



The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

DuPont
Material Safety Data Sheet

Page 1

6154FR "VERTREL" MCA Plus
Revised 26-SEP-2000

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"Vertrel" is a registered trademark of DuPont.

Formula : CF3CHFCHFCF2CF3, CC1H=CC1H (TRANS),
C5H10 (CYCLO)

Company Identification

MANUFACTURER/DISTRIBUTOR

DuPont Fluoroproducts
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS

Product Information : 1-800-441-7515 (outside the U.S.
302-774-1000)
Transport Emergency : CHEMTREC 1-800-424-9300(outside U.S.
703-527-3887)
Medical Emergency : 1-800-441-3637 (outside the U.S.
302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

| Material | CAS Number | % |
|--|-------------|-------|
| 1,1,1,2,2,3,4,5,5,5-DECAFLUOROPENTANE (HFC-43-10mee) | 138495-42-8 | 40-55 |
| TRANS, 1,2-DICHLOROETHYLENE (t-DCE) | 156-60-5 | 40-55 |
| CYCLOPENTANE | 287-92-3 | 2-8 |

HAZARDS IDENTIFICATION

Potential Health Effects

Gross overexposure by inhalation to HFC-43-10mee may cause suffocation if air is displaced by vapors and central nervous system stimulation with increased activity or sleeplessness, tremors or convulsions. These effects may be followed by central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness. Based on data from other fluorocarbons, gross overexposure may be associated with irregular heartbeat or heart rhythm, which may produce heart palpitation, dizziness, weakness, unconsciousness and death.

(HAZARDS IDENTIFICATION - Continued)

It is unlikely that concentrations sufficient to produce irregular heartbeat or heart rhythm would be achieved from HFC-43-10MEE without first producing other signs of toxicity. Immediate effects of overexposure to HFC-43-10mee by skin contact may include slight irritation with itching, redness or swelling. Repeated and/or prolonged exposure may cause defatting of the skin with itching, redness or rash. Based on animal data, significant skin permeation, and systemic toxicity after skin contact, appears unlikely. Immediate effects of overexposure to HFC-43-10mee by eye contact may include eye irritation with tearing, pain or blurred vision. The major ingestion hazard of HFC-43-10mee is aspiration (liquid entering the lungs during ingestion or vomiting) which may result in "chemical pneumonia." Symptoms include coughing, gasping, choking, shortness of breath, bluish discoloration of the skin, rapid breathing and heart rate, and fever. Pulmonary edema or bleeding, drowsiness, confusion, coma and seizures may occur in more serious cases. Symptoms may develop immediately or as late as 24 hours after exposure, depending on how much chemical entered the lungs. Increased susceptibility to the effects of HFC-43-10mee may be observed in persons with pre-existing disease of the central nervous system or the cardiovascular system.

Inhalation of t-DCE may cause central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness; or tremors, nausea, vomiting, weakness, and abdominal cramps. Other effects may include irregular heart beat with a strange sensation in the chest, "heart thumping", apprehension, lightheadedness, feeling of fainting, dizziness, or weakness. Skin contact with t-DCE may cause severe irritation with burning, redness, swelling, pain or rash. Eye contact with t-DCE may cause severe eye irritation with tearing, pain or blurred vision. Ingestion of t-DCE may cause pulmonary edema (body fluid in the lungs) with cough, wheezing, abnormal lung sounds, possibly progressing to severe shortness of breath and bluish discoloration of the skin: symptoms may be delayed. Ingestion may also cause pathological changes in the liver, central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness, and structural (pathological) changes in heart muscle tissue.

Inhalation of Cyclopentane may cause central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness; and non-specific effects such as headache, nausea and weakness. Repeated and/or prolonged exposure may cause peripheral nervous system effects with tingling, pain, or loss of sensation in extremities which may be accompanied by weakness or loss of muscle control. Higher exposures may cause "heart thumping", apprehension, lightheadedness, feeling of fainting, dizziness, weakness, sometimes progressing to loss of consciousness and death.

