



Material Safety Data Sheet.

Section 1 - Product and Company Identification

Chemical Name: Hexafluoro-1,3-butadiene (hexafluorobutadiene)

Formula: C₄F₆

Supplier Name: Miragas Co. Ltd.

Address of Supplier: Zhucun Industrial Park, Pengpo, Yichuan, Luoyang, Henan 471311, China

Telephone Number: +86 379-69581176

Emergency Telephone Number: +86 379-69581179

Fax: +86 379-69581180

Email address: Bureau@miragases.com

Recommended Usage: Plasma chemical etchant for electronic industry.

Restriction on Use: No Restrictions.

Section 2 - Hazards Identification

Emergency Overview: Highly Flammable Gas

GHS Hazard Category: According to the criteria of the chemical classification, warning label and warning specification series, the product is a flammable, toxic and liquefiable gas under pressure gas, category 3.

Label Elements:

Pictogram:



WARNING WORDS: Danger Warning

DANGEROUS INFORMATION: Highly flammable gas, Liquefied Pressured Gas, Toxic gas.

PRECAUTIONARY STATEMENT:

PREVENTIVE MEASURES: Away from the heat source, fire, open fire, hot surface. No smoking in workplace.

EMERGENCY RESPONSE: When there is a leakage, evacuate the people to upwind safe spot. Please refer to Section 6 for details.

SAFE STORAGE: Weather proof, and well-ventilated place.

WASTE DISPOSAL: Return container and unused product to supplier. Do not dispose of unused products without authorization.

PHYSICAL AND CHEMICAL HAZARDS: Extremely flammable gas, liquefied gas, blast and decomposition of toxic fluoride gas by heat.

ENVIRONMENTAL HAZARDS: None.



Section 3 - Composition/Information on ingredients

CHEMICAL CATEGORY: Single substance

HAZARDOUS COMPONENT: Hexafluorobutadiene

CONCENTRATION OR CONCENTRATION RANGE: > 99.5 %

CAS NUMBER: 685-63-2

Section 4- First Aid Measures

FIRST AID:

SKIN CONTACT: May cause frostbite. Remove contaminated clothing, flush with warm water (41-46 °C) for a few minutes, then immediately seeking for medical treatment.

EYE CONTACT: May cause frostbite. Flush with plenty of warm water for a 15 minutes, then immediately seeking for medical treatment.

INHALATION: Remove the person to fresh air; if not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

INGESTION: No exposure through this route

Section 5- Fire-Fighting Measures

SPECIAL HAZARD: Extremely flammable gas, mixed with air to form an explosive mixture. In case of open fire and high temperature, it may cause burning and explosion.

FIRE EXTINGUISHING METHOD AND EXTINGUISHING AGENT: Cut off gas supply first and extinguishing. Use water mist to reduce combustion by-products formed in the air. If the gas supply cannot be cut off, wait until it burned out. Cooling down the cylinder exposed to the fire with water from distance, and removing the cylinders away from the fire if possible. Fire extinguishing agent allocable is foam, carbon dioxide and dry powder.

FIRE EXTINGUISHING PRECAUTIONS AND MEASURES: Wear Scuba and fire protection Uniform, fighting fire in the upper wind direction. Cut off the gas supply first, if cannot cut off the gas supply, it is not allowed to extinguish the gas flame leaked. Spray water to cool down the cylinder until the gas burn out.

Section 6- Emergency Response for Leakage

OPERATIONAL PERSONNEL PROTECTION MEASURES, PROTECTIVE EQUIPMENT AND EMERGENCY RESPONSE PROCEDURES:

Evacuate the contaminated areas quickly to the upwind spot and isolate the area for restricted access. The emergency response personnel should wear scuba and fire-proof clothing. Remove all the inflammable materials and fire source, providing with maximum ventilation. Try to shut off the gas supply and isolate the leaking cylinders. If the cylinder valve leaks, contact the Supplier for further help. If leakage occurs in customer's system, close the cylinder valve, remember to release the system pressure and purge with inert gas before any maintenance.

ENVIRONMENTAL PROTECTION MEASURES: Recovery all the unused gas to avoid emissions to the atmosphere.

PREVENTIVE MEASURES TO PREVENT SECONDARY HAZARDS: Equip with scuba to cut off the gas



supply, remove all the inflammable materials and fire source, keep well ventilation, evacuate affected area quickly. Install the corresponding gas monitoring and alarming system.

Section 7- Handling and Storage

PRACTICE NOTE: Operators should undergo special training and strictly observe the operation procedures. The place of operation, use and storage should conform to the standards of fire and explosion protection, and set up gas leakage alarm device. Avoid contact with prohibited substances such as oxidants (see section 10). It is compatible with all the commonly used building materials.

STORAGE PRECAUTIONS: Store in a well ventilated, safe and weather free place. Keep away from fire and heat sources. All electrical appliances in storage area must have explosion-proof facilities. It is forbidden to use equipment and tools that are easy to generate sparks. Storage areas should comply with the provisions (National Electrical Codes) of the 1 categories of dangerous areas.

Section 8- Exposure Controls/Personal Protection

EXPOSURE LIMIT: No data

BIOLOGICAL LIMIT: No data

ENGINEERING CONTROL: Providing adequate ventilation and/or exhaust capacity to prevent accumulation of gas. Monitoring Oxygen level in working area and keep it no less than 19.5%.

