MATERIAL SAFETY DATA SHEET
Refrigerant 22

1. PRODUCT AND COMPANY INDENTIFICATION

Product Name: Refrigerant Gas (R-22)
Chemical Name: Chlorodifluoromethane
Chemical Family: Hydrochlorofluorocarbons
Chemical Formula: $CHClF_2$

2. COMPOSITION/INFORMATION ON INGREDIENTS

Material Name	CAS No.	Typical Wt %
Chlorodifluoromethane	75-45-6	100

3. HAZARDS IDENTIFICATION

Potential Health Effects

Eyes:
Eye contact with liquid may include eye irritation with discomfort, tearing, or blurring of vision.

Skin:
Skin contact with liquid can cause frostbite. Prolonged overexposure may cause de-fatting or dryness of the skin.

Inhalation:
Inhalation of high concentration of vapour is harmful and may cause heart irregularities, unconsciousness or death. Intentional misuse of deliberate in halation may cause death without warning. Vapour reduces oxygen available for breathing and is heavier than air. Higher exposures may lead to temporary alteration of the heart's electrical activity with irregular pulse, palpitations, or inadequate circulation. Gross exposure may be fatal.

Individuals with pre-existing diseases of the central nervous of cardiovascular system may have increased susceptibility to the toxicity of excessive exposures.

Inhalation may include temporary nervous systems depression, with anesthetic effects such as dizziness, headache, confusion, incordination and loss of consciousness.

4. FIRST AID MEASURES

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

Skin: In case of contact, flush area with lukewarm water. Do not use hot water. Call a physician.

Inhalation: If inhaled, immediately remove to fresh air. Keep person clam. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion: Not a probable rout, however in case of accidental ingestion, call a physician.

Notes to Physicians: This material may make heart more susceptible to Arrhythmias. Catehlolamines such as adrenaline and other compounds having similar effects should be reserved for emergencies and use only with special caution.

5. FIRE-FIGHTING MEASURES

Flammable Properties:
Upper, Flammable Limits in Air (% by volume): Not applicable
Lower, Flammable Limits in Air (% by volume): Not applicable
Flash point: Will not burn
Auto-ignition Temperature: 632 ℃ (1170 ℉)

Other materials may cause R22 to burn weakly. R22 is not flammable at ambient temperatures and atmospheric pressure. However, this material has been shown in test to be combustible at pressure as low as 60 psig at ambient temperature when mixed with air at concentration of 65 volume % air. Experimental data have been reported which indicated combustibility of R22 in pressure of certain concentrations of chlorine.

Unusual Fire and Explosion Hazards:
Cylinders may rupture under fire conditions. Decomposition may occur.

Extinguishing Media:
Use extinguishing media appropriate to surrounding fire conditions.

Fire Fighting Instructions:
Use water spray or fog to cool containers. Self –contained breathing apparatus (SCBA) is required if cylinders rupture or contents are released under fire conditions. Water runoff should be contained and neutralized prior to release.

6. ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel):
Review fire fighting measures and handling (personnel) sections before proceeding with clean up. Use appropriate personal protective equipment during clean up.

Accidental Release Measures:
Ventilate area, especially low or enclosed places where heavy vapours might collect. Remove open flames. Use self-contained breathing apparatus (SCBA) for large spills or releases.

7. HANDLING AND STORAGE

Handling (Personnel):
Avoid breathing vapors. Avoid liquid contact with eyes and skin. Use sufficient ventilation to keep employee exposure below recommended limits. R22 should not be mixed with air for leak testing. In general it should not be allowed to for material to be present with high concentrations of air above atmospheric pressure. Contact with chlorine or other strong oxidizing agents should also be avoided.

Storage: Keep in a clean, dry area. Do not heat above 52 ℃ (125 ℉).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls:

Avoid breathing vapours. Avoid contact with skin or eyes. Use with sufficient ventilation to keep employee exposure below recommended exposure limit. Local exhaust should be used if large amounts are released. Mechanical ventilation should be used in low or enclosed places.

