

LAB SPECIFIC OPERATING PROCEDURE (LSOP) for Perchloric Acid

Principal Investigator (PI):

Building:

Lab(s) Covered by LSOP:


Department:

Lab Phone Number(s):

SECTION 1. PHYSICAL & CHEMICAL PROPERTIES

CAS#: 7601-90-3	Density: 1.664 g/mL at 25 °C (77 °F)
Molecular Formula: HClO ₄	Flash point: 113 °C (235 °F) - closed cup
Form: Liquid	Lower explosion limit: no data available
Color: colorless	Upper explosion limit: no data available
Melting point/freezing point: -18 °C (0 °F)	Odor: no data available
Vapor pressure: 9.1 hPa (6.8 mmHg) at 25 °C (77 °F)	

SECTION 2. OSHA's (GHS)-SDS INFORMATION

Chemical Name	GHS Pictogram(s)	Generic Chemical Definition
Perchloric Acid		Perchloric acid is the inorganic compound with the formula HClO ₄ . Usually encountered as an aqueous solution, this colorless compound is a strong acid comparable in strength to sulfuric acid and nitric acid. It is a powerful oxidizer, but its aqueous solutions up to 70% are remarkably inert, only showing strong acid properties and no other oxidizing properties. Above concentrations of approx. 70% the speed of oxidizing reactions rapidly increases with increasing acid concentration. The oxidizing power also greatly increases as the temperature is increased. It is useful for preparing perchlorate salts, especially ammonium perchlorate, an important rocket fuel. Perchloric acid is also dangerously corrosive and readily forms explosive mixtures.

OSHA's GHS Signal Word is (DANGER)

SECTION 3. GHS HAZARD (H) CODES and PRECAUTIONARY STATEMENT (P) CODES

(H)/Hazard Statement (s)

H271=May cause fire or explosion; strong oxidizer.

H302=Harmful if swallowed.

H314=Causes severe skin burns and eye damage.

(P)/Precautionary Statement (s)

P220=Keep/Store away from clothing/ combustible materials.

P280=Wear protective gloves/ protective clothing/ eye protection/ face protection

P305 + P351 + P338=IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310=Immediately call a POISON CENTER or doctor/ physician.

SECTION 4. ADMINISTRATIVE CONTROLS

1. Lab-specific safety training must be provided by the principal investigator (PI) or other qualified personnel to all researchers working with Perchloric Acid.
2. The PI must perform a Workplace Hazard Assessment (WHA) form for Laboratories at, http://research.uchc.edu/wp-content/uploads/sites/1137/2015/09/workplace_hazard_assessment.pdf
3. Researchers must **not work alone** with Perchloric Acid. Please note that UCONN Health/Storrs has a **Working Alone Policy, found at <http://content.research.uconn.edu/pdf/uch/rcs/ehs/policy-workingalone2017.pdf>**
4. Documentation of training is required and satisfied upon review and sign-off of this LSOP and submission to EH&S for approval.
5. In addition to reviewing this document, you must review the Safety Data Sheet (SDS) for Perchloric Acid prior to use, and instruct your employees.
6. Whenever possible, find **safer substitutes or reduce** the quantities of Perchloric Acid.
7. Experiments should be performed **during normal business hours** (e.g.) 8:00 am-5:00 pm Mon-Fri) if possible.
8. Multiple transfers of small volumes/quantities of Perchloric Acid are preferred over a single transfer of larger volumes/quantities.
9. Any handling of Perchloric Acid requires supervision from the Lab supervisor, PI or other experience employee.

SECTION 5. ENGINEERING CONTROLS

10. Chemical fume hoods must be running at over 90 linear feet/minute and tested by EH&S within the last year.
11. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.
12. Ensure that eyewash stations and safety showers are proximal to the workstation location and tested accordingly.
13. EH&S certifies flow rates of fume hoods for UCONN Health, contact EH&S at 860-679-2723 for re-test.
14. If the hood is not working properly, contact Facilities to repair the hood at 860-679-2125.
15. Work with Perchloric Acid – the work must be conducted in a **suitable/rated fume hood**.
16. Sash height must be kept as low as possible to avoid escaping fumes and provide a physical barrier.
17. Laboratories and rooms where Perchloric Acid is used must have general room ventilation that is negative pressure with respect to the corridors and external environment. **The laboratory/room door must be kept closed at all times.**

SECTION 6. PERSONAL PROTECTIVE EQUIPMENT *(At a minimum, the following PPE must be worn at all times.)*

Eye and Face Protection

In case of eye contact-rinse thoroughly with plenty of water using an eyewash station for at least 15 minutes, occasionally lifting the upper and lower eyelids. Remove contact lenses if possible.

18. ANSI Z87.1-compliant safety glasses with side shields, or chemical splash goggles.
19. Ordinary prescription glasses will NOT provide adequate protection unless they also meet ANSI standard and have compliant side shields.

Skin and Body Protection

In case of skin contact If skin contact occurs, and/or skin or clothing are on fire, immediately drench in the safety shower with copious amounts of water for no less than 15 minutes to remove any remaining contaminants. If possible to do so without further injury, remove any remaining jewelry or clothing.

20. Gloves are required when handling hazardous chemicals. Refer to specific chemical SDS for information on glove selection.
21. Lab coats are required when handling hazardous chemicals in the lab. Select the type of lab coat according to the substances at the specific workplace.

22.	Long pants, closed-toe/closed-heel shoes, covered legs, and ankles.
SECTION 7. SPECIAL HANDLING & STORAGE REQUIREMENTS	
Conditions for safe handling	
23.	Perchloric acid mist and vapor can condense in ventilation systems to form metallic perchlorates, which can be explosive. If you are planning on heating perchloric acid, contact EH&S.
24.	Eliminate or substitute for a less hazardous material when possible.
25.	Design your experiment to use the least amount of material possible to achieve the desired result.
26.	Do not exceed the scale of procedures specified in Protocol/Procedure section without approval of the PI.
27.	Verify your experimental set-up and procedure prior to use.
28.	Know the location of the nearest eyewash, safety shower and fire extinguisher before beginning work.
29.	Upon leaving the work area, remove any personal protective equipment worn and wash hands.
30.	At the end of each project, thoroughly decontaminate the work area according to the material being handled.
Conditions for safe storage	
31.	Perchloric Acid must be stored separately from flammables and reducing agents in an approved acid or corrosives safety cabinet.
32.	If no corrosive cabinet available, use secondary container to store Perchloric Acid.
33.	Store, use and handel Perchloric Acid per SDS and Manufacturer safe recommendations.
34.	Conditions for safe storage, including any incompatibilities are to keep container tightly closed in a dry and well-ventilated place.
35.	
36.	Do not store Perchloric Acid flammable materials and reducing agents or other incompatibles.
SECTION 8. SPILLS, ACCIDENTS & EMERGENCY PROCEDURES	
37.	Call 911 or 7777 from landline if Life Threatening and call EH&S at 860-679-2723 for Non-Life Threatening Spill Coordination efforts.
38.	Evacuate the laboratory and inform others in the immediate area to leave the work area. Evacuate the laboratory calmly yet safely, and rally at the Emergency Assembly Area (EAA) as designated by the Fire Department
39.	The (EAA) is a pre-determined safe zone for employees to meet during an emergency.
40.	Upon evacuation, also try to minimize damage; isolate/contain if able. (e.g.) open hoods to accelerate dissipation in air, hit HVAC purge button to increase laboratory air changes, disconnect electrical sources etc.
41.	Upon Evacuation, close door(s) to lab and post a “NO ENTRY” sign(s) or other warning information on the door.
42.	The Emergency Evacuation Attendants (EEA) are those who have been assigned take roll call of employees and report to the Emergency Evacuation Coordinator (EEC)
43.	No one shall be permitted to leave the Emergency Assembly Area (EAA) until the scene has been determined safe for re-entry by the On-Scene Emergency Coordinator (EC) -Senior Fire Department Official.
44.	Do not re-enter the lab/area until instructed to do so by the On-Scene Emergency Coordinator (EC) -Senior Fire Department Official.
45.	Should the Emergency Assembly Area (EAA) be compromised, evacuees will be instructed by Emergency Evacuation Attendants (EEA’s) or the Emergency Evacuation Coordinator (EEC) to re-locate to a secondary Emergency Assembly Area (SEAA)

46.	EH&S recommends that individual labs discuss emergency response and readiness at their laboratory meetings and practice drill. EH&S can aid in this effort along with Public Safety.
47.	Report Spills, accidents which are also deemed non-life threatening or non-emergency situations to your respective PI/Supervisor and EH&S.