(HAZARDS IDENTIFICATION - Continued)

Skin contact with Cyclopentane may cause defatting of the skin with itching, redness or rash. Eye contact with liquid or high vapor concentrations of Cyclopentane may cause eye irritation with tearing, pain or blurred vision. Ingestion of Cyclopentane may cause gastrointestinal irritation with pain or diarrhea. The major ingestion hazard is aspiration (liquid entering the lungs during ingestion or vomiting) which may result in "chemical pneumonia". Symptoms include coughing, gasping, choking, shortness of breath, bluish discoloration of the skin, rapid breathing and heart rate, and fever. Pulmonary edema or bleeding, drowsiness, confusion, coma and seizures may occur in more serious cases. Symptoms may develop immediately or as late as 24 hours after exposure, depending on how much chemical entered the lungs. Increased susceptibility to the effects of Cyclopentane may be observed in persons with pre-existing disease of the central nervous or cardiovascular systems.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION

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

SKIN CONTACT

Flush skin with water after contact. Wash contaminated clothing before reuse.

EYE CONTACT

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

INGESTION

Material poses an aspiration hazard. If swallowed, do not induce vomiting. Immediately give 2 glasses of water. Never give anything by mouth to an unconscious person. Call a physician.

If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration.

(FIRST AID MEASURES - Continued)

Notes to Physicians

THIS MATERIAL MAY MAKE THE HEART MORE SUSCEPTIBLE TO ARRHYTHMIAS. Catecholamines such as adrenaline, and other compounds having similar effects, should be reserved for emergencies and then used only with special caution.

FIRE FIGHTING MEASURES

Flammable Properties

Flammable limits in Air, % by Volume

LEL : 6 %
UEL : 11 %

Flash Point : None.

Method : Pensky-Marten Closed Cup (ASTM D 93)

Flash Point : None.

Method : Tag Open Cup (ASTM D 1310)

AUTOIGNITION TEMPERATURE and FLAMMABLE LIMITS IN AIR:

Has not yet been determined for "Vertrel" MCA Plus.

Fire and Explosion Hazards:

Use water spray or fog to cool containers. Drums may rupture under fire conditions. Decomposition may occur.

Extinguishing Media

Water Spray, Water Fog, Dry Chemical, CO2.

Fire Fighting Instructions

Self-contained breathing apparatus (SCBA) is required if drums rupture and contents are spilled under fire conditions.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Initial Containment

Dike spill. Prevent material from entering sewers, waterways, or low areas.

(ACCIDENTAL RELEASE MEASURES - Continued)

Spill Clean Up

Immediately evacuate the area and provide maximum ventilation, especially in low places where heavy vapors might collect. Unprotected personnel should move upwind of spill. Only personnel equipped with proper respiratory and skin/eye protection should be permitted in area. Soak up with sawdust, sand, oil dry or other absorbent material. After all visible traces, including ignitable vapors, have been removed, thoroughly wet vacuum the area. Do not flush to sewer. If area of spill is porous, remove as much contaminated earth and gravel, etc. as necessary and place in closed containers for disposal.

In spill or leak situations, the composition of vapors above the liquid may fall within the LEL/UEL and, therefore, become flammable. Provide ventilation and assure no ignition sources are present.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapors or mist. Avoid contact with eyes, skin, or clothing. Wash thoroughly after handling.

The use of gloves is recommended when working with the material containers. Material should not be dispensed from its container by pouring, except for small sample containers where fume hoods or where other ventilation is used to manage the exposure limits. The use of a drum pump is recommended for dispensing from shipping containers.

Storage

Store in a clean, dry area. Do not allow stored product to exceed 52 C (125 F) to prevent leakage or potential rupture of container from pressure and expansion. Protect from freezing temperatures. If solvent is stored below -10 C (14 F), mix prior to use.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use only with adequate ventilation. Keep container tightly closed.

Vapors are heavier than air posing a hazard of asphyxia if they are trapped in enclosed or low places.

