

1 PRODUCT AND COMPANY IDENTIFICATION**Fluorochemicals Group**
2000 Market Street

Philadelphia, PA 19103

Information Telephone Numbers

Product Information

Product Name Forane (R) 409A
Product Synonym(s)

Chemical Family Hydrogenated Chlorofluorocarbon Blend

Chemical Formula Mixture

Chemical Name Chlorodifluoromethane (HCFC-22)/1-chloro-1,1-difluoroethane (HFC-142b)/
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124)

EPA Reg Num

Product Use Refrigerant Blend

EMERGENCY PHONE NUMBERS:

Chemtrec: (800) 424-9300 (24hrs) or (703) 527-3887

Medical: Rocky Mountain Poison Control Center
(303) 623-5716 (24Hrs)

Phone Number

800-245-5858

Available Hrs

8:00 am - 5:30 pm (Eastern)

2 COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient Name	CAS RegistryNumber	Typical Wt. %	OSHA
Chlorodifluoromethane	75-45-6	60%	Y
2-Chloro-1,1,1,2-tetrafluoroethane	2837-89-0	25%	Y
1-Chloro-1,1-difluoroethane, HCFC-142b	75-68-3	15%	Y

The substance(s) marked with a "Y" in the OSHA column, are identified as hazardous chemicals according to the criteria of the OSHA Communication Standard (29 CFR 1910.1200)

This material is classified as hazardous under Federal OSHA regulation.

The components of this product are all on the TSCA inventory list.

3 HAZARDS IDENTIFICATION**Emergency Overview**

Colorless liquified gas with faint ether odor.

WARNING!

LIQUID AND GAS UNDER PRESSURE, OVERHEATING AND OVERPRESSURIZING MAY CAUSE GAS RELEASE OR VIOLENT CYLINDER BURSTING. MAY DECOMPOSE ON CONTACT WITH FLAMES OR EXTREMELY HOT METAL SURFACES TO PRODUCE TOXIC AND CORROSIVE PRODUCTS. VAPOR REDUCES OXYGEN AVAILABLE FOR BREATHING AND IS HEAVIER THAN AIR. HARMFUL IF INHALED AND MAY CAUSE HEART IRREGULARITIES, UNCONSCIOUSNESS OR DEATH. LIQUID CONTACT WITH EYES OR SKIN MAY CAUSE FROSTBITE.

Potential Health Effects

Skin contact and inhalation are expected to be the primary routes of occupational exposure to this material. As with most liquified gases, contact with the rapidly volatilizing liquid can cause frostbite to any tissue. High vapor concentrations are irritating to the eyes and respiratory tract and may result in central nervous system (CNS) effects such as headache, dizziness, drowsiness and, in severe exposure, loss of consciousness and death. The dense vapor

of this material may reduce the available oxygen for breathing. Prolonged exposure to an oxygen-deficient atmosphere may be fatal. Inhalation may cause an increase in the sensitivity of the heart to adrenaline, which could result in irregular or rapid heartbeats. Medical conditions aggravated by exposure to this material include heart disease or compromised heart function.

4 FIRST AID MEASURES

IF IN EYES, immediately flush with plenty of water. Get medical attention if irritation persists.

IF ON SKIN, Flush exposed skin with lukewarm water (not hot), or use other means to warm skin slowly. Get medical attention if frostbitten by liquid or if irritation occurs.

IF SWALLOWED, Not applicable - product is a gas at ambient temperatures.

IF INHALED, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention. Do not give adrenaline, epinephrin or similar drugs following exposure to this product.

5 FIRE FIGHTING MEASURES

Fire and Explosive Properties

Auto-Ignition Temperature	NA	
Flash Point	NA - GAS	Flash Point Method
Flammable Limits- Upper	NA	
Lower	NA	

Extinguishing Media

Use extinguishing media appropriate to surrounding fire conditions.

Fire Fighting Instructions

Stop the flow of gas if possible. Use water spray on person making shut-off. Fire fighters and others who may be exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand NIOSH approved or equivalent). Fire fighting equipment should be thoroughly decontaminated after use.

Fire and Explosion Hazards

May decompose on contact with flames or extremely hot metal surfaces to produce toxic and corrosive products. Liquid and gas under pressure, overheating or overpressurizing may cause gas release and/or violent cylinder bursting. Container may explode if heated due to resulting pressure rise. Some mixtures of HCFCs and/or HFCs, and air or oxygen may be combustible if pressurized and exposed to extreme heat or flame.

