Material Safety Data Sheet

HFO-1234yf

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2,3,3,3-Tetrafluoropropene, HFO-1234yf

1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	**:**	**2,3,3,3-Tetrafluoropropene, HFO-1234yf**
Use of the substance / preparation	**:**	**Refrigerant**
Synonyms	**:**	**HFO-1234yf**
Molecular Formular	**:**	**$CF_3CF=CH_2$**
Manufacturer	**:**	**Zhejiang NOF Chemical Co.,Ltd.**
		No.20 Jincang Road,Green Industry Region, China
		0086-579-82025658
		0086-15088239500
FOR CHEMICAL EMERGENCY	**:**	**(Monday-Friday, 9:00am-5:00pm)**

2. HAZARDS IDENTIFICATION

Auto-ignition Temperature **405℃**

Slightly flammable.

GHS Label elements, including precautionary statements

Symbol(s):



Signal word : **Danger**

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.
	H380 - May displace oxygen and cause rapid suffocation.
Precautionary statements :	**P210 - Keep away from heat/sparks/open flames/hot surfaces. No smoking.**
	P261 - Avoid breathing fumes, gas, mist, spray, vapors.
	P264 - Wash skin thoroughly after handling.
	P271 - Use only outdoors or in a well-ventilated area.
	P280 - Wear protective gloves/protective clothing/eye protection/face 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.

3. COMPOSITION, INFORMATION ON INGREDIENTS

Chemical Name	CAS No	EC No.	%
2,3,3,3-Tetrafluoropropene	754-12-1	468-710-7	99.5

4. FIRST AID MEASURES

General advice

First aider needs to protect himself.
Take off all contaminated clothing immediately.

Inhalation

When inhaled remove to fresh air and seek medical aid.
If unconscious place in recovery position and seek medical advice.

Skin contact

Rapid evaporation of the liquid may cause frostbite.
In case of contact with liquid, thaw frosted parts with water, then remove clothing carefully.
Wash with plenty of water
Wash contaminated clothing before re-use.
Consult a physician.

Eye contact

Protect unharmed eye.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Call a physician immediately.

Ingestion	**Is not considered a potential route of exposure.**

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Specific hazards during fire fighting:

Slightly flammable.
Some risk may be expected of corrosive and toxic decomposition products.
In case of fire hazardous decomposition products may be produced such as:
Carbon monoxide, Hydrogen halides, Carbonyl halides
Cool closed containers exposed to fire with water spray.
Heating will cause pressure rise with risk of bursting and subsequent explosion.

Special protective equipment for fire-fighters:

Wear self-contained breathing apparatus and protective suit.

Further information:

In case of fire: Evacuate area. Fight fire remotely due to the risk of explosion.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:

Keep people away from and upwind of spill / leak.
Ventilate the area.
Wear self-contained breathing apparatus and protective suit.

Environmental precautions:

The product evaporates readily.
Prevent product from entering drains.

Methods for cleaning up:

Use low-sparking handtools and explosion-proof electrical equipment.
Allow to evaporate.

Additional advice:

Inform the responsible authorities in case of gas leakage, or of entry into waterways, soil or drains.
Pay attention to the spreading of gases especially at ground level (heavier than air) and to the direction of the wind.

For personal protection see section 8.

7. HANDLING AND STORAGE

Advice on safe handling:

Exhaust ventilation at the object is necessary.
Use explosion-proof equipment.
Pressurized container:
Protect from sunlight and do not expose to temperatures exceeding 50℃.
Do not pierce or burn, even after use.

Advice on protection against fire and explosion:

Use only in explosion-proof areas.
Keep product and empty container away from heat and sources of ignition.
Use only explosion-proof equipment.
Fire or intense heat may cause violent rupture of packages.

Further information on storage conditions:

Keep containers tightly closed in a cool, well-ventilated place.
Containers should be protected against falling down.
Protect from warmth.
Do not store at temperature exceeding 50℃.
Keep away from direct sunlight.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Highly effective exhaust ventilation

Respiratory protection:

In case of insufficient ventilation wear suitable respiratory equipment.

Hand protection: **Wear suitable gloves.**
Heat insulating gloves.

Eye protection: **Goggles.**

Skin and body protection: **Wear suitable protective equipment.**

Hygiene measures: **Provide adequate ventilation.**
Do not smoke.
When using do not eat or drink.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form	**Compressed liquefied gas**
Colour	**Colourless**
Odour	**Slight, ether-like**
Molecular Weight	**114g/mol**
PH	**Neutral**
Melting Point	**-152.2 °C**
Boiling Point, T_b	**-29.4℃**
Vapour Pressure	**5,830 hPa at 20℃**
Density	**4.8 kg/m^3 at 20 °C**
	Vapour density
Flash point	**Not applicable**
Auto-ignition Temperature	**405 °C at 1,013 hPa**
Lower Explosion Limit	**6.2 vol% at 21 °C**
Upper Explosion Limit	**12.3 vol% at 21 °C at 1013 hPa**
Water Solubility	**198.2 mg/l at 24℃**
Partition Coefficient	**Noctanol / Water POW: 2 at 25℃**
Relative Vapour Density	**4 (Air=1.0)**
Evaporation Rate	**Not determined.**
Critical Point	**95℃**
P_{vap}, MPa (25℃)	**0.673**
P_{vap}, MPa (80℃)	**2.47**
Liquid Density, kg/m^3 (25℃)	**1094**
Vapor Density, kg/m^3 (25℃)	**37.6**
ODP	**0**
GWP	**<1**
Atmospheric Lifetime	**11 Days**

10. STABILITY AND REACTIVITY

Conditions to avoid:

Keep away from: Heat, flames and sparks.

Do not spray on a naked flame or any incandescent material.

Gas cylinder : Keep at temperature not exceeding 52°C.

Pressurized container: Do not pierce or burn, even after use.

Materials to avoid:

Reactions with alkali metals.

Reactions with light metals.

Finely divided aluminium

Zinc

Magnesium

Hazardous decomposition products:

Risk of formation of toxic pyrolysis products containing fluorine.
Carbon Monoxide
Carbon Dioxide (CO_2)
Carbonyl Halides
Hydrogen Halides

11. TOXICOLOGICAL INFORMATION

Acute inhalation toxicity	**:**	**LC50** **Species: rat** **Does: > 400,000 ppm** **Exposure time: 4h**
Skin irritation	**:**	**Slight irritation**
Eye irritation	**:**	**Slight irritation**
Repeated dose toxicity	**:**	**Species: rat** **Route of exposure: Inhalation** **NOEL: 233mg/kg** **NOEL: 50000 ppm**

Further information:

Concentration above the admissible concentration at the workplace may cause dizziness, headache and inebriation. 2,3,3,3-Tetrafluoropropene: Mouse Micronucleus (4-hour): No toxicological significant signs reported. No increase in the frequency of micronuclei. Cardiac Sensitization: No effects for exposures up to 12% (120,189ppm).

12. ECOLOGICAL INFORMATION

Aquatic Toxicity

96 h LC50	**:**	**Cyprinus carpio (Carp) > 197 mg/l**
72 h NOEC	**:**	**Algae > 100 mg/l**
48 h EC50	**:**	**Daphnia magna (Water flea) > 100 mg/l**

Environmental Fate

Biodegradability aerobic : < 5 % OECD Test Guideline 301F
According to the results of tests of biodegradability this product is not readily biodegradable.

Bioaccumulation : **No bioaccumulation is to be expected (log Pow <= 4).**

13. DISPOSAL CONSIDERATIONS

Product : **Dispose according to legal requirements.**
Packaging : **Legal requirements are to be considered in regard of reuse or disposal of used packaging materials.**

14. TRANSPORT INFORMATION

UN number 3161
Proper shipping name Liquefied Gas, Flammable, N.O.S. (2,3,3,3-Tetrafluoropropene)
Class 2.1
Hazard Label



15. REGULATORY INFORMATION

TSCA 5E

This material contains one or more substances which are subject to a TSCA Section 5 Consent Order or Significant New Use Rule (SNUR).

TSCA 12B

This material contains one or more substances which requires export notification under TSCA Section 12(b) and 40 CFR Part 707 Subpart D

The approved uses are: refrigerant in motor vehicle air conditioning systems.

Processors and users of this substance must also comply with the applicable general SNUR requirements set forth in 40 CFR 721 subpart A, including export notification requirements if applicable (40 CFR 721.20), and the applicable record keeping requirements set forth at 40 CFR 721.125.

SARA 313 Regulated Chemical(s)

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

California Prop. 65

Chemicals known to the State of California to cause cancer, birth defects or any other harm: none known

16. OTHER INFORMATION

The information provided in this Safety Data Sheet is correct of the best of our knowledge, information and belief at the date of its publication. The information give is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid such material used in combination with any other materials or in any process, unless specified in the text. Final determination of suitability of any materials is the sole responsibility of the user.
This information should not constitute a guarantee for any specific product properties.

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