(EXPOSURE CONTROLS/PERSONAL PROTECTION - Continued)

Personal Protective Equipment

EYE/FACE PROTECTION

Wear safety glasses or coverall chemical splash goggles.

RESPIRATORS

Where there is potential for airborne exposures in excess of applicable limits, wear NIOSH approved respiratory protection.

PROTECTIVE CLOTHING

Where there is potential for skin contact have available and wear as appropriate impervious gloves, apron, pants and jacket.

Protective gloves and chemical splash goggles should be used when handling liquid.

Exposure Guidelines

Applicable Exposure Limits

1,1,1,2,2,3,4,5,5,5-DECAFLUOROPENTANE (HFC-43-10mee)

PEL (OSHA) : None Established
 TLV (ACGIH) : None Established
 AEL * (DuPont) : 200 ppm, 8 & 12 Hr. TWA
 400 ppm, Ceiling

TRANS, 1,2-DICHLOROETHYLENE (t-DCE)

PEL (OSHA) : 200 ppm, 790 mg/m³, 8 Hr. TWA
 TLV (ACGIH) : 200 ppm, 8 Hr. TWA
 AEL * (DuPont) : 200 ppm, 8 & 12 Hr. TWA

CYCLOPENTANE

PEL (OSHA) : None Established
 TLV (ACGIH) : 600 ppm, 1,720 mg/m³, 8 Hr. TWA
 AEL * (DuPont) : 600 ppm, 8 & 12 Hr. TWA

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point : 38 C (100 F)
 Vapor Pressure : 460 mm Hg @ 25 C (77 F)
 Vapor Density : 4.7 (Air=1.0)
 Form : Liquid
 Color : Colorless
 Density : 1.33 g/cm³ @ 25 C (77 F)
 11.1 lb/gal

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

Incompatibility with Other Materials

Incompatible with alkali or alkaline earth metals - powdered Al, Zn, Be, Na, Mg, etc.

Incompatible with strong bases such as NaOH, KOH, etc.

Decomposition

Decomposes with heat. High temperatures (open flames, glowing metal surfaces, etc.) can decompose HFC-43-10mee forming hydrofluoric acids and possibly carbonyl halides.

HFC-43-10mee is incompatible with strong bases and can react to form salts of hydrofluoric acid and unsaturated compounds of unknown toxicity.

1,2-Trans DCE is unstable at high temperatures and will form hydrochloric acid and unsaturates as well as break down or react in the presence of caustic to form salts of hydrochloric acid.

Polymerization

Polymerization will not occur.

TOXICOLOGICAL INFORMATION

Animal Data

HFC-43-10mee

Oral LD50: > 5,000 mg/kg in rats
Dermal ALD: > 5,000 mg/kg in rabbits
Inhalation, 4 hour LC50: 11,100 ppm in rats

t-DCE

Oral LD50: 1275 mg/kg in rats
Dermal LD50: > 5000 mg/kg in rabbits
Inhalation LC50, 4 hr: 24,100 ppm in rats

Cyclopentane

Inhalation 2 hour ALC: 38,390 ppm in mice

Animal testing indicates that HFC-43-10mee is a slight skin

(TOXICOLOGICAL INFORMATION - Continued)

irritant and a mild eye irritant, but is not a skin sensitizer. HFC-43-10mee did not cause cardiac sensitization in dogs exposed to 1000 or 5000 ppm. The cardiac sensitization potential was not evaluated at or above 10,000 ppm due to clinical signs consistent with central nervous system toxicity. Single exposure to 5,000 ppm HFC-43-10mee by inhalation caused tremors. A different single exposure study by inhalation in rats caused incoordination, hyperactivity and prostration; pathological examination of rats from this study revealed kidney and lung changes, and external hair loss. Repeated exposures to 1,900 - 3,500 ppm caused tremors or convulsions, behavioral effects, and altered clinical chemistry. In developmental toxicity studies with laboratory animals, HFC-43-10mee was not uniquely toxic to the developing fetus. No animal data are available to define the carcinogenic or reproductive hazards of HFC-43-10mee. Tests have shown that HFC-43-10mee does not cause genetic damage in bacterial or mammalian cell cultures. It has not produced genetic damage in tests on animals.

