Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

Product Name:	Carbonyl sulfide (MSDS No. P-4579-C)	**Trade Name:**	Carbonyl Sulfide
Chemical Name:	Carbonyl sulfide	**Synonyms:**	Carbon monoxide monosulfide, carbon oxide sulfide, carbon oxysulfide, dithiocarbonic anhydride, oxycarbon sulfide
Formula:	COS	**Chemical Family:**	Sulfide
Telephone:	**Emergencies:** 1-800-645-4633* **CHEMTREC:** 1-800-424-9300* **Routine:** 1-800-PRAXAIR	**Company Name:**	Praxair, Inc. 39 Old Ridgebury Road Danbury CT 06810-5113

** Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).*

2. Composition/Information on Ingredients

See section 16 for important information about mixtures.

INGREDIENT	CAS NUMBER	CONCEN-TRATION	OSHA PEL	ACGIH TLV-TWA (2004)
Carbonyl sulfide	463-58-1	> 99%*	None currently established.	None currently established.

** The symbol > means "greater than."*

3. Hazards Identification

EMERGENCY OVERVIEW

DANGER! Toxic, flammable liquid and gas under pressure.
May be fatal if inhaled.
Can form explosive mixtures with air.
May cause respiratory tract and central nervous system damage.
Can cause eye irritation.
Gas deadens sense of smell.
Symptoms may be delayed.
Self-contained breathing apparatus and protective clothing must be worn by rescue workers.
Odor: Rotten eggs; may be imperceptible

THRESHOLD LIMIT VALUE: None currently established (ACGIH, 2004).

Revised

EFFECTS OF A SINGLE (ACUTE) OVEREXPOSURE:

INHALATION–May be fatal if inhaled. Causes respiratory paralysis by depression of the central nervous system. Overexposure may cause headache, dizziness, confusion, nausea, vomiting, diarrhea, unconsciousness, and death. Rhinitis, pharyngitis, bronchitis (irritation of nose and throat passages); pneumonitis; cyanosis (bluish discoloration of the skin due to lack of oxygen); and pulmonary edema (fluid in the lungs) may also occur. Lack of oxygen can kill.

SKIN CONTACT–May irritate the skin causing local redness and pain; liquid may be corrosive and cause frostbite. Prolonged contact may result in absorption of harmful amounts of carbonyl sulfide.

SWALLOWING–An unlikely route of exposure. This product is a gas at normal temperature and pressure. Frostbite of the mouth and lips may occur from contact with the liquid. Carbonyl sulfide is harmful if swallowed.

EYE CONTACT–May cause painful conjunctivitis (inflammation) of the connective tissues of the eye, photophobia (intolerance of light), and corneal opacification (clouding of the tissues covering the eye).

EFFECTS OF REPEATED (CHRONIC) OVEREXPOSURE: May cause nausea, vomiting, weight loss, persistent low blood pressure, and loss of the sense of smell.

OTHER EFFECTS OF OVEREXPOSURE: May cause neurologic sequelae such as amnesia, intention tremor, neurasthenia, disturbance of equilibrium, or more serious brain stem and cortical damage.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. The skin-irritating properties of Carbonyl sulfide may aggravate an existing dermatitis.

SIGNIFICANT LABORATORY DATA WITH POSSIBLE RELEVANCE TO HUMAN HEALTH HAZARD EVALUATION: No information available.

CARCINOGENICITY: This product is not listed by NTP, OSHA, or IARC.

4. First Aid Measures

INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician at once. Keep victim warm and at rest.

SKIN CONTACT: Remove contaminated clothing and flush skin with plenty of water. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). In case of massive exposure, remove contaminated clothing while showering with warm water. Discard clothing and shoes. Call a physician.

SWALLOWING: An unlikely route of exposure. This product is a gas at normal temperature and pressure.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN**:** *Victims of overexposure should be observed for at least 72 hours for delayed onset of pulmonary edema. There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.*

5. Fire Fighting Measures

FLASH POINT (test method)**:**	Flammable gas	
AUTOIGNITION TEMPERATURE:	Not known.	
FLAMMABLE LIMITS IN AIR, % by volume**:**	**LOWER:** 11.9 %	**UPPER:** 29 %

EXTINGUISHING MEDIA: CO_2, dry chemical, water spray, or fog

SPECIAL FIRE FIGHTING PROCEDURES: DANGER! Toxic, flammable liquid and gas under pressure. Evacuate all personnel from danger area. Do not approach area without self-contained breathing apparatus and protective clothing. Immediately spray containers with water from maximum distance until cool, taking care not to extinguish flames. Remove sources of ignition if without risk. Remove all containers from fire area if without risk; continue cooling water spray while moving containers. Do not extinguish any flames emitted from containers; stop flow if without risk, or allow flames to burn out. Reapproach with extreme caution using self-contained breathing apparatus and protective clothing. On-site fire brigades must comply with OSHA 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS: May form explosive mixtures with air and oxidizing agents. Heat of fire can build pressure in container and cause it to rupture. No part of a container should be subjected to a temperature higher than 125°F (52°C). Carbonyl sulfide cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.) Reverse flow into cylinder may cause rupture. (See section 16.) If venting or leaking product catches fire, do not extinguish flames. Flammable vapors may spread from leak, creating an explosive reignition hazard. Vapors can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially confined areas, check atmosphere with an approved explosion meter.