Personal Protective Equipment:
Impervious gloves should be used to avoid prolonged or repeated exposure. Chemical splash goggles should be available for use as needed to prevent eye contact. Under normal manufacturing conditions, no respiratory protection is required when using this product. Self-contained breathing apparatus (SCBA) is required if large release occurs.

Exposures Guidelines:

Chlorodifluoromethane	ACGIH (TLV)	1000 ppm	3540 mg/m3
	OSHA (PEL)	None Established	

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Appearance	Clear, Colourless liquid and vapour
Odor	Slightly ethereal
pH	Neutral
Boiling Point	-40.8 ℃ (-41.4 ℉) @ 760mmHg
Freezing Point	-160 ℃ (-256 ℉)
Vapour Pressure	151.4 psia @ 25 ℃ (77 ℉) Saturated
Vapour Density	2.92 @ 25 ℃ (77 ℉) (Air=1)
Specific Gravity	1.19 @ 25 ℃ (77 ℉) (H_2O=1)
Solubility in Water	Slight
Molecular Weight	86.47

10. STABILITY AND REACTIVITY

Chemical Stability: This material is chemically stable under specific conditions, storage shipment and/or use. However avoid open flames and high temperatures.

Incompatibility with other materials: Incompatible with alkali or alkaline earth metals – powdered Al, Zn. Be, etc

Decomposition: This material can be decomposed in high temperatures (open flames, glowing metal surfaces, etc) thus, forming hydrochloric and hydrofluoric acids, and possibly carbonyl halides. These materials are toxic and irritating. Contact should be avoided.

Polymerization: Will not occur

11. TOXICOLOGICAL INFORMATION

Single exposure (acute) studies indicate: -
Inhalation – Practically non-toxic (2 hr-LD50 = 300000ppm (rat), 390000ppm (mouse)
Inhalation – Rat 10 min-EC50 = 140,000ppm (CNS Effects)
Eye Irritation – Slightly irritating to rabbits (5-30 sec. Expose to gas spray)
Skin Irritation – (Moderate) irritating to rabbits (liquefied gas with patch applied)

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 increased in the incidence of heart palpitations has 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 ten depression of the central nervous system (CNS). Symptoms in animals include loss of equilibrium, tremors, convulsion and narcosis and death, usually attributed to asphyxiation. At levels that caused anesthesia, dogs exhibited convulsions. Exposure by in halation 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 50,000ppm for 1 month, no effects were reported in guinea pigs, rats, dogs and cats; 60,000 ppm for 2-3 months eliclited mild liver effects in rabbits; 5000 ppm for 3 months caused no effects in dogs; 15,000 ppm for 4 months, produced no neuro-toxic 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 2000 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 test for genetic changed were mixed. Studies with mice, dogs, rats and monkeys have shown that inhalation exposure can caused cardiac arrhythmias. The NOEL for cardiac sensitization in dogs is 25,000 ppm.

12. ECOLOGICAL INFORMATION

Aquatic Toxicity: 48 hour EC50 – Daphnia magna: 433mg/L

ODP: 0.034
GWP: 1700 (relative to carbon dioxide for integration of 100 years)

13. DISPOSABLE CONSIDERATIONS

Waste Disposal
Comply with local regulations. Reclaim by distillation or remove to a permitted waste facility.

14. TRANSPORTATION INFORMATION

Shipping Information
DOT/IMO
Proper Shipping Name : Chlorodifluoromethane
DOT Name : Refrigerant Gas R22

IMO Class (Hazard Class) : 2.2
UN no. : 1018
DOT/IMO Label : Non-Flammable Gas

15. REGULATORY INFORMATION

Hazard Categories under SARA Title III Rules (40CFR Part 370)
Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : Yes

16. OTHER INFORMATION

The information in this Material Safety Data Sheet only concerns the above-mentioned product and does not relate to use with other product(s) or in any process. This information is to our best present knowledge correct and complete and is given in good faith but without warranty. It remains the user's own responsibility to ensure that the information is appropriate and correct for his special use of this product.

Revision Information: MSDS-R22 (REV-02-10)

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