SECTION 9. FIRST AID PROCEDURES *(Have your SDS Available for First Responders)*

First Aid- Eyes	<ol style="list-style-type: none"> 1. Remove contact lenses (if applicable) 2. Forcibly hold eyelids open and flush eyes under eyewash for 15 minutes 3. If pain persists after 15 minutes, dial 911 4. Keep flushing eyes until emergency personnel arrives 5. Report incident to PI/Supervisor and EHS.
First Aid- Skin	<ol style="list-style-type: none"> 1. Remove contaminated clothing (if applicable) 2. Flush affected area(s) under safety shower for 15 minutes 3. If pain persists after 15 minutes, dial 911 4. Keep rinsing affected area until emergency personnel arrives 5. Report incident to PI/Supervisor and EHS. 6. Needle stick/puncture exposure-wash the affected area with antiseptic soap and warm water for 15 minutes.
First Aid- Inhalation	<ol style="list-style-type: none"> 1. Move to fresh air 2. Dial 911 3. Report incident to PI/Supervisor and EHS.

SECTION 10. HAZARDOUS WASTE MANAGEMENT-(GENERAL)

48.	All hazardous wastes must be labeled with “Hazardous Waste” stickers or tags, use full chemical names to describe the waste (i.e. no chemical abbreviations or symbols), have 100% of the constituents by volume identified and be stored in containers with tight-fitting caps or lids, and be segregated by chemical compatibility.
49.	Hazardous wastes must be stored at or near a green (S.A.A.) aka “Satellite Accumulation Area” sign prior to disposal by EHS.
50.	Hazardous wastes must accumulate under the control of the generator, with a container maintained in good condition, free of exterior residues on container or in the spill tray. All spills and residues must be immediately cleaned up.
51.	Hazardous wastes must be transferred within a chemical fume hood but then be removed for temporary storage with the generator’s respective (SAA). When chemical waste is being transferred is the only time that it may remain open. Closed, means that no liquid will spill from a waste collection container, should the container be knocked over/inverted.
52.	All Perchloric Acid solutions and contaminate solids will be collected and characterized by EH&S as chemical waste (CT-Regulated versus Hazardous Waste)

SECTION 11. SPECIFIC PROCEDURE *(left blank intentionally; please see & follow instructions)*

(Document the Experiment Information with regard to use of Perchloric Acid, too include the procedures for disposal of the waste and the selection and application of correct PPE)

Instructions As Follows:

SECTION 12. APPROVAL

I have reviewed, understand and agree to follow this LSOP regarding Perchloric Acid liquids and solids. Failure to follow the LSOP and lab-specific training guidelines for research with Perchloric Acid is a violation of the [University Health & Safety Policy](#) and [University Code of Conduct](#). Further approval from the PI is required if any of the following events occur:

- A change in the agreed-upon experimental set-up is planned
- Signs of a failure in safety design or equipment are observed
- Signs or symptoms of a chemical exposure to any personnel are observed
- Unexpected and/or potentially dangerous experimental results occur (e.g., fire, uncontrolled buildup of heat and/or pressure, etc.)

PLEASE ENSURE THAT THIS LSOP AND THE SDS ARE REVIEWED, TRAINED UPON AND UNDERSTOOD BY END USERS. THIS FORM IS DESIGNED TO NOT ONLY PROVIDE UCONN HEALTH WITH RISK MITIGATION BUT FOR THE PRINCIPAL INVESTIGATOR AS WELL. PLEASE SEND A COPY OF THE COMPLETED LSOP TO EH&S FOR REVIEW AND APPROVAL. EH&S APPRECIATES YOUR COOPERATION WITH THIS MATTER.

Researcher Signature	Date	Trainer Signature	Training Date

SECTION 13. PRINCIPAL INVESTIGATOR CERTIFICATION

I approve the contents of the lab-specific standard operating procedure listed above:

PI Signature:	Date:
Date sent to EH&S for Review and Approval:	Date: