

Section 1. Product and company identification

GHS product identifier	trans-1,1,1,4,4,4-Hexafluoro-2-butene
Chemical name	trans-1,1,1,4,4,4-Hexafluoro-2-butene
Other means of identification	E-1,1,1,4,4,4-hexafluoro-2-butene; E-HFO-1336mzz, HFO-1336mZZ(E)
Product type	Liquefied Gas
Product use	Industrial and professional. Perform risk assessment prior to use. Laboratory chemicals. Synthesis of substances. Scientific research and development.
Supplier's details	Joinpath (Shanghai) Co., Ltd. Room 12612, Building 2, No. 1 Haikun Road, Fengxian District, Shanghai 021-32098022
24-hour telephone	021-32098022

Section 2. Hazards identification

OSHA/HCS status:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200). Liquefied gas H280 - Contains gas under pressure; may explode if heated Skin Irrit. 2 H315 - Causes skin irritation
Classification of the substance or mixture:	Eye Irrit. 2A H319 - Causes serious eye irritation STOT SE 3 H335 - May cause respiratory irritation STOT SE 3 H336 - May cause drowsiness or dizziness Aquatic Chronic 2 H411-Toxic to aquatic life with long lasting effects

GHS label elements

Hazard pictograms:



Signal word:	Warning
Hazard statements:	H280 - Contains gas under pressure; may explode if heated H315 - Causes skin irritation H319 - Causes serious eye irritation H335 - May cause respiratory irritation H336 - May cause drowsiness or dizziness H411-Toxic to aquatic life with long lasting effects.

Precautionary statements

General:	P261 - Avoid breathing fumes, gas, mist, spray, vapors P264 - Wash skin thoroughly after handling P271 - Use only outdoors or in a well-ventilated area P273 - Avoid release to the environment P280 - Wear protective gloves/protective clothing/eye protection/face
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	protection
	P302+P352 - If on skin: Wash with plenty of soap and water
	P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
	P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
	P312 - Call a POISON CENTER or doctor/physician if you feel unwell
	P332+P313 - If skin irritation occurs: Get medical advice/attention
	P337+P313 - If eye irritation persists: Get medical advice/attention
	P362+P364 - Take off contaminated clothing and wash it before reuse
	P391- Collect spillage.
	P403+P233 - Store in a well-ventilated place. Keep container tightly closed
	P410+P403 - Protect from sunlight. Store in a well-ventilated place
	P501 - Dispose of contents/container to an approved waste disposal plant
Prevention:	Use only outdoors or in a well-ventilated area. Do not breathe gas. Wear protective gloves. Wear protective clothing. Wear eye or face protection. In case of inadequate ventilation wear respiratory protection.
Response:	Get medical advice or attention if you feel unwell. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Storage:	Protect from sunlight. Store in a well-ventilated place. Store locked up.
Disposal:	Dispose of contents and container in accordance with all local, regional, national and international regulations.
Supplemental label elements	Keep container tightly closed. Use only with adequate ventilation. Do not enter storage areas and confined spaces unless adequately ventilated.
Hazards not otherwise classified:	May cause frostbite.

Section 3. Composition/information on ingredients

Substance/mixture:	Substance	
Ingredient name	%	CAS number
trans-1,1,1,4,4,4-Hexafluoro-2-butene	≥99.99	6671-86-2

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact	Immediately flush eyes thoroughly with water for at least 15 minutes. Get immediate medical advice/attention.
Inhalation	Remove person to fresh air and keep comfortable for breathing. If not breathing, give artificial respiration. Get immediate medical advice/attention.
Skin contact	Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
Ingestion	Ingestion is not considered a potential route of exposure.
Most important symptoms/effects, acute and delayed potential acute health effects	

Eye contact	Direct contact with the liquefied gas may cause severe and possibly permanent eye injury due to frostbite from rapid liquid evaporation.
Inhalation	Inhalation of high concentration may cause Cardiac sensitization, Anesthetic effects, light-headedness, Dizziness, and confusion. Lack of coordination, Drowsiness, Unconsciousness.
Skin contact	Contact with liquid or refrigerated gas can cause cold burns and frostbite.
Frostbite	Try to warm up the frozen tissues and seek medical attention.
Ingestion	As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact	No specific data.
Inhalation	No specific data.
Skin contact	No specific data.
Ingestion	No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician	Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.
Specific treatments	No specific treatment.
Protection of first-aiders	No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media	Use an extinguishing agent suitable for the surrounding fire. Carbon dioxide, dry powder, water spray, foam.
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Unsuitable extinguishing media	None known.
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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.
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Hazardous thermal	Hydrogen fluoride, Carbonyl fluoride, Carbon oxides
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decomposition products

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.

Special protective equipment for fire-fighters

Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

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. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders

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 non-emergency personnel".

Environmental precautions

Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill

Immediately contact emergency personnel. Stop leak if without risk.

Large spill

Immediately contact emergency personnel. Stop leak if without risk. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures

Handle in accordance with good industrial hygiene and safety practice, based on the results of the workplace exposure assessment. Close valve after each use and when empty. Wear cold insulating gloves/face shield/eye protection. Open the valves slowly to prevent pressure surges. Close valve after each use and when empty. Keep away from heat and sources of ignition. Take care to prevent spills, waste and minimize release to the environment. Avoid breathing gas. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders.

Advice on general

Handle in accordance with good industrial hygiene and safety procedures.

occupational hygiene

Do not eat, drink or smoke when using this product. Ensure that eye flushing systems and safety showers are located close to the working place. When using do not eat, drink or smoke. Wash contaminated clothing before re-use.

Conditions for safe storage, including any incompatibilities

Cylinders should be stored upright and firmly secured to pre-vent falling or being knocked over. Separate full containers from empty containers. Do not store near combustible materials. Avoid area where salt or other corrosive materials are present. Keep in properly labelled containers. Keep in a cool, well-ventilated place. Keep away from direct sunlight, Do not expose to temperatures exceeding 50 °C. Keep container closed when not in use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
trans-1,1,1,4,4,4-Hexafluoro-2-butene	TWA (OARS WELL) 400ppm (8h)

Appropriate engineering controls

Ensure good ventilation of the work station. Minimize workplace exposure concentrations. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Handle in accordance with good industrial hygiene and safety practice. Personal protective equipment. Wash hands before breaks and at the end of workday.

Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period.

Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection

Protective 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.

Body protection

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection

Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines.

Section 9. Physical and chemical properties

Appearance

Physical state

Liquified gas

Color

Colorless.

Odor

Odorless.

Odor threshold

Not available.

pH

Not applicable.

Melting point

<-20°C (-4°F)

Boiling point

7.5°C (45.5°F)

Critical temperature

Not available.

Flash point

[Product does not sustain combustion.]

Evaporation rate

Not available.

Flammability (solid, gas)

Not available.

Lower and upper

Not available.

explosive (flammable) limits

Vapor pressure

1.93 bar(@25°C)

Vapor density

5.3 (Air = 1)

Liquid Density

1.29 g/ml (@25°C)

Solubility

Not available.

Solubility in water

0.28 g/L (@25°C)

Partition coefficient: n- octanol/water

2.5 (@40°C)

Auto-ignition temperature

Not available

Decomposition temperature

Not available

Flow time (ISO 2431)

Not available

Molecular weight

164.05 g/mole

Section 10. Stability and reactivity

Reactivity	Not classified as a reactivity hazard. No reactivity at room temperature and thermally stable up to 250 °C.
Chemical stability	The product is stable at normal handling and storage conditions. Follow precautionary advice and avoid incompatible materials and conditions.
Possibility of hazardous reactions	Can react with strong oxidizing agents. Hazardous decomposition products formed under fire conditions. Carbon oxides, Hydrogen fluoride, Carbonyl fluoride
Conditions to avoid	Protect from sunlight, Heat, flames and sparks, Do not expose to temperatures exceeding 50 °C.
Incompatible materials	Not compatible with Oxidizing agents, alkali metals alkaline earth metals, powdered metals, powdered metal salts
Hazardous decomposition products	Under normal conditions of storage and use, hazardous decomposition products should not be produced. Hazardous decomposition products in case of fire, see Section 5.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity	Not available.
Irritation/Corrosion	Not available.
Sensitization	Not available.
Mutagenicity	Not available.
Carcinogenicity	Not available.
Reproductive toxicity	Not available.
Teratogenicity	Not available.
Specific target organ toxicity (single exposure)	Not available.
Specific target organ toxicity (repeated exposure)	Not available.
Aspiration hazard	Not available.
Information on the likely routes of exposure	Not available.

