UNIVERSITY OF VICTORIA
Occupational Health, Safety and Environment

Chemical Safety – Special Hazards

Safe Work Procedure (SWP – 001)

Perchloric Acid

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REVISION HISTORY

	Revision Date	*Author*	*Position*
1.	23-June-2014	Troy Hasanen	OHSE Consultant
2.	16-Apr-2019	Troy Hasanen	OHSE Consultant

DOCUMENT APPROVAL

Approved by: Laboratory Safety Committee

Martin Boulanger _____ *November 18, 2019*

Chair, Laboratory Safety Committee *Date Approved*

**This revision replaces all previous versions of this document. If a copy is printed, it is the users' responsibility to verify the copy is the most current version of the document.*

University of Victoria

PURPOSE

To provide guidance and instruction on the safe use of perchloric acid in laboratories and to ensure regulatory compliance with WorkSafeBC (WSBC). In addition to this general Safe Work Procedure (SWP), each lab must develop a lab-specific safe work procedure unique to the experiments and activities being performed. The Lab SWP must be reviewed by OHSE (see Procedures, #7).

SCOPE

This SWP applies to the use of perchloric acid in concentrations of 3.3M (20% v/v) or less. The use of perchloric acid in higher concentrations, or in applications involving digestions or heating, is not permitted since the university does not have a dedicated perchloric acid fume hood with wash-down capabilities.

TRAINING

The following training is required to be completed prior to working with perchloric acid:

- WHMIS
- Lab Safety for Lab Workers
- Lab SWP with documented signoff by the individual and their supervisor.

Refresher training in the General and Lab SWP must be provided when:

- there has been an extended timeframe of inactivity, or
- there has been an incident or injury, or
- 2 years has elapsed since the original training.

REGULATION AND POLICY

The University of Victoria will follow WorkSafeBC Occupational Health and Safety Regulation, specifically sections 30.8 (5,b); 30.10 (2, b) and 30.21.

RESPONSIBILITY

It is the responsibility of personnel undertaking activities with special hazards to complete all required training and adhere to the safe work procedures, including any additional lab or job-specific procedures.

It is the PI's or supervisor's responsibility to ensure that individuals working with special hazards have been trained prior to commencing work and have demonstrated competency in safely performing all duties associated with the special hazard in accordance with the safety work procedures.

DEFINITIONS

List key terms or regulatory abbreviations, as applicable

MATERIALS

Acid waste container dedicated to perchloric acid to ensure no incompatible materials are mixed in by other lab users. Dedicated lab bench area clearly delineated and labelled for perchloric acid use only. Storage and working containers must be in glass or Teflon.

HAZARD

Perchloric acid is a very strong oxidizing agent and strong acid. Even dilute solutions can, over time, reduce certain plastics to dust. Perchloric acid can form explosive mixtures with organic materials such as wood, paper, cardboard and many organic solvents. Clothing and rubber materials can become highly flammable if contaminated with

perchloric acid. Perchloric acid vapours can condense to form perchlorate crystals, which are highly explosive and sensitive to physical shock. To reduce potential for vapours, no use of perchloric acid above room temperature is permitted. The perchloric acid SDS must be reviewed for hazards and compatibilities prior to any use.

PROCEDURES

1. Handling

a. To safely handle (>20% v/v) perchloric acid a dedicated perchloric acid fume hood with wash down capabilities is required. UVic does not have any perchloric acid hoods available, so all perchloric activities must be with perchloric acid concentrations of 3.3M or 20% v/v or less.
b. To safely handle perchloric acid (3.3 M or 20% v/v/ or less) dedicated areas with no combustible material and Lab SWP (Safe Work Procedures) are required.
c. Perchloric acid digestions and experiments involving heating or exothermic reaction are not permitted. These activities would produce vapours requiring a dedicated perchloric acid fume hood with wash down capabilities.
d. Current perchloric acid usage on campus is for electrochemistry experiments and biochemical histone work. It is permissible to use unheated ≤20% v/v/ perchloric acid in general laboratories where a Lab SWP has been approved by OHSE. The SDS lists perchloric acid as safe to use with no engineering controls (fume hood) at room temperature due to its very low vapour pressure.

