FORWARD MATERIAL CO., LTD

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MATERIAL SAFETY DATA SHEET R22

1 CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification CAS Number: 75-45-6 Formula: CHCLF2 Molecular Weight: 86.47
Tradenames and Synonyms: HCFC-22, Chlorodifluoromethane

2 COMPOSITION / INFORMATION ON INGREDIENTS

Ingredient Name	CAS Registry Number	Typical Wt. %	OSHA
chlorodifluoromethane (HCFC-22)	75-45-6	100%	Y

The substance(s) marked with a "Y" in the OSHA column, are identified as hazardous chemicals according to thecriteria of the OSHA Hazard 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

Inhalation and skin contact 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 vaporconcentrations are irritating to the eyes and respiratory tract and may result in central nervous system (CNS) effectssuch as headache, dizziness, drowsiness and, in severe exposure, loss of consciousness and death. The dense vaporof this material may reduce the available oxygen for breathing. Prolonged exposure to an oxygen-deficient atmospheremay be fatal. Inhalation may cause an increase in the sensitivity of the heart to adrenaline, which could result inirregular 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 occures.

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 thisproduct.

5 FIRE FIGHTING MEASURES

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 maybe 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 equipmentshould be thoroughly decontaminated after use.

Fire and Explosion Hazards

May decompose on contact with flames or extremely hot metal surfaces to produce toxic and corrosiveproducts. Liquid and gas under pressure, overheating or overpressurizing may cause gas release and/or violentcylinder bursting. Container may explode if heated due to resulting pressure rise. Some mixtures of HCFCsand/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

Handling

Avoid breathing gas. Avoid contact with eyes, skin and clothing. Keep container closed. Use only withadequate 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 localmechanical 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 approvedrespiratory protection equipment appropriate to the material and/or its components (full facepiecerecommended). Consult respirator manufacturer to determine appropriate type equipment for a givenapplication. Observe respirator use limitations specified by NIOSH or the manufacturer. For emergency andother 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 airsupply. Respiratory protection programs must comply with 29 CFR § 1910.134.

Airborne Exposure Guidelines for Ingredients

Exposure Limit Value

chlorodifluoromethane (HCFC-22)

ACGIH TWA -1000 ppm 3540 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	1.19 @ 25 C
Vapor Pressure	136 psia @ 21.1 C (70 F)
Vapor Density	(AIR = 1) 3.00
Melting Point	NE
Freezing Point	-160 C (-256 F)
Boiling Point	-40.8 C (-41.4 F)
Solubility In Water	Slight
Molecular Weight	86.47

10 STABILITY AND REACTIVE

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, magnesiumor zinc and strong oxidizers, since they may react or accelerate decomposition.

Hazardous Decomposition Products

Thermal decomposition products could include Halogen acids (HCl and HF), Halogens, Carbon monoxide,Carbon

dioxide, and Carbonyl halides.

11 TOXICOLOGICAL INFORMATION

Toxicological Information

Single exposure (acute) studies indicate:Inhalation - Practically Non-toxic to Rats (2 hr-LC50 300,000 ppm)Eye Irritation - Slightly Irritating to Rabbits (5-30 sec. exposure to gas spray)Skin Irritation - Moderately Irritating to Rabbits (liquefied gas with patch applied) Several accidental deaths havebeen associated with exposure to this material or mixtures with other fluorocarbons. Death was generallyattributed to oxygen deficiency. Microscopic examination of the tissues of some of the victims showed effectson the lungs and fatty deposits in liver cells. An increase in the incidence of heart palpitations has been claimedby individuals occupationally exposed. Monitoring of workers during occupational exposure showed noconnection to exposure and cardiac arrhythmia or neurologic disorders. Other epidemiological studies havereported similar results. Repeated skin application of a 10 second spray caused reddening and slight swellingof the skin and a delay in hair growth.

No skin allergy was observed in guinea pigs following repeated exposure. Studies with mice, dogs, rats, rabbits,cats and monkeys have shown that inhalation exposure can cause cardiac arrhythmias. Inhalation causes an initial stimulation and then depression of the central nervous system (CNS). Symptoms in animals include lossof equilibrium, tremors, convulsions and narcosis and death, usually attributed to asphyxiation. At levels that caused anesthesia, dogs exhibited convulsions. Acute exposure by inhalation was fatal to rabbits, also causinghemorrhages and effects on the liver. Following repeated inhalation exposure, no effects were reported inguinea pigs, dogs and cats; mild liver effects were reported in rabbits; and, effects on the lungs, CNS, heart,liver, kidney, spleen were reported in rats, mice and rabbits. An increase in malignant tumors of the salivaryglands was reported in male rats but not in female rats or mice of either sex after long-term inhalation exposure.
Long-term oral dosing produced no adverse effects in rats. Inhalation exposure produced no adverse effectson male reproductive performance in rats and mice. Eye malformations were reported in the offspring of ratsexposed by inhalation during pregnancy. In rabbits, rats and humans, a small portion of inhaled material wasdistributed into the brain, heart, lungs, liver, kidneys and fat. It was rapidly eliminated from the body in theinhaled air. No significant metabolism occurs in humans or rats. The results of the tests for genetic changeswere mixed.

12 ECOLOGICAL INFORMATION

Ecotoxicological Information

The toxicity threshold for fish is 180 mg/l (24-hrs) and for bacteria under anaerobic conditions is >400 mg/l (24hrs). 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 that contained this material at 5mg/ml.

Chemical Fate Information

Chlorodifluoromethane This material is not readily biodegradable (0% after 28-days) and is practically not bioaccumulable (log Pow1.08). In air, it has a half-life in the atmosphere of 8.4 years, an ozone depletion potential (ODP) of 0.055, and ahalocarbon global warming potential (HGWP) of 0.33. It is moderately adsorbed in soils and sediments (log Koc1.8).

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 wastemanagement 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: Chlorodifluoromethane
DOT Technical Name
DOT Hazard Class: 2.2
UN Number: UN 1018
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
chlorodifluoromethane (HCFC-22)	NE	

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, Section313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372. See Section 2
chlorodifluoromethane (HCFC-22)

Massachusetts Right to Know
This product does contain the following chemicals(s), as indicated below, currently on the Massachusetts Right to Know SubstanceList.
chlorodifluoromethane (HCFC-22)

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.

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. chlorodifluoromethane (HCFC-22)

Pennsylvania Environmental Hazard
This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Environmental Hazard List. chlorodifluoromethane (HCFC-22)

Pennsylvania Right to Know
This product does contain the following chemical(s), as indicated below, currently on the Pennsylvania Hazardous Substance List. chlorodifluoromethane (HCFC-22)

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16 OTHER INFORMATION

Revision Information

Revision Date 11 OCT 2004 Revision Number 9
Supercedes Revision Dated 18-FEB-2004

Revision Summary
ATOFINA Chemicals, Inc. has changed its name to Arkema Inc..

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