

Perchloric Acid

Introduction

Perchloric acid is a strong mineral acid, which is colorless, odorless, and fully soluble in water. Perchloric acid is corrosive to all tissues of the body, harmful if inhaled, ingested, or absorbed through the skin. Inhalation may cause irritation to the respiratory tract with burning pain in the nose and throat, coughing, wheezing, shortness of breath, and pulmonary edema. Skin contact causes burns and irritation. Eye contact causes burns, irritation, and may cause blindness. Ingestion may cause permanent damage to the digestive tract. Symptoms of exposure include cough, headache, dizziness, difficulty breathing, diarrhea, muscle weakness, nausea, vomiting, shock, coma, convulsions, or respiratory arrest.

Concentrations greater than 50% are considered “highly dangerous.” At concentrations greater than 72%, perchloric acid is a strong oxidizer. The oxidizing properties of perchloric acid increase greatly when heated. Although not flammable itself, concentrated perchloric acid may ignite other combustible material and increase the intensity of a fire. Anhydrous perchloric acid, or solutions with concentrations greater than 85%, present a serious explosion hazard. At these concentrations, perchloric acid is unstable and can decompose explosively or spontaneously combust at ordinary temperatures if mixed with organic compounds. Perchloric acid is incompatible with various chemicals and materials including, but not limited to, strong bases, strong acids, amines, phosphorus halides, alcohols, organic materials, powdered metals, and reducing agents.

Safe Work Practices

Lab personnel must follow the work practices below when handling, storing, or disposing of perchloric acid.

1. Read and understand the safety data sheet (SDS) for perchloric acid prior to use. The SDS must always be readily accessible in the lab.
2. If possible, substitute less hazardous chemicals for perchloric acid or reduce the quantity being used.
3. Properly label secondary containers holding perchloric acid with the name and hazard warnings.
4. Lab personnel must not work alone with perchloric acid.
5. Store perchloric acid in a designated corrosives storage cabinet away from organic or combustible materials and incompatible chemicals. Perchloric acid is incompatible with acids, bases, anilines, metals, dehydrating agents, reducers, phosphorus compounds, and organic

materials. Mixing perchloric acid with alcohols and certain other organic compounds can form explosive perchlorate esters.

6. Store in original container and inside proper secondary containment made of glass or porcelain. Perchloric acid should not be stored in metal or plastic containers.
7. An eyewash and safety shower must be in the immediate work area where perchloric acid is used.
8. All research with perchloric acid at concentrations of <72% and at normal temperatures must be conducted in a chemical fume hood with the sash at the lowest working height.
9. When working with perchloric acid at concentrations of 72% or greater, performing digestions, heating, or mixing with strong dehydrating chemicals, a specialized fume hood with built-in wash down systems and non-reactive metal surfaces must be used. The hoods must be washed down every day or more often according to the manufacturer's instructions and depending on frequency of use.
10. Place a sign on the hood when perchloric acid is in use to indicate that organic chemicals are prohibited.
11. Always wear appropriate personal protective equipment (PPE) while handling perchloric acid, including ANSI Z87.1-approved tight-fitting splash goggles, lab coat or chemical-resistant apron, chemical-resistant gloves as indicated on the SDS, clothing that covers the legs, and closed-toed footwear that covers the entire foot.

Storage

1. Store in a tightly closed container.
2. Store containers on shelves below eye level.
3. Store in a cool, dry, well-ventilated area away from sources of heat.
4. Protect from physical damage.
5. Store separately from organic material, bases, metals, and other incompatible materials.

Resources

UCLA Perchloric Acid SOP

<https://ucla.app.box.com/s/ushkrni7obl0fcpyea55me1ayloww42q>

University of Washington SOP

<https://www.ehs.washington.edu/resource/perchloric-acid-sop-532>

National Institute of Health

<https://pubchem.ncbi.nlm.nih.gov/compound/Perchloric-Acid>

National Oceanic and Atmospheric Administration

<https://cameochemicals.noaa.gov/chemical/1292>

Sigma-Aldrich

<https://www.sigmaaldrich.com/US>