Tradeasia International PTE LTD
133 Cecil Street # 12-03 Keck Seng Tower, Singapore 069535
Tel: +65-6227 6365 Fax: +65-6225 6286
www.chemtradeasia.com

Material Safety Data Sheet
Octafluorocyclobutane

Section 1 - Product Identification

Synonym	:	Cyclobutane, 1,1,2,2,3,3,4,4-octafluoro-; Cyclobutane, octafluoro
Chemical Formula	:	C_4F_8
Company Identification	:	Tradeasia International Pte. Limited
Address	:	133 Cecil Street # 12-03 Keck Seng Tower, Singapore Tel: +65-6227 6365 Fax: +65-6225 6286 Email: contact@chemtradeasia.com
Recommended use	:	For general analytical/synthetic chemical uses.

Section 2 – Hazards Identification

2.1. Classification
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

2.2. Label elements
Hazard pictograms (GHS US)

2.3. Signal Word
Warning

2.4. Hazard Statements
Contains gas under pressure; may explode if heated. May displace oxygen and cause rapid suffocation. May cause frostbite.

2.5. Precautionary Statements Storage
General
Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position.
Prevention
Use and store only outdoors or in a well ventilated place.
Response
Not applicable.
Storage
Protect from sunlight. Store in a well-ventilated place.
Disposal
Not applicable.

2.6. Other hazards
Liquid can cause burns similar to frostbite

Section 3 – Composition/Information on Ingredients

3.1 Composition comments

Substance/mixture : substance
CAS Number : 115-25-3

Chemical Name	EC No/CAS No	Purity, %
Octafluorocyclobutane	115-25-3	max. 99.9

Section 4 – First-Aid Measures

4.1. Description of first aid measures

First-aid measures after inhalation :
Remove victim to uncontaminated area wearing self contained breathing apparatus. Keepvictim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
First-aid measures after skin contact :
The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.
First-aid measures after eye contact :
Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.
First-aid measures after ingestion :
Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

N.A.

4.3. Indication of any immediate medical attention and special treatment needed

No hazards which require special first aid measures.

Section 5 – Fire Fighting Measures

5.1. Suitable Extinguishing media

Use an extinguishing agent suitable for the surrounding fire.

5.2. Unsuitable Extinguishing media

N.A.

5.3. Specific hazards arising from the chemical

Contains gas under pressure. In a fire or if heated, a pressure increase will occur and the container may burst or explode.

5.4. Special protective actions for fire-fighters

Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for

specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Section 6 – Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures - For non-emergency personnel
No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

6.2. Personal precautions, protective equipment and emergency procedures - For emergency personnel
If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For nonemergency personnel".

6.3. Environmental precautions
Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.4. Methods and material for containment and cleaning up
Immediately contact emergency personnel. Stop leak if without risk.

Section 7 – Handling and Storage

7.1. Precautions for safe Handling
Put on appropriate personal protective equipment. Contains gas under pressure. Do not get in eyes or on skin or clothing. Avoid breathing gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement. Empty containers retain product residue and can be hazardous.

7.2. Conditions for safe storage, including any incompatibilities
Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use.

Section 8 – Exposure Controls/Personal Protection

8.1. Appropriate engineering controls
Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

8.2. Individual protection measures, such as personal protective equipment (PPE)
Eye/face protection

Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it.

Body Protection

Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a fullface particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure

Do not let product enter drains.

Section 9 – Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Physical state : Gas
Molecular mass : 200 g/mol
Color : Colorless.
Odor : Ethereal. Poor warning properties at low concentrations.
Odor threshold : Odor threshold is subjective and inadequate to warn for overexposure.
pH : Not applicable.
Relative evaporation rate (butyl acetate=1) : No data available
Relative evaporation rate (ether=1) : Not applicable.
Melting point : -40.2 °C
Freezing point : No data available
Boiling point : -5.8 °C
Flash point : Not applicable.
Critical temperature : 114.8 °C
Auto-ignition temperature : Not applicable.
Vapor pressure : 270 kPa
Critical pressure : 2784 kPa
Relative vapor density at 20 °C : No data available
Relative density : 1.6
Relative density of saturated gas/air mixture : 6.907
Relative gas density : 6.9
Solubility : Water: 140 mg/l

Section 10 – Stability and Reactivity

10.1. Reactivity

No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability
Stable at normal conditions.

10.3. Possibility of hazardous reactions
N.A.

10.4. Conditions to avoid
None under recommended storage and handling conditions

10.5. Incompatible materials
Polystyrene. Alloys with >2% magnesium in the presence of water.

10.6. Hazardous decomposition products
Thermal decomposition may produce : Fluorides. Toxic fumes. Carbon. Tetrafluoromethane.

Section 11 – Toxicological Information

11.1 Health effects associated with ingredients
Acute toxicity : Not classified
Skin corrosion/irritation : Not classified
pH: Not applicable.
Serious eye damage/irritation : Not classified
pH: Not applicable.
Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
STOT-single exposure : Not classified
STOT-repeated exposure : Not classified
Aspiration hazard : Not classified

Section 12 – Ecological Information

12.1.Ecotoxicity
N.A.

12.2. Bioaccumulative potential
Partition coefficient n-octanol/water (Log Pow) Not applicable.
Partition coefficient n-octanol/water (Log Kow) Not applicable.
Bioaccumulative potential No data available.

12.3. Mobility in soil
Mobility in soil No data available.
Ecology - soil Because of its high volatility, the product is unlikely to cause ground or water pollution.