6 ACCIDENTAL RELEASE MEASURES

In Case of Spill or Leak

Use Halogen leak detector or other suitable means to locate leaks or check atmosphere. Keep upwind. Evacuate enclosed spaces and disperse gas with floor-level forced-air ventilation. Exhaust vapors outdoors. Do not smoke or operate internal combustion engines. Remove flames and heating elements.

7 HANDLING AND STORAGE

7 HANDLING AND STORAGE

Handling

Avoid breathing gas. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Do not enter confined spaces unless adequately ventilated.

Storage

Do not apply direct flame to cylinder. Do not store cylinder in direct sun or expose it to heat above 120 F. Do not drop or refill this cylinder. Keep away from heat, sparks and flames.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering Controls

Investigate engineering techniques to reduce exposures below airborne exposure limits. Provide ventilation if necessary to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

Eye / Face Protection

Where there is potential for eye contact, wear chemical goggles and have eye flushing equipment available.

Skin Protection

Wear appropriate chemical resistant protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine appropriate type glove material for given application. Rinse contaminated skin promptly. Wash contaminated clothing and clean protective equipment before reuse. Wash skin thoroughly after handling.

Respiratory Protection

Avoid breathing gas. When airborne exposure limits are exceeded (see below), use NIOSH approved respiratory protection equipment appropriate to the material and/or its components (full facepiece recommended). Consult respirator manufacturer to determine appropriate type equipment for a given application. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency and other conditions where exposure limit may be significantly exceeded, use an approved full face positive-pressure, self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. Respiratory protection programs must comply with 29 CFR § 1910.134.

Airborne Exposure Guidelines for Ingredients

Exposure Limit	Value
2-Chloro-1,1,1,2-tetrafluoroethane	
WEEL TWA -	1000 ppm
Chlorodifluoromethane	
ACGIH TWA -	1000 ppm 3540 mg/m3
1-Chloro-1,1-difluoroethane, HCFC-142b	
WEEL TWA -	1000 ppm 4100 mg/m3

- Only those components with exposure limits are printed in this section.
- Skin contact limits designated with a "Y" above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required.
- ACGIH Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic reactions.
- WEEL-AIHA Sensitizer designator with a value of "Y" above means that exposure to this material may cause allergic skin reactions.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance/Odor	Colorless liquified gas with faint ether odor.
pH	NA
Specific Gravity	1.21 @ 4 C
Vapor Pressure	107.0 PSIA @ 70 F
Vapor Density	3.36
Melting Point	NE
Freezing Point	NE
Boiling Point	-31 F
Solubility In Water	Negligible
Percent Volatile	100
Molecular Weight	97.43
Bulk Density	1.21 @ 25 C (g/cm ³)

10 STABILITY AND REACTIVITY**Stability**

This material is chemically stable under specified conditions or storage, shipment and/or use. See HANDLING AND STORAGE section of this MSDS for specified conditions.

Incompatibility

Avoid contact with strong alkali or alkaline earth metals, finely powdered metals such as aluminum, magnesium or zinc and strong oxidizers, since they may react or accelerate decomposition.

Hazardous Decomposition Products

Thermal decomposition products include hydrogen fluoride, hydrogen chloride, carbon monoxide, carbon dioxide and chlorine.

11 TOXICOLOGICAL INFORMATION**Toxicological Information****Chlorodifluoromethane**

There have been several accidental deaths associated with exposure to this material or mixtures with other fluorocarbons. Death was generally attributed to oxygen deficiency. Microscopic examination of the tissues of some of the victims showed effects on the lungs and fatty deposits in liver cells. An increase in the incidence of heart palpitations have been claimed by individuals occupationally exposed. Monitoring of workers during occupational exposure showed no connection to exposure and cardiac arrhythmia or neurologic disorders. Other epidemiological studies have reported similar results.