HAZARDOUS COMBUSTION PRODUCTS: CO, CO_2, SO_2, CS_2, sulfur

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: DANGER! Toxic, flammable liquid and gas under pressure. May form explosive mixtures with air. (See section 5.) Immediately evacuate all personnel from danger area. Reverse flow into cylinder may cause rupture. (See section 16.) Use self-contained breathing apparatus and protective clothing where needed. Remove all sources of ignition if without risk. Reduce vapors with fog or fine water spray. Shut off leak if without risk. Ventilate area or move cylinder to a well-ventilated area. Flammable vapors may spread from spill. Before entering area, especially confined areas, check atmosphere with an appropriate device.

WASTE DISPOSAL METHOD: Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN STORAGE: Store and use with adequate ventilation. Separate cylinders containing this product from oxygen, chlorine, and other by at least 20 ft (6.1 m), or use a barricade of noncombustible material. This barricade should be at least 5 ft (1.53 m) high and have a fire resistance rating of at least ½ hour. Firmly secure cylinders upright to keep them from falling or being

knocked over. Screw valve protection cap firmly in place by hand. Post "No Smoking or Open Flames" signs in storage and use areas. There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 125°F (52°C). Store full and empty cylinders separately. Use a first-in, first-out inventory system to prevent storing full cylinders for long periods.

PRECAUTIONS TO BE TAKEN IN HANDLING: Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. All piped carbonyl sulfide systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. Never insert an object (e.g., wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Open valve slowly. If valve is hard to open, discontinue use and contact your supplier. For other precautions in using carbonyl sulfide, see section 16.

For further information on storage, handling, and use of this product, see NFPA 55, *Standard for the Storage, Use, and Handling of Compressed and Liquefied Gases in Portable Cylinders*, published by the National Fire Protection Association.

8. Exposure Controls/Personal Protection

VENTILATION/ENGINEERING CONTROLS:

LOCAL EXHAUST–An explosion-proof system is acceptable. See SPECIAL.

MECHANICAL (general)–Inadequate. See SPECIAL.

SPECIAL–Use only in a closed system. An explosion-proof, forced draft fume hood is preferred.

OTHER–See SPECIAL.

RESPIRATORY PROTECTION: Use an air-supplied respirator or a full-face, positive-pressure, self-contained breathing apparatus. Respiratory protection must conform to OSHA 29 CFR 1910.134. Select per OSHA 29 CFR 1910.134 and ANSI Z88.2.

SKIN PROTECTION: Wear work gloves when handling containers; neoprene gloves where contact with product may occur.

EYE PROTECTION: Wear safety glasses and a full face shield. Select eye protection in accordance with OSHA 29 CFR 1910.133.

OTHER PROTECTIVE EQUIPMENT: Metatarsal shoes for container handling. Protective clothing where needed. Select in accordance with OSHA 29 CFR 1910.132 and 1910.133. Regardless of protective equipment, never touch live electrical parts.

9. Physical and Chemical Properties

MOLECULAR WEIGHT:	60.07
SPECIFIC GRAVITY (H_2O = 1) at -124.6°F (-87°C):	1.24
SPECIFIC GRAVITY (Air = 1) at 70°F (21.1°C) and 1 atm:	2.074
SOLUBILITY IN WATER, % by wt :	Reacts slowly, 1.33 cm^3/cm^3
VAPOR PRESSURE at 70°F (21.1°C):	174.7 psig (1204.5 kPa)
PERCENT VOLATILES BY VOLUME:	100
EVAPORATION RATE, Butyl Acetate = 1:	High
BOILING POINT at 1 atm:	-58.27°F (-50.15°C)
MELTING POINT:	-217.84°F (-138.8°C)

APPEARANCE, ODOR, AND STATE: Colorless gas at normal temperature and pressure; odor of rotten eggs. (Gas cannot always be detected by odor.)

10. Stability and Reactivity

STABILITY: ☐ **Unstable** ☒ **Stable**

INCOMPATIBILITY (materials to avoid): Hydrogen, moisture, oxidizing agents, and alkalis. In the presence of moisture, some metals such as brass are attacked.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition or burning may produce CO, CO_2, SO_2, CS_2, sulfur.

HAZARDOUS POLYMERIZATION: ☐ **May Occur** ☒ **Will Not Occur**

CONDITIONS TO AVOID: None known.

11. Toxicological Information

Inhalation, LC_{50}, 1 hr, mouse = 1700 ppm.

