



Miragas Co., Ltd.

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Section 1 — Product and Company Identification

Chemical Name: Hexafluoro-1,3-butadiene

Formula: C₄F₆

Supplier Name: Miragas Co. Ltd.

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

Telephone Number: +86 379-69581179

Emergency Telephone Number: +86 379-69581176-887

Fax: +86 379-69581180

Email Address: bureau@miragases.com

Recommended Usage: The dry etching gas is used in the etching process of micro contact holes.

Restriction on Use: No restrictions.

Section 2 — Hazards Identification

Emergency Overview: Toxic, flammable liquid and gas under pressure. Harmful or fatal if inhaled.

GHS Hazard Classification: According to the standard series of the chemical classification, warning label and warning specification, this product is a toxic, flammable liquid and gas under pressure, category 1, 3.

Label Elements:

Pictograms:



Warning Words: Danger

Hazard Information: Liquefied gas, flammable gas, toxic gas.

Precautionary Statement:

Preventive Measures: Avoid heat source, fire source, open fire, hot surface. No smoking in workplace.



Emergency Response: When there is a leakage, evacuate personnel to safe areas upwind. Please refer to Section 6 “Accidental Release Measures” for details.

Safe Storage: Store in weatherproof 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; Liquefied gas, heated explosion. Heat decomposes toxic fluoride gas.

Health Hazards: Harmful by inhalation.

Environmental Hazards: None.

Section 3 — Composition/Information on ingredients

Chemical Category: Single substance

Hazardous Component: Hexafluoro-1,3-butadiene

Concentration or Concentration Range: $\geq 99.995\%$

CAS Number: 593-63-2

Shelf life: 12 months

Section 4 — First Aid Measures

First Aid:

-Skin Contact: May cause frostbite. Remove contaminated clothing, flush with plenty of warm water for a few minutes, then immediately seek medical treatment.

-Eye Contact: May cause frostbite. Flush with plenty of water for at least 15 minutes, then immediately seek medical treatment.

-Inhalation: Remove victim to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If cardiac arrest occurs, give cardiopulmonary resuscitation and get medical attention immediately.

-Ingestion: Not a potential route of exposure.

Section 5 — Fire-Fighting Measures

Special Hazard: Extremely flammable, with fire hazard; In case of high heat, the internal pressure increases and the container is in danger of explosion.

Fire Extinguishing Method and Extinguishing Agent: Cut off the air source and put out the fire. Use water mist to reduce the combustion products formed in the air. If the air source cannot be cut off, it is not allowed to extinguish the flame at the leakage. Cool cylinders exposed to flame with water from a safe distance and remove containers from the fire site if possible. Use foam, carbon dioxide or dry powder extinguishers.

Fire Extinguishing Precautions and Measures: Wear positive pressure respirator and full body fire fighting clothes to extinguish the fire in the upwind direction. If the container in the fire site has changed color or made a



sound from the safety pressure relief device, it must be evacuated immediately. Isolate the accident site and prohibit irrelevant personnel from entering. Receive and treat fire water to prevent environmental pollution.

Section 6 — Accidental Release Measures

Operational Personnel Protection Measures, Protective Equipment and Emergency Response Procedures:

Personnel shall quickly evacuate the leakage contaminated area to the windward. Emergency treatment personnel shall wear positive pressure respirator and protective clothing to enter the leakage area, isolate the leakage contaminated area and strictly restrict access. Remove all items that may burn and provide maximum explosion-proof ventilation. All equipment used in operation shall be grounded. If possible, cut off the air supply and isolate all leaking cylinders. In case of leakage from the vessel, pressure relief valve or its own valve, contact the supplier. If the leakage comes from the user's system, close the cylinder valve, and be sure to carefully relieve the pressure and purge with inert gas before repairing the system.

Environmental Protection Measures: The waste gas shall be introduced into the incinerator for treatment or returned to the supplier.

Methods and Materials for Collection and Disposal of Leaked Chemicals: incinerate in furnace. Incinerate on the spot if not dangerous.

Preventive Measures to Prevent Secondary Hazards: Wear positive pressure respirator, turn off the air source and remove all possible fire sources. Ventilate and evacuate irrelevant personnel quickly

Section 7 — Handling and Storage

Handling Notes: Do not pull, roll, slide or drop the cylinder. Move the cylinder with the appropriate trolley. Do not try to pick up the cylinder by the cap. Ensure that the cylinder is fixed in place throughout its use. Use regulator to safely supply gas from the cylinder and use a one-way valve to prevent back flow. Use a well-designed pipeline with adequate pressure rating. Do not heat any part of the cylinder with open fire or adjacent source of heat. Temperature should not exceed 52°C on any part of the cylinder. Once the cylinder is connected to the system, the valve should be opened slowly with caution. If it's difficult to open the cylinder valve, stop using it and contact the supplier. Do not insert tools such as a wrench, screwdriver, etc. into the valve cap, it may damage the valve and cause leakage. Use an adjustable wrench to open the over-tightened or rusty cap. All delivery systems and related equipment must be grounded. All electrical equipment must be sparkle-proof or explosion-proof. The gas shall be compatible with all common building materials. Pressure rating requirements should be considered when selecting materials and designing systems. Special Note: The storage and operation on compressed gases should follow the provisions of CGAP-1 of the CGA manual (ph. 703-412-0900). Any related local regulations should be followed.