Repeated daily application of a 10 second spray caused reddening and slight swelling of the skin and a delay in hair growth. Skin allergy was not observed in guinea pigs following repeated exposure. Inhalation causes an initial stimulation and then depression of the central nervous system (CNS). Symptoms in animals include loss of equilibrium, tremors, convulsions and narcosis and death, usually attributed to asphyxiation. At levels that caused anesthesia, dogs exhibited convulsions. Exposure by inhalation at 300,000 to 400,000 ppm for 10-15 minutes was fatal to rabbits, also causing hemorrhages and effects on the liver. Following inhalation exposure to 50,000 ppm for 1 month, no effects were reported in guinea pigs, rats, dogs and cats; 60,000 ppm for 2-3 months elicited mild liver effects in rabbits; 5,000 ppm for 3 months caused no effects in dogs; 15,000 ppm for 4

11 TOXICOLOGICAL INFORMATION

months, produced no neurotoxic effects in rats; 14,000 ppm for 10 months produced effects on the lungs, CNS, heart, liver, kidney, spleen of rats, mice and rabbits, while at 2,000 ppm no effects were reported in rats and mice. An increase in malignant tumors of the salivary glands was reported in male rats but not in female rats or mice of either sex after inhalation exposure to 50,000 ppm 5 hr/day, 5 day/wk for 21 months. Long term inhalation of 5,000 ppm was not carcinogenic to rats and mice. Oral dosing for 52 weeks produced no adverse effects in rats. Inhalation at levels up to 50,000 and 100,000 ppm, produced no adverse effects on male reproductive performance in rats and mice respectively. Eye malformations were reported in rats exposed by inhalation during pregnancy at 50,000 ppm. In rats at 1,000 ppm or in rabbits exposed at levels up to 50,000 ppm. In rabbits, rats and humans, a small portion of inhaled material was distributed into the brain, heart, lungs, liver, kidneys and fat. It was rapidly eliminated from the body in the inhaled air. No significant metabolism occurs in humans or rats. The results of the tests for genetic changes were mixed. Studies with mice, dogs, rats, rabbits, cats and monkeys have shown that inhalation exposure can cause cardiac arrhythmias. The NOEL for cardiac sensitization in dogs is 25,000 ppm. Single exposure (acute) studies indicate:

Inhalation - Practically Non-Toxic (2 hr-LD₅₀ = 300,000 (rat), 390,000 ppm (mouse))

Inhalation - Rat 10 min-EC₅₀ = 140,000 ppm (CNS Effects)

Eye Irritation - Slightly Irritating to Rabbits (5-30 sec. exposure to gas spray)

Skin Irritation - (Moderate) Irritating to Rabbits (liquefied gas with patch applied)

1-Chloro-1,1-difluoroethane, HCFC-142b

Inhalation exposure causes an initial stimulation and then depression of the central nervous system. Symptoms in animals include loss of equilibrium, tremors, convulsions and narcosis. Death was usually attributed to respiratory failure. The lowest lethal concentration for a 30 minute exposure in rats was 500,000 ppm. Animals that died from inhalation exposure, generally showed lung irritation. Following inhalation exposure to this material at 200,000 ppm effects on the lungs were noted in rats; 100,000 ppm was severely irritating to the lungs and lethal to all rats within 9 exposures; repeated exposure to 10,000 ppm produced no effects in rats and dogs. Long term exposure to 20,000 ppm was reported to be the (NOEL) level in rats. No birth defects were noted in rats exposed by inhalation during pregnancy at levels up to 10,000 ppm. The results of tests for genetic changes were mixed.

Inhalation exposure to this material can cause cardiac arrhythmias and effects on the cardiac and respiratory system in dogs. Dogs treated with adrenalin then exposed by inhalation to this material at 50,000 ppm for 5 minutes exhibited cardiac sensitization. Following repeated inhalation exposure to this material no increases in urinary fluoride was reported and this material was not detected in the tissues. Single exposure (acute) studies indicate:

Inhalation - Practically Non-Toxic to Mice (30 min-LC₅₀ 300,000 ppm)

Inhalation - Practically Non-Toxic to Mice (2 hr-LC₅₀ 368,000 ppm)

Inhalation - Practically Non-Toxic to Rats (6 hr-LC₀ = 200,000 ppm)

Eye Irritation - Slightly Irritating to Rabbits (dry ice cooled liquid)

2-Chloro-1,1,1,2-tetrafluoroethane

Acute inhalation of high concentrations has produced a rapid anesthetic effect in mice and dogs. Inhalation, followed by intravenous injection of epinephrine to simulate stress reactions, resulted in cardiac sensitization in dogs. Following repeated inhalation exposure, drowsiness and loss of coordination were observed in rats (at high dose levels) and slight central nervous system effects and minor blood chemistry changes were observed in rats and mice. No birth defects were noted in the offspring of rats or rabbits exposed by inhalation during pregnancy, even at dosages which produced significant adverse effects in the mother. No genetic changes were observed in tests using bacteria, animal cells and whole animals. Single exposure (acute) studies indicate

11 TOXICOLOGICAL INFORMATION

Inhalation - Practically Non-toxic to Rats (4-hr LC50 Estimated to be between 230,000 to 300,000 ppm)

12 ECOLOGICAL INFORMATION**Ecotoxicological Information**

Chlorodifluoromethane

No effects were reported on the growth of aerobic and anaerobic microorganisms over a 24 hour period, including gram-positive and gram-negative species, from exposure to a media containing this material at 5 mg/ml.

