



SHOWA DENKO K.K.

GPS/JIPS Safety Summary

1. SUBSTANCE NAME

1,1,1,2-Tetrafluoroethane (CAS No.: 811-97-2)

2. GENERAL STATEMENT

Under normal temperatures, 1,1,1,2-tetrafluoroethane is a stable, clear, odorless, non-flammable gas that has been specified as a greenhouse gas. When handling the gas, it is necessary to exercise caution in regard to oxygen deficiency and high-pressure gas. Our high-quality 1,1,1,2-tetrafluoroethane is suitable for use in semiconductor manufacturing processes, as an etching gas.

3. CHEMICAL IDENTITY

Item	Description
Chemical or generic name	1,1,1,2-Tetrafluoroethane
Product name	High Purity HFC-134a
CAS No.	811-97-2
Other Nos.	Japan: Chemical Substances Control Law (2)-3585 EC No. EINECS No: 212-377-0
Chemical formula	CF ₃ CH ₂ F
Structural formula	$ \begin{array}{c} \text{F} \quad \text{F} \\ \quad \\ \text{F}-\text{C}-\text{C}-\text{H} \\ \quad \\ \text{F} \quad \text{H} \end{array} $
Sources/references	Sections 3 and 16 of the SDS issued by SHOWA DENKO K.K.

4. USES AND APPLICATIONS

Main uses	Our 1,1,1,2-tetrafluoroethane is used for an etching gas as a high-quality gas for producing semiconductors. Other applications of 1,1,1,2-tetrafluoroethane include a refrigerant agent.
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5. PHYSICAL/CHEMICAL PROPERTIES

1,1,1,2-Tetrafluoroethane takes form of a clear gas under normal temperatures and pressures.

Appearance	Gas
Color	Colorless
Odor	Odorless
Boiling point	-26.08°C
Flammability	Non-combustible
Auto-ignition temperature	No reliable data

Vapor pressure	4481mmHg (25 °C)
Vapor density	No reliable data
Solubility in water	67mg/L (25°C)
Partition coefficient (n-octanol/water)	LogPow=1.274
Sources/references	Section 9 of the SDS issued by SHOWA DENKO K.K.

6. HEALTH EFFECTS

Effect assessment	Results (GHS ^(Note 1) hazard classification)
Acute toxicity (oral)	Classification not possible ^(Note 2)
Acute toxicity (dermal)	Classification not possible
Acute toxicity (Inhalation : gases)	Not classified ^(Note 3)
Acute toxicity (Inhalation : vapors)	Not applicable ^(Note 4)
Acute toxicity (Inhalation : dusts and mists)	Not applicable
Skin corrosion/irritation	Not classified
Serious eye damage/eye irritation	Not classified
Respiratory sensitization	Classification not possible
Germ cell mutagenicity	Not classified
Carcinogenicity	Not classified
Reproductive toxicity	Not classified
Specific target organ toxicity (single exposure)	Category 3 (narcotic effect)
Specific target organ toxicity (repeated exposure)	Not classified
Aspiration hazard	Not applicable
Sources/references	Sections 2, 11 of the SDS issued by SHOWA DENKO K. K.

(Note 1) GHS (Globally Harmonized System of Classification and Labeling of Chemicals): It is a system for classifying chemicals according to type and hazard level, and for indicating label information pursuant to the globally unified rules for offering Safety Data Sheets.

(Note 2) Classification not possible: when unable to classify due to a lack of sufficiently reliable data for defining the classification.

(Note 3) Not classified: when the hazards are believed to be less than even the lowest hazard classification defined in the GHS.

(Note 4) Not applicable: when chemicals do not fall within the scope of classification because the physical properties defined in the GHS do not apply.

7. ENVIRONMENTAL EFFECTS

Effect assessment	Results (GHS hazard classification)
Hazardous to the aquatic environment	
Acute hazard	Not classified
Long-term hazard	Not classified
Hazardous to the ozone layer	Montreal Protocol on Substances that Deplete the Ozone Layer (revised version): not included in the list
Sources/references	Sections 2 of the SDS issued by SHOWA DENKO K.K.

Environmental fate/dynamics	Results
Mobility in soil	No reliable data available.
Persistence/degradability	No reliable data available.
Bioaccumulation potential	No reliable data available.
Conclusion about PBT/vPvB	The criteria for persistent bioaccumulative and toxic (PBT; remaining persistently in the environment and possessing high bioaccumulation potential and toxicity) and very persistent and very bioaccumulative (vPvB; remaining very persistently in the environment and possessing very high bioaccumulation potential) chemicals are believed to inapplicable.
Other	Emissions of gas affecting global warming. Global warming potential (GWP 100years): 1,300(Legal value)
Sources/references	Section 12 of the SDS issued by SHOWA DENKO K.K.

8. EXPOSURE

	Exposure potentials through main uses
Occupational exposures	Since the company's product is produced in a closed process, the potential for occupational exposure is extremely limited. However, workers could inhale the substance, or their skin and eyes could come in direct contact with it when sampling, etc.
Consumer exposures	The substance is not used in any case by general consumers.
Environmental exposures	Since the substance is normally manufactured and used in a closed process, its emission into the environment is extremely limited. The substance exists in the form of gas under normal temperatures and pressures, and is believed to be dispersed in the air when discharged into the environment. Further, the substance could be promptly decomposed in the air.
Precautions	If there is the potential for exposure during use in other applications, please implement appropriate measures by referring to the risk management recommendations.

