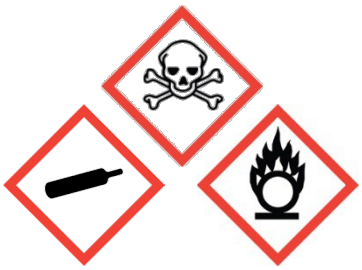
VANDERBILT UNIVERSITY

Principal Investigator: Date Approved:

This document covers basic chemical safety information for acutely toxic oxidizing gases and supplements the laboratory Chemical Hygiene Plan as appropriate. The use of any acutely toxic oxidizing gas is subject to pre-approval by the Principal Investigator (PI) and/or designated Laboratory Responsible Safety Person. DO NOT USE ANY ACUTELY TOXIC OXIDIZING GAS UNTIL YOU HAVE OBTAINED THE NECESSARY PRE-APPROVAL.

Acutely Toxic Oxidizing Gases

Acutely toxic gases include any gas with a median lethal concentration (LC_{50}) of 500 ppm or less. Acutely toxic oxidizing gases can also contribute to combustion by acting as an oxygen source. These gases can react rapidly and violently with combustible materials or flammable vapors.



Examples of acutely toxic oxidizing gases include fluorine, chlorine dioxide, nitrogen oxides (NO_x), and chlorine trifluoride. Note: Nitrous oxide (N_2O) is not acutely toxic, and therefore is not covered by this CSP.

Personal Protective Equipment & Personnel Monitoring

Lab Coat

Flame-resistant lab coat.

Gloves

For proper glove selection, review the chemical safety data sheet and consult glove manufacturer recommendations with your PI or supervisor.

Eye Protection

ANSI Z87.1-compliant safety glasses or safety goggles.

Labeling & Storage

Acutely toxic oxidizing gases must be stored in a toxic gas cabinet or exhausted enclosure.

Keep away from combustible materials, flammable gases, flammable and combustible liquids, finely-divided metals, and other easily oxidized substances such as hydrides, sulfur and sulfur compounds, silicon, and ammonia and amine compounds.

NFPA 55 requires that cylinders of oxidizing gases in storage be separated from fuel-gas cylinders or combustible materials (especially oil or grease) by a minimum distance of 20 feet or by a noncombustible barrier at least five feet high and with a fire resistance rating of at least one-half hour. Section 2703.9.8 of the IFC requires the barrier to be at not less than 18 inches above and to the sides of the stored material.

Acutely toxic oxidizing compressed gas cylinders should be secured to the inner wall of the toxic gas cabinet or a stable structure within an exhausted enclosure. The chain/strap should be 1/3 from the top of the cylinder. Compressed gas cylinders in use with a regulator attached should be secured individually so that no slippage or sliding occurs that could damage or alter the regulator. Alternatively, use a cylindrical casing to secure the cylinder within the exhausted enclosure next to your experimental setup. Refer to American Society of Mechanical Engineers code for Process Piping, ASME B31.3, to select compliant piping.

What not to do: Do not use table/bench clamps for securing cylinders. Never store cylinders on transportation carts. Remove regulators from cylinders when not in use and replace with the safety cap. Never use a cylinder without a regulator. Never permit the gas to enter the regulator suddenly. Never try to stop a leak between a cylinder and regulator by tightening the union nut unless the cylinder valve has been closed first. Never strike an electric arc on the cylinder.

Engineering Controls, Equipment & Materials	
Fume Hood	If you have any reason to believe that your protocol may generate fugitive toxic gases (e.g., an open system which terminates outside of a fume hood or other exhausted enclosure), contact the Department of Environmental Health, Safety and Sustainability (EHSS) to determine whether alternative engineering controls and/or additional respiratory protection is warranted.
Housekeeping	
Waste	If the vendor does not have a method to return/refill a cylinder, refer to the laboratory *Chemical Hygiene Plan* (Section 6.7) for information on proper chemical waste disposal procedures.
First Aid & Emergencies	
Releases	Immediately notify others in the area of the release and evacuate the location where the release occurred. Notify your PI/Responsible Safety Person and call Vanderbilt University Public Safety (VUPS) at 615-421-1911 or use the VandySafe app on your smart phone. Report any exposure through Risk and Insurance Management's Origami portal and mark that it occurred in research when prompted. Both VUPS and the Origami system will notify EHSS of the incident. Remain on site at a safe distance to provide detailed information to first responders.
Skin or Eye Contact	Without putting yourself at risk, move person into fresh air. Remove contaminated clothing and accessories; flush affected area with water for at least 15 minutes. Get medical attention immediately.
Inhalation	Without putting yourself at risk, move person into fresh air. Get medical attention immediately.

Name	Signature	Date