12.4. Persistence and Degradability
Expected to be biodegradable

12.4. Other adverse effects

Effect on ozone layer : None.
Global warming potential [CO2=1] : 10300
Effect on the global warming : Contains Fluorinated greenhouse gases covered by the Kyoto protocol.

Section 13 – Disposal Considerations

13.1. Disposal methods
Waste treatment methods :
Do not discharge into any place where its accumulation could be dangerous. Refer to the supplier's waste gas recovery program.
Product/Packaging disposal recommendations :
Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.

Section 14 – Transport Information

14.1. Transport Regulation

Transport document description (DOT)	: UN1976 Octafluorocyclobutane, 2.2
UN-No.(DOT)	: UN1976
Proper Shipping Name (DOT)	: Octafluorocyclobutane
Class (DOT)	: 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Hazard labels (DOT)	: 2.2 - Non-flammable gas

DOT Special Provisions (49 CFR 172.102) :
T50 - When portable tank instruction T50 is referenced in Column (7) of the 172.101 Table, the applicable liquefied compressed gases are authorized to be transported in portable tanks in accordance with the requirements of 173.313 of this subchapter.

14.2. Transport by Sea
UN-No. (IMDG) : 1976
Proper Shipping Name (IMDG) : OCTAFLUOROCYCLOBUTANE (REFRIGERANT GAS RC 318)
Class (IMDG) : 2 - Gases
Division (IMDG) : 2.2 - Non-flammable, non-toxic gases
MFAG-No : 126

14.3. Air transport
UN-No. (IATA) : 1976
Proper Shipping Name (IATA) : Octafluorocyclobutane
Class (IATA) : 2
Civil Aeronautics Law : Gases under pressure/Gases nonflammable nontoxic under pressure

Section 15 – Regulatory Information

15.1. Safety, health and environmental regulations
This material safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006.

Section 16 : Additional Information

16.1. List of abbreviation and acronyms used in this MSDS

SDS : Safety Data Sheets
Index N° : atomic number of the element most characteristic of the properties of the substance
CAS No : Chemical Abstracts Service number
EC No : EINECS Number : European Inventory of Existing Commercial Substances
Repr. Cat. 2 : Substance presumed human reproductive toxicant
Acute Oral Cat. 5 : Substance which is of relatively low acute oral toxicity.
GHS : Globally Harmonised System of Classification and Labelling
LD_{50} : Median Lethal Dose
LC_{50} : Lethal Concentration, 50%
N.A. : Not Applicable
OSHA : Occupational Safety & Health Administration
Cal OSHA : The State of California Division of Occupational Safety and Health (DOSH)
PEL : Permissible Exposure Limits
ACGIH : American Conference of Governmental Industrial Hygienists
TLV : Threshold Limit Value
Japanese MITI : Japanese Ministry of International Trade and Industry
EC_{50} : Half maximal effective concentration
UN : United Nations
U.S. EPA TSCA Inventory: Inventory of the chemical substances manufactured or processed in the United States according to Toxic Substances Control Act compiled and published under the autority of the Environmental Protection Agency
Canadian DSL: Canadian Domestic Substances List

16.2. List of relevant hazard statements and precautionary statements used in this MSDS

Hazard Statement
H361 d: Suspected of damaging the unborn child
H319: Causes serious eye irritation
H303: May be harmful if swallowed
Precautionary Statements
Prevention
P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P281: Use personal protective equipment as required.
P264: Wash eyes thoroughly after handling.
P280: Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response
P308 + P313: If exposed or concerned: get medical advice/attention.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes.
Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/attention.
Storage
P405: Store locked up.
Disposal
P501: Dispose of contents/container to in accordance with local regulations.

16.3. References

1. Litovitz T L, Norman S A, Veltri J C, Annual Report of the American Association of Poison Control Centers Data Collection System. Am. J. Emerg. Med. (1986), 4, 427-458

2. Denton SM (1996). Acute oral toxicity study in the rat: anhydrous boric acid. Final report. Report no.: 1341/7-1032.
3. National Toxicology Program (NTP) – Technical Report Series No. TR324, NIH Publication No. 88 2580 (1987), PB88 213475/XAB
4. Fail et al., Fund. Appl. Toxicol. (1991) 17, 225-239
5. Heindel et al., Fund. Appl. Toxicol. (1992) 18, 266-277
6. Birge W J, Black J A, EPA-560/-76-008 (April 1977) PB 267 085
7. Scialli AR, Bonde JP, Brüske-Hohlfeld I, Culver D, Li Y, Sullivan FM; ELSEVIER 2009
8. Robbins WA, Xun L, Jia J, Kennedy N, Elashoff DA, Ping L. ;ELSEVIER 2009;(Reproductive Toxicology)
9. Hansveit and Oldersma, 2000; TNO Nutrition and Food Research Institute. Report No. V99.157.
10. Gersich, FM (1984a). Environ.Toxicol.Chem., 3 #1, 89-94 (1984)
11. Soucek et al., 2010. Illinois Natural History Survey, University of Illinois.
For general information on the toxicology of borates see ECETOC Technical Report No. 63 (1995); Patty's Industrial Hygiene and Toxicology, 4th Edition Vol. II, (1994) Chap. 42, 'Boron'.

16.4. Disclaimer of Liability

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its accuracy, reliability or completeness. The conditions or methods of handling, storage use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the user's responsibility to satisfy himself as to the suitableness and completeness of such information for his own particular use.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.