



OXIDIZERS

STANDARD OPERATING PROCEDURES



GENERAL SUMMARY

Oxidizing agents **promote/support combustion** or spontaneously evolve **oxygen and other oxidizing substances** (e.g., bromine, chlorine, or fluorine) at room temperature or with slight heating. Oxidizers have a wide variety of applications including disinfectants, agricultural fertilizers, fuel, and explosives. Common oxidizers include **peroxides, nitric acid, nitrates, nitrites, and perchlorates**. The National Fire Protection Association (NFPA) separates oxidizing materials into **four ascending classes** according to their ability to cause spontaneous combustion and to increase the burning rate.

Some oxidizers have **specific handling or storage requirements and other associated hazards, such as corrosivity or toxicity** (e.g., nitric acid, sodium nitrite). **Consult the Safety Data Sheet** for the specific chemical you plan to utilize to create an **agent specific SOP** (see below).

more hazardous



less hazardous

- **may explode** when catalyzed or exposed to heat, shock, or friction; or **may cause spontaneous ignition**
- **ammonium permanganate, hydrogen peroxide (>91%), perchloric acid solutions (>72.5%)**
- **severely increases the burning rate of combustibles**
- **causes sustained and vigorous decomposition if contaminated with combustibles/sufficient heat**
- **ammonium dichromate, potassium bromate, potassium chlorate**
- **moderately increases the burning rate of combustibles**
- **may cause spontaneous ignition**
- **chromic acid, magnesium perchlorate, nitric acid (40%-86%)**
- **slightly increases the burning rate of combustibles**
- **does not cause spontaneous ignition**
- **hydrogen peroxide (<27.5%), potassium nitrate, sodium nitrite**

ROUTES OF EXPOSURE



INHALATION

Breathing in fumes, vapors, gases, or particulate matter.



DERMAL

Splashes on intact and non-intact skin, in eyes and nose, or injection.



INGESTION

Consuming a chemical, contaminated items, or using contaminated hands.

- Oxidizers have **similar health hazards to corrosives**.
- **Ingestion** of oxidizers can lead to **caustic esophagitis and lipid peroxidation**.
- The stronger, or **more concentrated**, the oxidizer and the **longer** it remains in **contact** with the body, the **worse the injury** will be.
- Inhalation of corrosive oxidizers may cause chemically induced **pulmonary edema**.



PLANNING CONSIDERATIONS

- Use a **less hazardous chemical**, if possible.
- Purchase the **minimum quantity and concentration** needed.
- Ensure **space is suitable** for proposed work.
- **Verify all work areas** have appropriate engineering controls in place.

ENGINEERING CONTROLS

Single pass ventilation, where 100% of the air is pulled from the outside and directly exhausted back out, should be provided to all areas where oxidizing chemicals may be handled or stored.

Chemical Fume hoods are required when working with oxidizers. If a chemical fume hood is not available, glove boxes or other appropriate containment devices may be used.



Check that your fume hood is in working order by:

- Verifying the date on the **certification** sticker is in the past year.
- Check the flow monitor is between **80 and 120 FPM**.
- Test the hood alarm to ensure correct function.
- Contact EHS&EM if hood is not functioning properly.

Work safely in a fume hood by:

- Working with the **sash as low as practicable** and not above 16.”
- **Work 6 inches into the depth** of the cabinet, not right on the edge.
- Keep **bulky equipment outside the hood** if possible.

****Work with perchloric acid ($\geq 72\%$ or heated)** requires the use of specially designed fume hoods:

- Use of heated and concentrated perchloric acid in a regular fume hood may lead to the formation of potentially explosive perchloric acid crystals within the fume hood exhaust system.
- Perchloric acid hoods and exhaust ductwork must be constructed of materials that are impervious to and non-reactive with perchloric acid and/or its by-products
- The hood must be equipped with a wash-down system to prevent the perchlorate salt formation or buildup.
- The hood baffles must be removable for inspection and cleaning.
- Ductwork should take the shortest path to the outside of the building

Emergency showers, eye washes, and/or eyewash/drench hose units must be available. [A weekly operational check](#) of the eyewash stations is required and the path to all emergency equipment should be **free of any obstructions**.



ADMINISTRATIVE CONTROLS








Always Use Good Lab Safety Practices!

- No Food or drink
- Wash Hands
- Clean after yourself
- Label fridges and ice machines "Lab Use only"
- Utilize appropriate PPE
- Never reuse disposable gloves
- Don't work alone

- Design procedures to:
 - **Minimize contact and exposure time**
 - **Minimize open container work**
- Designate and label work areas with **limited access**
- Complete all relevant **training**
- Know the location of all **emergency equipment**
- **Never leave experiments unattended**
- Use extra caution when mixing with organics; add small amounts to limit heat production and control the reaction
- Perform **liquid transfers** slowly using a **funnel** to minimize splash, splatter, and spills; for **small volumes** utilize luer-lock, integrated-needle syringes or mechanical pipettes
- Ensure all **containers/materials are compatible** for proposed use. **Do not use cork or rubber stoppers** to seal containers
- Practice proper [glove removal technique](#)

PERSONAL PROTECTIVE EQUIPMENT

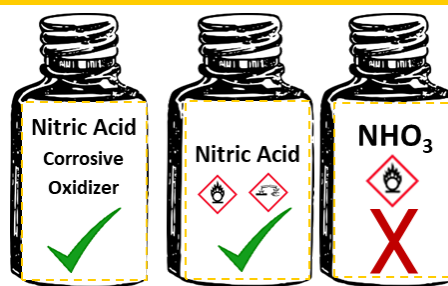
Remove all PPE before leaving the lab; don't touch common items (e.g., doorknobs) with gloves on.