2. Storage

a. Perchloric acid should be stored separately from other chemicals, and must never be stored with known incompatible materials.
b. No more than 2 L of 20% v/v perchloric acid may be stored in a laboratory.
c. Perchloric acid should be stored in the original container or a clear glass or Teflon bottle utilizing a non metallic cap with Teflon seal.
d. Containers of perchloric acid must be stored using secondary containment glass or ceramic trays that will contain the entire volume of stored acid in a designated metal acid storage cabinet.
e. Perchloric acid must be stored in such a manner that, in the event of breakage, the spilled acid will not contact flammable materials, wood or similar combustible materials.
f. Stored perchloric acid must be inspected at least monthly and if any discolouration is noted it must be disposed of immediately. See Waste Disposal.
g. If crystals have formed around the bottom of the bottle or around the threads of the cap, there is a potential explosion hazard. The perchlorate crystals are shock and friction sensitive and can explode if disturbed. Do NOT move the bottle. Evacuate the lab posting a 'Do Not Enter' sign then immediately contact OHSE for assistance.

3. Spills

a. Follow OHSE's general spill response instructions.
b. Specific steps for perchloric acid spills:
    i. Don personal protective equipment nitrile gloves, safety glasses, lab coat and closed toe shoes.
    ii. Neutralize with a reducing agent such as sodium bisulfite or ferrous sulphate.
    iii. Slowly apply acid neutralizer (Spill X-A, Sodium carbonate, or equivalent) from the outside of the spill inward.
    iv. Use pH paper to ensure all of the acid is neutralized.

v. Scoop the absorbed neutralized material into an appropriately sized plastic (polyethylene or polypropylene) container.
vi. Wipe up any residue with a moist rag or paper towel.
vii. Rinse the rag or paper towel in a sink under running water thoroughly to remove any trace of perchloric acid from the rag or paper towel and the sink.
viii. Wash all tools and equipment that may be contaminated with perchloric acid to remove any traces of perchloric acid contamination.
ix. Collect and label all materials used in the clean-up for disposal through the hazardous waste system indicating the material is "Neutralized perchloric acid spill absorbent and debris".

c. Complete a *Department Incident & Investigation Report* to document and review the spill incident.

4. Decontamination

a. Neutralize equipment or surfaces with a reducing agent such as sodium bisulfite or ferrous sulphate.
b. Materials (e.g. disposable pipette tips, reusable beakers, etc.) that have been in contact with perchloric acid solutions must be rinsed with 10x volume of water in a sink.

5. Emergencies and First Aid

a. Call 911 to summon an ambulance if there is a medical emergency.
b. Call Campus Security at 250-721-7599 for first aid.
c. If material has contacted the eyes, use emergency eyewash and flush for at least 15-20 minutes.
d. For skin contact, flush affected area with running water for at least 15-20 minutes.

6. Waste Disposal

a. Perchloric acid solutions
    i. Solutions of perchloric acid should not be mixed with other acids.
    ii. Perchloric acid solutions (less than 20% v/v or 3.3 M) can be placed in a clear glass bottle or Teflon bottle utilizing non-metallic cap with Teflon seals.
    iii. Dispose as hazardous waste
a. Materials that have been in contact with Perchloric acid solutions.
    i. Follow decontamination procedure and dispose with similar materials as hazardous waste.

7. Lab SWP

In additional to this general SWP, each lab that is using perchloric acid (3.3M (20% v/v) or less) requires a Lab SWP that includes specific procedures for:

a. Storage in clear glass containers utilizing non-metallic caps with Teflon seals;
b. Secondary spill containment using trays of glass or ceramic;
c. How to decontaminate any surfaces or reusable lab ware;
d. How to dispose of any consumables by decontaminating with minimum 10x volume of water;
e. The clear delineation of lab bench work space with a sign stating "Perchloric acid use, No flammable or combustible materials";
f. Spill containment and response.

REFERENCES

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