Oxidizing Chemicals

Standard Operating Procedure

Revision Date: 09/14/2023

This standard operating procedure (SOP) outlines the handling and use of oxidizing chemicals. Review this document and supply the information required to make it specific to your laboratory. In accordance with this document, laboratories should use appropriate controls, personal protective equipment, and disposal techniques when handling oxidizing chemicals. *All laboratory workers must read and understand the*[*Laboratory Emergencies SOP*](https://ehs.umich.edu/wp-content/uploads/2022/05/LaboratoryEmergencyProceduresSOP.docx)*prior to commencing any work in a laboratory.*

# Description [Provide additional information as it pertains to your research protocol]

Oxidizing chemicals are materials that spontaneously evolve oxygen at room temperature or with slight heat.  In other words, these substances either can supply oxygen in a reaction or can be reduced (gain electrons), thereby facilitating oxidation (loss of electrons) of another substance. (American Chemical Society Joint Board–Council Committee on Chemical Safety, 2017) Oxidizing chemicals also promote combustion.  Strong oxidizers are capable of forming explosive mixtures when mixed with combustible, organic, or easily oxidized materials.

Table : Examples of Oxidants

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| **Gases:** | Fluorine, chlorine, ozone, nitrous oxide, steam, oxygen |
| **Liquids:** | Hydrogen peroxide, nitric acid, perchloric acid, bromine, sulfuric acid, water |
| **Solids:** | Nitrates, nitrites, perchlorates, peroxides, chromates, dichromates, picrates, permanganates, hypochlorites, bromates, iodates, chlorites, chlorates |

(Prudent Practices in the Laboratory: Handling and Disposal of Chemicals, 1995, p. 50)

## Process [Write the steps for using the chemical in your research protocol]

# Potential Hazards [Provide additional information as it pertains to your research protocol]

Oxidizers are agents that initiate or promote combustion in other materials, generally through the release of oxygen.

**Check the safety data sheet (SDS) to determine if a material is an oxidizer and to identify other hazards.**

# Engineering Controls [Provide additional information as it pertains to your research protocol]

Work with strong oxidizing agents should be conducted in a fume hood. Sash height should be kept low to avoid the release of fumes and provide a physical barrier.

# Work Practice Controls [Provide additional information as it pertains to your research protocol]

* Minimize the quantities of oxidizers on hand.
* Exercise caution when mixing oxidizing agents with flammable or combustible materials for research. Use small amounts to reduce the generation of heat and control the reaction.
* Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving oxidizing chemicals must be conducted in a fume hood, glove box, or isolated in an acceptable manner.
* Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.
	+ Ensure the cold trap is appropriate for situation and follows all manufacturer and safety guidelines. Refer to this [Cold Trap Selection Guide](https://www.labconco.com/category/centrivap-cold-traps#resources) from Labconco for guidance on selecting the correct cold trap.
	+ Refer to the [U-M Cryogenic Liquids SOP](https://ehs.umich.edu/research-clinical/chemical/)

# Personal Protective Equipment [Provide additional information as it pertains to your research protocol]

**Eye protection** in the form of safety glasses must be worn at all times when handling oxidizing chemicals. Ordinary (street) prescription glasses do not provide adequate protection. Adequate safety glasses must meet the requirements of ANSI Z87. 1 and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for splash hazard exists, other eye protection and/or face protection must be worn.

**Gloves** should be worn when handling oxidizing chemicals. Disposable nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. Lab workers should contact Environment, Health & Safety (EHS) at (734) 647-1143 for advice on chemical-resistant glove selection when direct or prolonged contact with hazardous chemicals is anticipated.

**Lab coats**, closed-toe shoes, and long-sleeved clothing must be worn when handling oxidizing chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

Safety shielding is required any time there is a risk of explosion, splash hazard, or a highly exothermic reaction. All manipulations of oxidizing chemicals which pose this risk should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

# Transportation and Storage [Provide additional information as it pertains to your research protocol]

* Store in an isolated area away from flammable and combustible materials. These agents may react at room temperature producing fire or explosions so store them in a cool, dry location in accordance with the manufacturer's guidance.
* Do not store on wooden shelves or in wooden cabinets.
* Do not use corks or rubber stoppers.

# Waste Disposal [Provide additional information as it pertains to your research protocol]

Because most spent, unused, and expired chemicals/materials are considered hazardous wastes, they must be properly disposed of. **Do not dispose of chemical wastes by dumping them down a sink, flushing them in a toilet, or discarding them in regular trash containers, unless authorized by EHS Hazardous Materials Management (HMM)**. Contact EHS-HMM at (734) 763-4568 for waste containers, labels, manifests, waste collection, and any questions regarding proper waste disposal. Also, refer to the EHS [Hazardous Waste](http://ehs.umich.edu/haz-waste/) Web page for more information.

# Training of Personnel

All personnel are required to complete the ***General Laboratory Safety Training*** session (**BLS025w** *or equivalent*) via the [EHS My LINC](http://ehs.umich.edu/education/) Web Page. Furthermore, all personnel shall read and fully adhere to this SOP when handling oxidizing chemicals.

# References

American Chemical Society Joint Board–Council Committee on Chemical Safety. (2017). *Safety Document Archive.* Retrieved from ACS Institute: https://www.acs.org/content/dam/acsorg/about/governance/committees/chemicalsafety/publications/safety-in-academic-chemistry-laboratories-students.pdf

Prudent Practices in the Laboratory: Handling and Disposal of Chemicals. (1995). Washington, DC: The National Academies Press. doi:10.17226/4911

# Certification

I have read and understand the above SOP. I agree to contact my Lab Director if I plan to modify this procedure.

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### Major Revisions (Tracking purposes only -- Do not print as part of SOP)

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| Date | Revision |
| 09-19-18 | Updated EHS name and logo and format and revised the Exposure/unintended contact section (AKJ) |
| 04-04-19 | Updated format (DML). |
| 09-14-23 | Added references, aligned guidance with CHP. (RSH)  |