9. RISK MANAGEMENT RECOMMENDATIONS

	Risk management recommendations
Occupational exposures	Technical measures
	•Install a wash stand, eye washer and safety shower at places that manufacture, store or handle the product. Additionally, when handling the substance, implement the following technical measures.
	Local exhaust and total ventilation
	•Install local exhaust or total ventilation systems at places where the product is manufactured, stored or handled. Additionally, maintain appropriate air concentration levels.
	Protective equipment
	While working, wear appropriate protective eyewears, air-supplied respirators, clothes and protective gloves made of materials

	impermeable to 1,1,1,2-tetrafluoroethane.
	Precautions
	•Managers responsible for processes should educate workers on the selection of appropriate protective gear, their proper usage and how to manage their working places.
Consumer exposures	Normally, general consumers would not use the substance. However if it is used, implement risk-management measures similar to those indicated in "Occupational Exposures" above.
Environmental exposures	In order to prevent environmental exposures, implement preventive measures against leakage into the atmosphere, for instance, treatment of the used gases containing 1,1,1,2-tetrafluoroethane with an exhaust gas treatment facility, and also pay attention to the daily management and handling of the substance.
Special instructions (emergency measures at times of leakage, etc.)	In the event of leakage, make certain to wear protective gear and deal with it appropriately. Abide by the relevant acts and regulations when disposing the collected substance.
Sources/references	Sections 6, 7, 8, and 13 of the SDS issued by SHOWA DENKO K.K.

10. STATE AGENCY REVIEW

Hazard assessment	Situations of review
International Chemical Safety Cards	ICSC No:1281, http://www.ilo.org/dyn/icsc/showcard.display?p_lang=en&p_card_id=1281


11. REGULATORY INFORMATION/ GHS CLASSIFICATION-LABELING INFORMATION

Regulatory information only in Japan

Applicable laws	Regulatory situations
Foreign Exchange and Foreign Trade Act	•Item (2), Appended Table 1-16 of Export Trade Control Order
Act on Port Regulations	Hazardous substances • Compressed gas , Article 21-2 of the Act, Article 12 of Enforcement Regulations
Civil Aeronautics Act	Pressurized gases, Appended Table 1 specifying the hazardous substances, Article 194 of the Enforcement Regulations
High Pressure Gas Safety Act	•Liquefied gas, Article 2-1 of the Act •Non-flammable gas, Article 2-4 of Regulations for Safety Precautions for High-Pressure Gas
Ship Safety Act	High Pressure gas, Appended Table 1 specifying the hazardous substances, Article 3 of Regulations for the Carriage and Storage of Dangerous Goods in Ship
Road Act	•Restrictions on vehicle traffic, Article 19-13 of the Enforcement Ordinance, Appended Table 2 of Notification No.12 of Japan Expressway Holding and Debt Repayment Agency

Act on Promotion of Global Warming Countermeasures	Greenhouse Gases, paragraph 3-4, Article 2 of the Act, Article 1-6 of the Enforcement Ordinance
UN classification	Class 2.2
UN No.	UN3159

GHS classification, label information

Hazards	Classification results (hazard information)
Physical chemical hazards	
Flammable gases	Not classified
Oxidizing gases	Not classified
Gases under Pressure	Low Pressure liquefied gas
Health hazards	
Acute toxicity (Inhalation : gases)	Not classified
Skin corrosion/irritation	Not classified
Serious eye damage/eye irritation	Not classified
Germ cell mutagenicity	Not classified
Carcinogenicity	Not classified
Reproductive toxicity	Not classified
Specific target organ toxicity (single exposure)	Category 3 (narcotic effect)
Specific target organ toxicity (repeated exposure)	Not classified
Hazardous to the aquatic environment	
Acute hazard	Not classified
Long-term hazard	Not classified
GHS label elements	
Pictogram or symbol	
Signal word	Warning
Hazard statement	Contains gas under pressure; may explode if heated. May cause drowsiness or dizziness.

12. CONTACT INFORMATION

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13. DATE OF ISSUE AND REVISION, ADDITIONAL INFORMATION

Date of issue: December 18, 2013

Revisions:

Date of revision	Revised section	Revised item	Version

Special instructions: none

14. DISCLAIMER

This Safety Summary which is a translation of original Safety Summary prepared in Japanese, has been prepared as a part of the efforts by GPS/JIPS: Japan Initiative of Product Stewardship by the chemical industry. This Safety Summary is meant to provide an outline of information related to the safe handling of the subject substance rather than provide expert information regarding the risk assessment processes, the effect on human health or the environment, etc. Moreover it is not a replacement for the Safety Data Sheet (SDS), the Chemical Safety Report (CSR), or other risk assessment documents. To the greatest extent possible, the Safety Summary contains accurate statements based on laws, materials, information and other data available at the time of issue. However, it does not cover all such data. Additionally, it does not intend to provide a guarantee in any way.