HANDS	EYE & FACE	SKIN
<ul style="list-style-type: none"> ➤ Gloves are always required. ➤ Always check glove compatibility with the specific chemical in use. ➤ If working with a chemical with high dermal toxicity, double-glove. ➤ Change gloves when contaminated or damaged. 	<ul style="list-style-type: none"> ➤ Safety glasses required. ➤ Safety goggles and/or a face shield must be worn when transferring large volumes, and in other situations where a splash or aerosols are likely (e.g., transfer of liquids outside of a fume hood). 	<ul style="list-style-type: none"> ➤ Lab coat, fastened with sleeves extending to the wrists is required. ➤ Long pants and close-toed shoes are required. ➤ Use a rubber apron when handling large volumes or there is a high splash risk.
	 	   

LABELING REQUIREMENTS

Chemical containers **must be labeled** with:

- **Full chemical name** and all **hazards**.
- Labels should be **legible** and in **good condition**.
- Regularly check chemical stock to **verify chemicals are labeled properly**.



STORAGE REQUIREMENTS

- Store in **shatter-resistant containers** in **secondary containment**.
- Store in a **well-ventilated** area away from heat sources and combustible materials.
- Store in **oxidizer or corrosion-resistant cabinets** whenever possible; If no corrosion-resistant cabinet is available, store in plastic containment in regular non-wooden cabinets away from other potentially combustible materials. Parafilm the cap can help reduce corrosion to the interiors of metal cabinetry/hardware.
- Do not store oxidizing liquids **under sinks or above eye level**.
- Keep containers **tightly closed**.
- **Do not store with incompatible chemicals**: Keep away from all organic reagents and solvents; Separate acids and bases; inorganic acids and organic acids. **Nitric acid** should be stored away from all other chemicals. [Access our compatibility flyer here!](#)
- Regularly **check containers** for cracks/warping and expiration dates.

WASTE DISPOSAL

- Do **not** dispose of oxidizing chemicals **into sinks or sewer drains**. Refer to App State's [Drain Disposal Guidance](#) if you are unsure on whether a chemical can be discarded into the drain or must be collected for disposal.
- **Store** hazardous waste in **chemically compatible containers** within designated waste area.
- Ensure **structural integrity** of containers until pick up.
- Keep containers **capped tightly** and use **secondary containment**.
- **Separate** waste by hazard class and compatibility.
- **Label** with an [Appalachian State hazardous waste label](#) prior to pick up.
- Waste should be neutralized before pickup, if possible.



CONTACT **EHS & EM** AT **(828) 262-4008** FOR CHEMICAL WASTE COLLECTION OR REGULATORY GUIDANCE.



EMERGENCY INFORMATION:

FIRE:

Evacuate the building immediately, pulling the fire alarm on the way out. Meet at your building's assembly point and contact emergency personnel (University Police- 828-262-8000 or 911). Follow instructions and advise emergency personnel of the situation. When able, contact the primary and secondary emergency contacts listed in the Lab Safety Plan.

SPILLS:

Do not clean the spill unless trained. Evacuate the area if the spill is fuming or irritating to the respiratory tract or eyes/skin. Contact emergency personnel (University Police- 828-262-8000 or 911). Follow instructions and provide information such as location, chemical name & hazards, amount released, etc. When able, contact the primary and secondary emergency contacts listed in the Lab Safety Plan.

EXPOSURE:

Consult the Lab-Specific procedures to identify and follow any exposure procedures for the specific chemical in question. If no specific procedures are listed, for spills on the body, in the eye, or in an open wound, find and activate the nearest emergency shower or eyewash station. Immediately discard any contaminated clothing. Stand in the emergency shower stream or use the eyewash/drench hose to stream water over the affected areas for at least 15 full minutes. Contact emergency personnel (University Police- 828-262-8000 or 911) using the Safety Data Sheet of the chemical to communicate the hazards with medical professionals. When able, contact the primary and secondary emergency contacts listed in the Lab Safety Plan.

EMERGENCY CONTACT INFORMATION

Appalachian Police Department.....	(828) 262-8000
Environmental Health, Safety, and Emergency Management	(828) 262-4008
Watauga Medical Center	(828) 262-4100
Poison Control Center	(800) 222-1222



LAB-SPECIFIC PROCEDURES

Chemical Name:	Enter full chemical name here.
Hazards:	Describe all hazard classes and categories associated with this chemical (E.g. Carcinogen, Category 2).
Special First-aid Considerations:	Describe special first-aid treatments associated with this chemical including the location of supplies in the lab.
Maximum Purchased Amount:	What is the maximum amount the lab will purchase?
Maximum Purchased Concentration:	What is the maximum concentration the lab will purchase?
Maximum Use Concentration:	What is the maximum concentration allowed for use in the lab?
Chemical Storage Area:	Describe where the chemical is stored.
Required PPE:	Eye Protection: <input type="checkbox"/> Safety glasses <input type="checkbox"/> Chemical splash goggles <input type="checkbox"/> Face shield Hand Protection: <input type="checkbox"/> Gloves (Specify Type) (See Glove Compatibility Chart, check with your glove manufacturer) <input type="checkbox"/> Double Glove Required Skin Protection: <input type="checkbox"/> Lab Coat (Buttoned, Sleeves Extending to the wrist) <input type="checkbox"/> Apron
PPE Storage Location:	Describe where PPE is stored.
Details of Process:	Enter process details for this chemical. How is it used? What is the purpose?
Designated Work Area(s):	Specify designated work area(s) for this chemical.
Work Area Decontamination Procedures:	Describe decontamination procedures.
Chemical-specific Waste Procedures:	Describe container type, storage location, and any chemical compatibility considerations.