t-DCE is a severe eye irritant, and a moderate to severe skin irritant. Single and repeated exposure to t-DCE by ingestion caused increased kidney weight, histopathological changes of the lungs, liver effects, decreased motor activity, pulmonary edema, cardiovascular system changes, and mortality. Single and repeated exposure to t-DCE by inhalation caused pathological changes of the liver and lungs, inactivity or anaesthesia, altered white blood cell count, cardiovascular system changes and weak cardiac sensitization, a potentially fatal disturbance of the heart rhythm caused by a heightened sensitivity to the action of epinephrine. Long-term exposure caused altered liver and lung function. A more recent inhalation study (Dec. 1998) conducted with well-characterized t-DCE containing > 99.4% t-DCE, produced no adverse, compound-related effects. The NOEL was 4000 ppm. Exposure of pregnant rats shows maternal toxicity at 2000, 6000 and 12,000 ppm. Developmental toxicity was seen only at 12,000 ppm. Tests have shown that t-DCE does not cause genetic damage in bacterial or mammalian cell cultures. No animal data are available to define the carcinogenic or reproductive hazards of t-DCE.

Animal testing indicates that Cyclopentane is a slight skin irritant. Single exposure by inhalation to Cyclopentane caused inactivity or anaesthesia, altered righting reflexes, and cardiac sensitization, a potentially fatal disturbance of heart rhythm associated with a heightened sensitivity to the action of epinephrine. No animal data are available to define the carcinogenicity, developmental, reproductive or mutagenic hazards of Cyclopentane.

ECOLOGICAL INFORMATION

Ecotoxicological Information

AQUATIC TOXICITY:

HFC-43-10mee:

96 hour LC50, fathead minnows: 27.2 mg/L
96 hour LC50, rainbow trout: 13.9 mg/L
48 hour LC50, Daphnia magna: 11.7 mg/L

t-DCE:

96 hour LC50, bluegill sunfish: 1350 mg/L
48 hour LC50, Daphnia magna: 220 mg/L

Cyclopentane:

96 hour LC50, coho salmon: > 100 mg/L
48 hour LC50, Daphnia magna: 150 mmol/m3

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO/IATA - Not regulated in containers with less than 2200 lbs. If greater than 2200 lbs. use:

Proper Shipping Name : Environmentally Hazardous Substance,
Liquid, N.O.S. (Trans-1,2-Dichloro-
ethylene)
Hazard Class : 9
UN Number : 3082
Packing Group : III
Reportable Quantity : 1000 lbs.(Trans-1,2-Dichloroethylene)
2200 lbs.("Vertrel" MCA Plus)

REGULATORY INFORMATION

U.S. Federal Regulations

All Components Are Listed on the TSCA Public Inventory

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : No

1,1,1,2,2,3,4,5,5,5-DECAFLUOROPENTANE (CAS# 138495-42-8) is controlled by TSCA Section 5, Significant New Use Rule (SNUR; 40 CFR 721.5645) The approved uses are: precision and general cleaning, carrier fluid, displacement drying, printed circuit board cleaning, particulate removal and film cleaning, process medium, heat transfer fluid (dielectric and non-dielectric), and test fluid. 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.

LISTS:

SARA Extremely Hazardous Substance -No
CERCLA Hazardous Substance -Yes*

*Trans-1,2 Dichloroethylene Component Only

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 1
Flammability : 0
Reactivity : 1

Personal Protection rating to be supplied by user depending on use conditions.

Additional Information

This MSDS applies to "VERTREL" MCA Plus produced after December 1998.

(Continued)

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsibility for MSDS : MSDS Coordinator
> : DuPont Fluoroproducts
Address : Wilmington, DE 19898
Telephone : (800) 441-7515

Indicates updated section.

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS