

MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: Octafluorocyclobutane
CHEMICAL NAME: Octafluorocyclobutane **FORMULA:** C₄F₈
SYNONYMS: Halocarbon-C318, Perfluorocyclobutane
MANUFACTURER: Air Products and Chemicals, Inc.
7201 Hamilton Boulevard
Allentown, PA 18195 -1501
PRODUCT INFORMATION: (800) 752 -1597
MSDS NUMBER: 1309 **REVISION:** 1
REVIEW DATE: October 1999 **REVISION DATE:** October 1999

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Octafluorocyclobutane is sold as a pure product >99%.

CAS NUMBER: 115-25-3

EXPOSURE LIMITS:

OSHA: None established

ACGIH: None established

NIOSH: None established

SECTION 3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW

Octafluorocyclobutane is a nonflammable, colorless, odorless liquefied compressed gas packaged in cylinders under its own vapor pressure of 25 psig at 70 °F. This product can cause rapid suffocation when concentrations are sufficient to reduce oxygen levels below 19.5%. Self-Contained Breathing Apparatus (SCBA) may be required for rescue workers. Contact with product can cause frostbite.

EMERGENCY TELEPHONE NUMBERS

(800) 523 -9374 Continental U.S., Canada, and Puerto Rico
(610) 481 -7711 other locations

ACUTE POTENTIAL HEALTH EFFECTS:

ROUTES OF EXPOSURE:

EYE CONTACT: Contact with liquid (or rapidly expanding gas) may cause irritation and frostbite.

INGESTION: Ingestion is not a likely route of exposure for Octafluorocyclobutane.

INHALATION: This product may cause suffocation by displacing the oxygen in air. Exposure to an oxygen deficient atmosphere (less than 19.5%) may cause dizziness, drowsiness, nausea, vomiting, excessive salivation, diminished mental alertness, loss of consciousness and death. Exposure to

atmospheres containing less than 12% oxygen will bring about unconsciousness without warning and so quickly that the individuals cannot help themselves. Inhalation of high concentrations may also cause mild central nervous system depression and cardiac arrhythmias (heart beat irregularities).

SKIN CONTACT: Contact with liquid (or rapidly expanding gas) may cause irritation and frostbite.

POTENTIAL HEALTH EFFECTS OF REPEATED EXPOSURE:

ROUTE OF ENTRY: Skin contact

SYMPTOMS: Repeated or prolonged contact may cause dermatitis.

TARGET ORGANS: Heart, central nervous system, skin

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: Persons with preexisting cardiac or central nervous system disorders may have increased susceptibility to the effects of overexposure. May aggravate existing dermatitis.

CARCINOGENICITY: This product is not listed as a carcinogen or potential carcinogen by NTP, IARC, or OSHA.

SECTION 4. FIRST AID MEASURES

EYE CONTACT: Contact with product may cause frostbite. If frostbite suspected, flush eyes with plenty of lukewarm water for several minutes. Obtain medical attention immediately.

INGESTION: Ingestion is not a likely route of exposure for Octafluorocyclobutane.

INHALATION: Remove person to fresh air. If not breathing, administer artificial respiration. If breathing is difficult, administer oxygen. Obtain prompt medical attention.

SKIN CONTACT: Contact with product may cause frostbite. If frostbite suspected, remove contaminated clothing and flush with plenty of lukewarm water for several minutes. Seek medical attention immediately.

NOTES TO PHYSICIAN: The use of catecholamine drugs, such as epinephrine, should be considered only as a last resort in life-threatening emergencies, due to the possibility of cardiac rhythm disturbances.

SECTION 5. FIRE FIGHTING MEASURES

FLASHPOINT:
Not applicable

AUTO IGNITION:
Not applicable

FLAMMABLE RANGE:
Nonflammable

EXTINGUISHING MEDIA: Product is nonflammable and does not support combustion. Use extinguishing media appropriate for surrounding fire.