Potential acute health effects

Eye contact	Contact with rapidly expanding gas may cause burns or frostbite.
Inhalation	LC ₅₀ (Rat, gas, 4-hr),25,400-49,000 ppm(Charles River Laboratory, 2010) LC ₅₀ (Rat, gas, 4-hr),>17,000 (DuPont, 2012)
Skin contact	Contact with rapidly expanding gas may cause burns or frostbite.
Ingestion	As this product is a gas, refer to the inhalation section.
Symptoms related to the physical, chemical and toxicological characteristics	

Eye contact	No specific data.
Inhalation	No specific data.
Skin contact	No specific data.
Ingestion	No specific data.
Delayed and immediate effects and also chronic effects from short and long term exposure	
Short term exposure	
Potential immediate effects	Not available.
Potential delayed effects	Not available.
Long term exposure	
Potential immediate effects	Not available.
Potential delayed effects	Not available.
General	Not available.
Carcinogenicity	Not available.
Mutagenicity	Not available.
Teratogenicity	Not available.
Developmental effects	Not available.
Fertility effects	Not available.
Numerical measures of toxicity	
Acute toxicity estimates	Not available.

Section 12. Ecological information






Toxicity	LC ₅₀ (Rice fish, 96 h), 14.1 mg/L LC ₅₀ (Rare Minnow fish, 96 h), 1.78 mg/L ErC ₅₀ (Alga, 72 h), >14.4 mg/L EC ₅₀ (Daphnia magna, 48 h), 92.9 mg/L
Persistence and degradability	The product is not readily biodegradable
Bioaccumulative potential	No data available.
Mobility in soil	Not available.
Soil/water partition coefficient (KOC)	Not available.
Other adverse effects	No additional information available.

Section 13. Disposal considerations

13.1 Waste treatment methods

Waste from residues	Dispose of in accordance with local regulations.
Contaminated packaging	Empty containers should be taken to an approved waste handling site for recycling or disposal.

Section 14. Transport information

	DOT	TDG	ADR	IMDG	IATA
UN number	UN3163	UN3163	UN3163	UN3163	UN3163
UN proper shipping name	trans-1,1,1,4,4,4-Hexafluoro-2-butene	trans-1,1,1,4,4,4-Hexafluoro-2-butene	trans-1,1,1,4,4,4-Hexafluoro-2-butene	trans-1,1,1,4,4,4-Hexafluoro-2-butene	trans-1,1,1,4,4,4-Hexafluoro-2-butene
Transport hazard class(es)	2.2 	2.2 	2.2 	2.2 	2.2 
Packing group	II	II	II	II	II
Environmental hazards	No.	No.	No.	No.	No.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

Additional information

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.

DOT Packaging Exceptions (49 CFR 173.xxx) 306

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) 75 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) 150 kg

DOT Vessel Stowage Location A - The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel.

Other information No supplementary information available.

Section 15. Regulatory information

15.1 U.S. Federal regulations

All components of this product are listed, or excluded from listing, on the United States Environmental Protection Agency Toxic Substances Control Act (TSCA) inventory except for:

(E)-1,1,1,4,4,4-Hexafluoro-2-butene CAS No 66711-86-2 ≥99.99%

This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR § 372.38(a) subject to the reporting requirements of

section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

15.2. International regulations

CANADA

No additional information available

EU-Regulations

No additional information available

National regulations

No additional information available

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer and/or reproductive harm.

Section 16. Hazards identification

Hazardous Material Information System (U.S.A.)

Health	/	2
Flammability		0
Physical hazards		1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

	Flammability 0
Health 3	Instability/Reactivity 1
	Special

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Procedure used to derive the classification

Classification	Justification
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Eye Irrit. 2A H319 - Causes serious eye irritation STOT SE 3 H335 - May cause respiratory irritation STOT SE 3 H336 - May cause drowsiness or dizziness Aquatic Chronic 2 H411-Toxic to aquatic life with long lasting effects	Expert judgment
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History

Date of revision 2025/03/01

Date of preparation 2025/03/01

Version 1

Key to abbreviations

ATE = Acute Toxicity Estimate
 BCF = Bioconcentration Factor
 GHS = Globally Harmonized System of Classification and Labelling of Chemicals
 IATA = International Air Transport Association
 IBC = Intermediate Bulk Container
 IMDG = International Maritime Dangerous Goods
 LogPow = logarithm of the octanol/water partition coefficient
 MARPOL = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
 UN = United Nations

References Not available

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.