Storage Precautions: Store in well-ventilated, safe, and weatherproof location. Cylinders shall be placed upright. Keep valve closed and sealed with cap. Keep cylinder cap tightly installed. There should be no fire source in the storage area and all electrical appliances must be explosion-proof. The storage area shall conform to the requirements of National Electric Codes hazard areas of Category 1. The storage area should be at least 20 feet away from the oxygen and oxidant storage area, or isolated with over 5-feet-tall nonflammable barriers with half-hour fire rating. "No Fire" warning signs shall be installed in storage and operation areas. The temperature must be kept lower than 125°F (52°C) in the storage area, which should be kept away from main entrances and emergency exits. Store empty and full cylinders separately. Use first-in, first-out system to avoid extended storage time.



Section 8 — Exposure Controls/Personal Protection

Exposure Limit: No data

Biological Limit: No data

Monitoring Methods: If needed, monitor oxygen level in working area. Local exhaust and ambient ventilation systems must be installed in working area.

Engineering Control: Provide adequate ventilation and/or dedicated exhaust to prevent accumulation of gas. Monitor oxygen level in working area and ensure it is no less than 19.5%.

Respiratory Protection: Wear SCBA to enter area with oxygen level lower than 19.5%.

Eye Protection: Wear safety glasses.

Hand Protection: Wear general operation gloves.

Skin and Body Protection: Wear protective clothing for general operations. Safety shoes are recommended when moving cylinders.

Other Protection: Ensure ventilation and no smoking in working area.

Section 9 — Physical and Chemical Properties

Physical and Chemical Properties: Colorless, odorless and toxic liquefied flammable gas

PH Value: No data

Melting Point/Freezing Point (°C): -132

Boiling Point (°C): 6

Critical Density: No data

Relative Vapor Density (Air = 1): 6.79

Relative Density (Water = 1): 1.553 @ -20°C

Heat of Combustion (kJ/kg): No data

Saturated Vapor Pressure (psig): 25 @ 20°C

Critical Pressure (Mpa): No data

Critical Temperature (°C): No data

Flash Point (°C): No data

N-octanol/Water Partition Coefficient: No data

Decomposition Temperature (°C): No data

Ignition Temperature (°C): No data

Upper Explosive Limit [% (V/V)]: 73

Lower Explosive Limit [% (V/V)]: 7

Odor Threshold: No data

Evaporation Rate: No data

Flammability: Flammable

Solubility: No data

Section 10 — Stability and Reactivity

Stability: Stable

Conditions to Avoid: High temperature, open fire

Hazardous Reaction: No data

Hazardous Decomposition Products: Hydrogen fluoride

Incompatible Substances: Strong oxidant, strong acid, strong alkali, etc.



Section 11 — Toxicological Information

Acute Toxicity: LC50: 4.42mg/L (668ppm, 4hour ,rat)

LC50: 1334 ppm (1hour, rat)

Skin Irritation/Corrosion: No data

Eye Irritation/Corrosion: No data

Germ Cell Mutagenicity: No data

Carcinogenicity: No data

Reproductive Toxicity: No data

Specific Target Organ Toxicity: No data

Toxicokinetics, Metabolism and Distribution Information: No data

Respiratory or Skin Allergies: No data

Inhalation Hazard: Harmful by inhalation. May cause respiratory irritation, cough, dizziness, anesthesia, arrhythmia and negative renal effects.

Section 12 — Ecological Information

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative potential: No data

Mobility: No data

Section 13 — Disposal Considerations

Disposal Methods:

-Products: Return cylinders and unused products to supplier.

-Unclean Packaging: Return contaminated cylinder to supplier or dispose of following local regulations.

Disposal Notices: Refer to relevant national and local regulations before disposal.

Section 14 — Transport Information

United Nations Hazardous Chemicals Code (Hazard Code): No data

United Nations Dangerous Goods Number (UN): 3160

United Nations Transport Name: Hexafluoro-1,3-butadiene

United Nations Hazard Classification: 2.3 (2.1)

Packing Group: -

Packing Method: Steel cylinders

Packaging Marks: Liquefied toxic and flammable gas

Marine Pollutants: None

Packaging (Yes/No): Steel cylinders



Transportation Precautions: cylinders should be placed upright in a well-ventilated truck for transport. Do not ship by passenger vehicle. Ensure the cylinder valves are tightly closed, valve cap and cylinder cap and installed before shipment.

Section 15 — Regulatory Information

Regulatory Information:

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

Supervision Regulation on Safety Technology for Gas Cylinder (TSG R0006-2014)

Safety data sheet for chemical products - Content and order of sections (GB/T16483-2008)

General specifications for transport packages of dangerous goods (GB12463-2009)

General rule for classification and hazard communication of chemicals (GB13690-2009)

Packing Symbols of Dangerous Goods (GB 190-2009)

Classification and code of dangerous goods (GB 6944-2012)

List of dangerous goods (GB12268-2012)

Catalog of Hazardous Chemicals (2015 Edition)

Provisions on the Administration of Road Transport of Dangerous Goods (2010)

Rules for storage of chemical dangers (GB15603-1995)

Rules for classification and labeling of chemicals - Part 3: Flammable gases (GB 30000.3-2013)

Rules for classification and labeling of chemicals - Part 6: Gases under pressure (GB 30000.6-2013)

Section 16 — Other Information

Notes: Revision every 3 years or when necessary.