SPECIAL FIRE FIGHTING INSTRUCTIONS: Evacuate all personnel from area. If possible, without risk, remove cylinders from fire area or cool with water. The products of combustion may be toxic; self-contained breathing apparatus (SCBA) may be required by rescue workers.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Most cylinders are designed to vent contents when exposed to elevated temperatures. Pressure in a cylinder can build up due to heat and it may rupture if pressure relief devices should fail to function.

HAZARDOUS COMBUSTION PRODUCTS: Carbon monoxide, hydrogen fluoride, and other toxic fluoride compounds.

SECTION 6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Evacuate immediate area. Increase ventilation to release area and monitor oxygen level. Use appropriate protective equipment (SCBA). Shut off source of leak if possible. Isolate any leaking cylinder. If leak is from container, pressure relief device or its valve, contact your supplier. If leak is in user's system, close cylinder valve, safely vent pressure and purge with inert gas before attempting repairs.

SECTION 7. HANDLING AND STORAGE

STORAGE: Store cylinders in a well-ventilated, secure area, protected from the weather. Cylinders should be stored upright with valve outlet seals and valve protection caps in place. Do not allow storage temperature to exceed 125 °F (52 °C). Storage should be away from heavily traveled areas and emergency exits. Full and empty cylinders should be segregated. Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time.

HANDLING: Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure-reducing regulator or separate control valve to safely discharge gas from cylinder. Use a check valve to prevent reverse flow into cylinder. Use piping and equipment adequately designed to withstand pressure to be encountered. Never apply flame or localized heat directly to any part of the cylinder. Do not allow any part of the cylinder to exceed 125 °F (52 °C). Once cylinder has been connected to process, open cylinder valves slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings. Doing so may damage valve causing a leak to occur. Use an adjustable strap - wrench to remove over-tight or rusted caps.

Octafluorocyclobutane is compatible with all common materials of construction. Pressure requirements should be considered when selecting materials and design systems.

SPECIAL PRECAUTIONS: Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage or use.

Caution: Users of this product must be aware of the hazards caused by the accumulation of high concentrations, especially in confined spaces. Compliance with OSHA regulations, especially 29 CFR 1910.146 (confined space entry), is essential.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

VENTILATION: Provide adequate general ventilation and/or local exhaust to prevent accumulation of high concentrations of gas. Oxygen levels in work areas should be monitored to ensure they do not fall below 19.5%.

RESPIRATORY PROTECTION:

Emergency Use: Use self-contained breathing apparatus (SCBA) or positive pressure airline with mask and escape pack in areas where oxygen concentration is less than 19.5%. Air-purifying respirators will not provide protection.

EYE PROTECTION: Safety glasses. Chemical splash goggles and face shield are recommended when handling liquid.

SKIN PROTECTION: Leather work gloves are recommended when handling cylinders. Leather gloves are recommended when handling liquid.

OTHER PROTECTIVE EQUIPMENT: Safety shoes are recommended when handling cylinders. Safety shower and eyewash stations should be readily available.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE, ODOR AND STATE: Colorless, odorless gas

MOLECULAR WEIGHT: 200.0

BOILING POINT (At 1 atm) : 17.6 °F (-8 °C)

SPECIFIC GRAVITY (also called vapor density)(Air=1) : 6.9

FREEZINGPOINT/MELTINGPOINT (At1atm) : -42.5 °F(-41.4 °C)

VAPORPRESSURE (At70 °F(21.1 °C)): 25psig

GASDENS ITY (At70 °F(21.1 °C)and1atm) : 0.535lb/ft ³

SECTION10.STABILITYANDREACTIVITY

CHEMICALSTABILITY: Stable

CONDITIONSTOAVOID: Cylindersshouldnotbeexposedtotemperaturesinexcessof125 °F(52 °C).

INCOMPATIBILITY(MaterialstoAvoid): Alkalioralkalineearthmetals -powderedaluminum,zinc,etc.