12. Ecological Information

No adverse ecological effects expected. This product does not contain any Class I or Class II ozone-depleting chemicals. This product is not listed as a marine pollutant by DOT.

13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. For emergency disposal, secure cylinder in a well-ventilated area or outdoors; then slowly discharge gas to the atmosphere. Keep waste from contaminating surrounding environment. Keep personnel away.

14. Transport Information

DOT/IMO SHIPPING NAME: Carbonyl sulfide

HAZARD CLASS: 2.3	**IDENTIFICATION NUMBER:** UN 2204	**PRODUCT RQ:** 100 lb (45.4 kg)
SHIPPING LABEL(s):	POISON GAS, FLAMMABLE GAS*	
PLACARD (when required):	POISON GAS, FLAMMABLE GAS*	

**The words in the POISON GAS diamond are INHALATION HAZARD.*

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure position, in a well-ventilated vehicle. Cylinders transported in an enclosed, nonventilated compartment of a vehicle can present serious safety hazards.

Additional Marking Requirement: INHALATION HAZARD

Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)

CERCLA: COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980 (40 CFR Parts 117 and 302):

Reportable Quantity (RQ): 100 lb (45.4 kg)

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None
EHS RQ: (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and chemical inventory reporting with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes
DELAYED: Yes
PRESSURE: Yes
REACTIVITY: No
FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Carbonyl sulfide is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act o 1986 (SARA) and 40CFR Part 372.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Carbonyl sulfide is listed in quantities of 10,000 lb (4536 kg) or greater.

TSCA: TOXIC SUBSTANCES CONTROL ACT: This product is listed on the TSCA inventory.

OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION**:**

29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.

Carbonyl sulfide is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the gas is used as a fuel.

STATE REGULATIONS:

CALIFORNIA: This product is not listed by California under THE SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).

PENNSYLVANIA: This product is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

16. Other Information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE: ***Toxic, flammable liquid and gas under pressure.*** May be fatal if inhaled. Do not breathe gas. Do not depend on odor to detect the presence of gas. Use only with adequate ventilation or respiratory protection. (See section 8.) Do not get liquid or vapor in eyes, on skin, or on clothing. (See section 3.) Have safety showers and eyewash fountains immediately available. Use piping and equipment adequately designed to withstand pressures to be encountered. Use only with compatible materials and equipment. Use only in a closed system. ***May form explosive mixtures with air.*** Keep away from heat, sparks, and open flame. Use only spark-proof tools and explosion-proof equipment. Ground all equipment. Store and use with adequate ventilation at all times. Keep away from oxidizing agents and other flammables. ***Prevent reverse flow.*** Reverse flow into cylinder may cause rupture. Use a check valve or other protective device in any line or piping from the cylinder. ***Never work on a pressurized system.*** If there is a leak, close the cylinder valve. Blow the system down in a safe and environmentally sound manner in compliance with all federal, state, and local laws; then repair the leak***. Follow safe practices when returning cylinder to supplier.*** Be sure valve is closed; then install valve outlet plug tightly. ***Never place a compressed gas cylinder where it may become part of an electrical circuit.***

NOTE: *Prior to using any plastics, confirm their compatibility with this mixture.*

MIXTURES: When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person, when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

HAZARD RATING SYSTEMS:

NFPA RATINGS:		**HMIS RATINGS:**	
HEALTH	= 3	HEALTH	= 3
FLAMMABILITY	= 4	FLAMMABILITY	= 4
INSTABILITY	= 1	PHYSICAL HAZARD	= 2
SPECIAL	= None		

STANDARD VALVE CONNECTIONS FOR U.S. AND CANADA:

THREADED:	CGA-330
PIN-INDEXED YOKE:	Not applicable
ULTRA-HIGH-INTEGRITY CONNECTION:	Not applicable

Use the proper CGA connections. **DO NOT USE ADAPTERS.** Additional limited-standard connections may apply. See CGA pamphlets V-1 and V-7 listed below. Ask your supplier about free Praxair safety literature as referred to in this MSDS and on the label for this product. Further information about this product can be found in the following pamphlets published by the Compressed Gas Association, Inc. (CGA) , 4221 Walney Road, 5th Floor, Chantilly, VA 20151-2923, Telephone (703) 788-2700, http://www.cganet.com/Publication.asp.

AV-1 *Safe Handling and Storage of Compressed Gases*
P-1 *Safe Handling of Compressed Gases in Containers*
S-1 *Pressure Relief Device Standards -Part 1- Cylinders for Compressed Gases*
V-1 *Compressed Gas Cylinder Valve Inlet and Outlet Connections*
V-7 *Standard Method of Determining Cylinder Valve Outlet Connections for Industrial Gas Mixtures*
— *Handbook of Compressed Gases, Fourth Edition*

Praxair asks users of this product to study this Material Safety Data Sheet (MSDS) and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information on this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user's obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current Praxair MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (**Phone:** 1-800-PRAXAIR; **Address:** Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

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