**Standard Operating Procedures**

Laboratory Specific

**Chemical:** **Perchloric acid**

Please fill out the form completely.  Print a copy and insert into your

*Laboratory Safety Manual and Chemical Hygiene Plan*.

Refer to instructions for assistance.

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Department:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_                        Date when SOP was written:\_\_\_\_\_\_\_

Date when SOP was approved by the lab supervisor: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Principal Investigator:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Internal Laboratory Safety Coordinator/Lab Manager:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Laboratory Phone:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_   Office Phone:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Emergency Contact:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(Name and Phone Number)*

Location(s) covered by this SOP:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*(Building/Room Number)*

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**Type of SOP:** Process Hazardous Chemical Hazardous Class

**Purpose**

Perchloric acid is the [inorganic compound](http://en.wikipedia.org/wiki/Inorganic_compound) with the formula HClO4. Usually encountered as an aqueous solution, this colorless compound is a [strong acid](http://en.wikipedia.org/wiki/Strong_acid) comparable in strength to [sulfuric](http://en.wikipedia.org/wiki/Sulfuric_acid) acid and [nitric acid](http://en.wikipedia.org/wiki/Nitric_acid). It is a powerful [oxidizer](http://en.wikipedia.org/wiki/Oxidizer), but its aqueous solutions up to 70% are remarkably inert, only showing strong acid properties and no other oxidizing properties. Above concentrations of appr. 70% the speed of oxidizing reactions rapidly increases with increasing acid concentration. It is useful for preparing [perchlorate](http://en.wikipedia.org/wiki/Perchlorate) salts, especially [ammonium perchlorate](http://en.wikipedia.org/wiki/Ammonium_perchlorate), an important rocket fuel. Perchloric acid is also dangerously corrosive and readily forms explosive mixtures.

### Perchloric acid is mainly produced as a precursor to [ammonium perchlorate](http://en.wikipedia.org/wiki/Ammonium_perchlorate), which is used as rocket fuel. The growth in rocketry has led to increased production of perchloric acid. Several million kilograms are produced annually. It is one of the strongest [Brønsted-Lowry acids](http://en.wikipedia.org/wiki/Br%C3%B8nsted-Lowry_acid-base_theory). Despite hazards associated with the explosiveness of its salts, the acid is often preferred in certain syntheses.

**Physical & Chemical Properties/Definition of Chemical Group**

CAS#: 7601-90-3

Class: **Produces explosive salts, crystals and perchlorate residues**

Molecular formula: HClO4

Boiling Point: 203 oC @ 760 mm Hg

Melting Point:-18 oC

Decomposition Temperature: Not available



**Potential Hazards/Toxicity**

**EMERGENCY OVERVIEW:** Appearance: clear, colorless liquid. Causes digestive and respiratory tract burns. Causes eye and skin burns. Strong oxidizer. Contact with other material may cause a fire. Heating may cause an explosion. Contact with other material may cause explosion. Corrosive to metal.

**Highly important danger information!**

In addition to being a corrosive liquid, while not combustible, under some circumstances perchloric acid may act as an oxidizer and/or present an explosion hazard. Perchloric crystals, or perchloric acid in crystalline form, is an extremely dangerous inorganic compound. The crystals are sometimes formed due to condensation inside of ventilation hoods in chemical labs or in bottles stored for extended periods in the lab. Among the principle hazards are that the perchlorite crystals are subject to exploding on impact.  
  
Organic materials are especially susceptible to spontaneous combustion if mixed or contacted with perchloric acid. Under some circumstances, perchloric acid vapors form perchlorates in duct work, which are shock sensitive.

**Target Organs:** Eyes, thyroid, skin, mucous membranes.

**Potential Health Effects:**

**Eye:** Causes eye burns.

**Skin:** Causes skin burns.

**Ingestion:** Harmful if swallowed. Causes gastrointestinal tract burns.

**Inhalation:** Causes severe respiratory tract irritation with possible burns.

**Chronic:** Prolonged or repeated skin contact may cause dermatitis.

**Personal Protective Equipment (PPE)**

**Eyes:** Wear chemical goggles and face shield. Use chemical splash and impact-rated goggles.

**Skin:** Natural Rubber, Natural Rubber, PVC, Nitrile or Viton gloves must be worn while handling perchloric acid

**Clothing:** Wear long pants, closed toed shoes and a lab coat

**Respirators:**

Lab personnel intending to use/wear a respirator mask must be trained and fit-tested by ORS and should contact occhealt@uga.edu. This is a UGA requirement described in more detail in the [UGA Respiratory Protection Plan](https://esd.uga.edu/sites/default/files/respiratoryprotection.pdf) and supported by the [Office of Research Occupational Health and Safety Program](https://research.uga.edu/ohsp/).

