ignite spontaneously or even explode after absorbing perchloric acid liquid or vapor.
- Do not subject perchloric acid to strong dehydrating conditions.
- Dilute by adding perchloric acid to water, not by adding water to acid.
- If solutions containing perchloric acid are filtered through a paper filter, the filter (and precipitate) should be washed thoroughly with water to remove all perchlorate before being allowed to dry.
- Do not mix concentrated perchloric acid (>72%) with organic chemicals if temperatures could rise above ambient levels.
- Perchloric acid digestions and other uses at elevated temperatures require that the procedures be conducted in a specially designed fume hood with a water wash-down system. This system is required to prevent the buildup of explosive perchlorates in the ductwork.
- Do not exceed the manufacturer's recommendation for amounts of perchloric that can be handled by a perchloric hood at any given time.
- Do not heat perchloric acid in an oil bath. Use a sand bath, a heating mantle, or a hot plate.

Waste

- Waste should be managed so that incompatible materials are not mixed.
- Waste containers should be compatible with their contents and should be segregated by hazard class into separate secondary containers.
- For questions regarding waste management contact ESSR, Environmental Affairs at envaffairs@umd.edu.

SPILL CLEANUP

- Spill cleanup must follow the items specified in the Emergency Response Guide posted in the laboratory.
- If the laboratory is equipped and personnel are trained, minor spills can be handled by laboratory personnel.
- If a spill is beyond the capacity of the laboratory to address, call (301) 405-3333 from a safe location.

REFERENCES AND ADDITIONAL RESOURCES

1. Safety Data Sheet (SDS) for Perchloric Acid
2. PubChem Perchloric Acid
3. Carnegie Mellon University, EHS Guidelines for Using Perchloric Acid
4. University of Illinois, Division of Research Safety Perchloric Acid
5. Boston University, Research Support Perchloric Acid and Perchlorate Salts
6. Prudent Practices in the Laboratory: Handling and Management of Chemical Hazards, National Academy Press, Washington, DC, 2011.
7. *Bretherick's Handbook of Reactive Chemical Hazards, 8th Edition*, Elsevier Science, 2017.