REACTIVITY:

A)HAZARDOUSDECOMPOSITIONPRODUCTS: Thismaterialcanbedecomposedbyhigh temperatures(openflame,glowingmetalsurfaces,etc.)forminghydrofluoricacidandpossibly carbonylfluoride.

B)HAZARDOUSPOLYMERIZATION: Willnotoccur

SECTION11.TOXICOLOGICALINFORMATION

LC₅₀(Inhalation): Simpleasphyxiant;four -hourexposureto 80%Octafluorocyclobutaneproducedno deathsinrats.

LD₅₀(Oral): Notapplicable

LD₅₀(Dermal): Notapplicable

SKINCORROSIVITY: Octafluorocyclobutaneisnotcorrosivetotheskin.

ADDITIONALNOTES: Octafluorocyclobutane hascausedcontractionofthetracheainanesthetized rhesusmonkeysandmaycausecardiacarrhythmias.Rats,mice, rabbitsanddogsexposedto10% Octafluorocyclobutane,sixhoursperday,forninetydaysshowednoadverseeffects.

Octafluorocyclobutanewasmutagenicinabacterial(E.coli)assay.

SECTION12.ECOLOGICALINFORMATION

AQUATICTOXICITY: Notavailable

MOBILITY: Notavailable

PERSISTENCEANDBIODEGRADABILITY: Notavailable

POTENTIALTOBIOACCUMULATE: Notavailable

REMARKS: Noadverseecologicaleffectsareexpected.Octafluorocyclobutanedoesnot containany ClasslorClassIIozonedepletingchemicals.

SECTION13.DISPOSALCONSIDERATIONS

UNUSEDPRODUCT/EMPTYCONTAINER: Returncontainerandunusedproducttosupplier.Donot attempttodisposeofresidualorunusedquantities.

DISPOSALINFORMATION: Foremergencydisposal,securethecylinderandslowlydischargegasto theatmosphereinawellventilatedareaoroutdoors.

SECTION14.TRANSPORTINFORMATION

DOTSHIPPINGNAME: Octafluorocyclobutane

HAZARDCLASS: 2.2

IDENTIFICATIONNUMBER: UN1976

SHIPPINGLABEL(s): NonflammableGas

PLACARD(Whenrequired): NonflammableGas

SPECIAL SHIPPING INFORMATION: Cylinders should be transported in a secure upright position in a well-ventilated truck. Never transport in passenger compartment of a vehicle. Ensure cylinder valve is properly closed, valve outlet cap has been reinstalled, and valve protection cap is secured before shipping cylinder.

CAUTION: Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with the owner's written consent is in violation of federal law (49 CFR 173.301).

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SECTION 15. REGULATORY INFORMATION

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): None

SARA TITLE III: Superfund Amendment and Reauthorization Act

SECTIONS 302/304: Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: This product is not listed.

Threshold Planning Quantity (TPQ): None

Reportable Quantity (RQ): None

SECTIONS 311/312: Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: No PRESSURE: Yes

DELAYED HEALTH: No REACTIVITY: No

FIRE: No

SECTION 313: Toxic Chemical Release Reporting (40 CFR Part 372)

This product does not require reporting under Section 313.

CLEAN AIR ACT:

SECTION 112(r): Risk Management Programs for Chemical Accidental Release
(40 CFR PART 68)

This product is not listed as a regulated substance.

Threshold Quantity (TQ): None

TSCA: Toxic Substance Control Act

This product is listed on the TSCA inventory.

OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:

29 CFR Part 1910.119: Process Safety Management of Highly Hazardous Chemicals

This product is not listed in Appendix A as a highly hazardous chemical.

Threshold Quantity (TQ): None

STATE REGULATIONS:

CALIFORNIA:

Proposition 65: Octafluorocyclobutane is not a listed substance which the State of California requires warning under this statute.

SECTION 16. OTHER INFORMATION

NFPA RATINGS:

HEALTH: 1

FLAMMABILITY: 0

REACTIVITY: 0

SPECIAL:

HMIS RATINGS:

HEALTH: 0

FLAMMABILITY: 0

REACTIVITY: 0