A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

**Engineering Controls**

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Any procedure involving heating of perchloric acid must be conducted in a perchloric acid fume hood, with the sash down. No organic materials should be stored in the perchloric acid hood.

**First Aid Procedures**

**Eyes:** In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid immediately.

**Skin:** Destroy contaminated shoes. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.

**Ingestion:** If swallowed, do NOT induce vomiting. Call the poison control center at 1-800-222-1222. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.

**Inhalation:** If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

**Notes to Physician:** Treat symptomatically and supportively.

**Special Handling and Storage Requirements**

**Handling:** Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use spark-proof tools and explosion proof equipment. Avoid contact with clothing and other combustible materials. Do not get on skin or in eyes. Do not ingest or inhale. Use only with adequate ventilation. Do not allow perchloric acid to come into contact with strong dehydrating agents (concentrated sulfuric acid, anhydrous phosphorous pentoxide, etc.). Keep the quantities of perchloric acid handled at the bare minimum for safety. Perchloric acid should be handled in a masonry building with concrete or tile floors. Handling acid on wooden floors is dangerous, especially after the acid has dried. The wooden floor will then become sensitive to ignition by friction. Perchloric acid mist and vapor can condense in ventilation systems to form metallic perchlorates, which can be explosive. Inform laundry personnel of contaminant's hazards.

**Storage:** Do not store near combustible materials. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Avoid storage on wood floors. Perchloric acid should be stored segregated from all other chemicals & inside secondary containment (such as pyrex baking dish). It must not be stored near organic acids, near bases, or near other organic or flammable material. Shelves and floor material should be non-combustible and acid-resistant. Protect from freezing.

**Spill and Accident Procedure**

**Chemical Spill Dial 911**

**24-7 On-Call Response to Research, Environment, Health or Safety Concerns Dial 2-5561 from a campus phone or 706-542-5561 from a non-campus line.**

**Spill** – Follow the procedures set out in the [UGA Chemical and Laboratory Safety Manual.](http://research.uga.edu/docs/units/safety/manuals/Chemical-Laboratory-Safety-Manual.pdf)

[If there are any chemical-specific protocols for responding to a spill, insert them here or mark “none”:]

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# **Medical Emergency Dial 911**

**Life Threatening Emergency, After Hours, Weekends And Holidays** – Dial **911** or the emergency phone numbers listed at the beginning of the UGA Chemical and Laboratory Safety Manual

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Non-Life Threatening Emergency** – Follow the instructions in the UGA Chemical and Laboratory Safety Manual.

*Note: All incidents that result in an injury or property damage must be reported to ORS / ESD using a University Incident/Accident Report.*

**Decontamination/Waste Disposal Procedure**

**For general hazardous waste disposal procedures, see Appendix H of the UGA Chemical and Laboratory Safety Manual.**

**Chemical Specific Procedures: [to be inserted or marked as “none”]**

**Safety Data Sheet (SDS) Location**

UGA personnel can access Online SDS through a link in the upper left corner of the ESD home page (<https://esd.uga.edu>) and logging in by using their UGA email user name and password.

**Protocol/Procedure**

*(Add specific description of procedure.)*

**Note:** Any deviation from this SOP requires written approval from PI.

**Documentation of Training** (signature of all users is required)

* Prior to conducting any work with Perchloric acid, designated personnel must provide training to his/her laboratory personnel specific to the hazards involved in working with this substance, work area decontamination, and emergency procedures.
* The Principal Investigator must provide his/her laboratory personnel with a copy of this SOP and access to the SDS provided by the manufacturer.
* The Principal Investigator must ensure that his/her laboratory personnel have attended appropriate laboratory safety training or refresher training within the last 12 months.

I have read and understand the content of this SOP:

|  |  |  |
| --- | --- | --- |
| **Name** | **Signature** | **Date** |
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