1-Chloro-1,1-difluoroethane, HCFC-142b

This material is slightly toxic to freshwater organisms such as rainbow trout (96-hr LC50 36 ppm) and practically non-toxic to guppies (96-hr LC50 220 ppm) and Daphnia magna (48-hr EC50 160- >190).

Chemical Fate Information

Chlorodifluoromethane

The octanol/water partition coefficient (log Pow) was reported to be 1.08.

1-Chloro-1,1-difluoroethane, HCFC-142b

The octano/water partition coefficient (log Pow) for this material was reported to be 1.62

This material was evaluated with a Modified Strum Test (20-day= 5%) and determined to be not readily biodegradable.

2-Chloro-1,1,1,2-tetrafluoroethane

When released into the environment, this material may be expected to partition almost exclusively into the atmosphere. Based on its low n-octanol/water partition coefficient (log Pow 1.9-2.0), bioaccumulation is considered unlikely. In a 28-day ready biodegradability closed bottle test, it appeared to be stable (about 2% degraded).

13 DISPOSAL CONSIDERATIONS**Waste Disposal**

Recover, reclaim or recycle when practical. Dispose of in accordance with federal, state and local regulations. Note: Chemical additions to, processing of, or otherwise altering this material may make this waste management information incomplete, inaccurate, or otherwise inappropriate. Furthermore, state and local waste disposal requirements may be more restrictive or otherwise different from federal laws and regulations.

14 TRANSPORT INFORMATION

DOT Name	Liquefied Gas, NOS
DOT Technical Name	(Chlorodifluoromethane, Chlorodifluoroethane)
DOT Hazard Class	2.2
UN Number	UN 3163
DOT Packing Group	PG NA
RQ	

15 REGULATORY INFORMATION

Hazard Categories Under Criteria of SARA Title III Rules (40 CFR Part 370)

Immediate (Acute) Health	Y	Fire	N
Delayed (Chronic) Health	N	Reactive	N
		Sudden Release of Pressure	Y

The components of this product are all on the TSCA inventory list.

Ingredient Related Regulatory Information:

SARA Reportable Quantities	CERCLA RQ	SARA TPQ
2-Chloro-1,1,1,2-tetrafluoroethane	NE	NE
Chlorodifluoromethane	NE	NE
1-Chloro-1,1-difluoroethane, HCFC-142b	100 LBS	100 LBS

SARA Title III, Section 313

This product does contain chemical(s) which are defined as toxic chemicals under and subject to the reporting requirements of, Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 986 and 40 CFR Part 372. See Section 2

- 1-Chloro-1,1-difluoroethane, HCFC-142b
- 2-Chloro-1,1,1,2-tetrafluoroethane
- Chlorodifluoromethane

Massachusetts Right to Know

This product does contain the following chemical(s), as indicated below, currently on the Massachusetts Right to Know Substance List.

- 1-Chloro-1,1-difluoroethane, HCFC-142b
- Chlorodifluoromethane

New Jersey Right to Know

This product does contain the following chemical(s), as indicated below, currently on the New Jersey Right-to-Know Substances List.

- 1-Chloro-1,1-difluoroethane, HCFC-142b
- 2-Chloro-1,1,1,2-tetrafluoroethane
- Chlorodifluoromethane

Pennsylvania Environmental Hazard

This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Environmental Hazard List.

- Chlorodifluoromethane

Pennsylvania Right to Know

This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Hazardous Substance List.

- 1-Chloro-1,1-difluoroethane, HCFC-142b

Pennsylvania Right to Know

This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Hazardous Substance List.
Chlorodifluoromethane

16 OTHER INFORMATION**Revision Information**

Revision Date	20 SEP 2001	Revision Number	5
Supersedes Revision Dated	25-JUL-2000		

Revision Summary

Revised section 9.

Key

NE= Not Established NA= Not Applicable (R) = Registered Trademark

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