RESPIRATORY PROTECTION: Wear scuba to enter area oxygen level lower than 19.5 %.

EYE PROTECTION: Wear Safety glass.

SKIN AND BODY PROTECTION:

Wear protective clothing for general operations. Safety shoes are recommended when moving cylinders.

HAND PROTECTION: Cortical gloves recommended.

OTHER PROTECTION: Pay attention to ventilation in the working environmental and no smoking.

Section 9- Physical and Chemical Properties

APPEARANCE AND PROPERTIES: Colorless and tasteless liquefied flammable gas

PH VALUE: No data

MELTING POINT / FREEZING POINT(°C): -132

BOILING POINT(1.013x10⁵Pa, °C):6

DENSITY: No data

RELATIVE VAPOR DENSITY(air = 1): 6.79

RELATIVE DENSITY(water = 1): 1.553 @ -20°C

BURNING HEAT(KJ/kg): no data

SATURATED VAPOR PRESSURE(MPa): 25 psig @ 20°C

CRITICAL PRESSURE(MPa): 5.88

CRITICAL TEMPERATURE(°C): 44.55

FLASH POINT(°C): No data

N-OCTANOL/WATER PARTITION COEFFICIENT: No data

O-DECOMPOSITION TEMPERATURE(°C): No data

IGNITION TEMPERATURE(°C): No data



EXPLOSIVE UPPER LIMIT[% (V/V)]: 73

LOWER LIMIT OF EXPLOSION[% (V/V)]: 7

ODOUR THRESHOLD: No data

EVAPORATION RATE: No data

FLAMMABLE: Yes

SOLUBILITY: No data

Section 10- Stability and Reactivity

STABILITY: Stable. Avoid high temperature and open fire.

HAZARDOUS REACTION: Non-data available

HAZARDOUS DECOMPOSITION SUBSTANCE: hydrogen fluoride

PROHIBITED SUBSTANCES: Strong oxidants, strong acid, strong alkali

Section 11- Toxicological Information

ACUTE TOXICITY: LC50:4.42mg/L (668ppm) (4 hours) (rat)

LC50 1334 ppm (1 hour) (rat)

ON SKIN IRRITATION OR CORROSION: No data

EYE IRRITATION OR CORROSION: No data

GERM CELL MUTAGENICITY: No data

CARCINOGENICITY: No data

REPRODUCTIVE TOXICITY: No data

SYSTEMIC TOXICITY OF SPECIFIC TARGET ORGANS: No data

TOXICOKINETICS, METABOLISM AND DISTRIBUTION INFORMATION: No data

RESPIRATORY OR SKIN ALLERGIES: no data

INHALATION HAZARD: Inhalation is harmful. It may lead to respiratory irritation, cough, vertigo, anesthesia, arrhythmia and negative kidney effects.

Section 12- Ecological Information

ECOTOXICITY: No data

PERSISTENCE AND DEGRADABILITY: No data

POTENTIAL BIOACCUMULATION: No data

MIGRATION: No data

Section 13- Disposal Considerations

WASTE DISPOSAL METHODS:

PRODUCTS: Return cylinders and unused products to supplier.

UNCLEAN PACKAGING: Return contaminated cylinder to Supplier or dispose of following local regulations.

DISCARDED NOTICES: Refer to relevant national and local regulations before disposal.



Section 14- Transport Information

UNITED NATIONS HAZARDOUS CHEMICALS CODE(Hazard code): 3160

UNITED NATIONS TRANSPORT NAME: Liquefied gas toxic, flammable, n.o.s.

(1,3-butadiene,1,1,2,3,4,4-hexafluoro-)

United Nations Hazard Classification: 2.3 (2.1)

PACKING GROUP:N/A

Packing Method: Steel cylinders

PACKAGING MARKS: Liquefied toxic flammable gases

MARINE POLLUTANTS: No

PACKAGING(Yes/No): Steel cylinders

TRANSPORTATION PRECAUTIONS: cylinders should be upright in a well-ventilated truck for transport, not allowed shipped together with passengers. The cylinder valve should be tight closed before shipment, the valve plug and the valve cap is fixed.

Section 15- Regulatory Information

REGULATORY INFORMATION:

Ordinance on the Safety of Hazardous Chemicals(Order No. 591 of the State Council of the People's Republic of China)

Technical Monitoring Protocol for Gas Cylinder Safety(TSG R0006-2014)

Chemical Safety Technical Manual Content and Project Sequence(GB/T16483-2008)

Common Technical Conditions for Transport Packaging of Dangerous Goods(GB12463-2009)

General Principles for Classification and Hazard Communication of Chemicals(GB13690-2009)

Dangerous Goods Packing Mark(GB 190-2009)

Dangerous Goods Classification and Classification Number(GB 6944-2012)

List of dangerous goods(GB12268-2012)

Catalogue of Hazardous Chemicals(2015 Edition)

Regulation on the transport of dangerous goods by road(2010)

General Principles for Storage of Commonly Used Hazardous Chemicals(GB15603-1995)

Classification of chemicals, labels and Safety Code. Flammable gases(GB 20577-2006)

Classification of chemicals, labels and Safety Code. Pressure Gas (GB 20580-2006)

Section 16- Other Information

NOTES: Revisions are routinely updated every three years or on necessary.