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DuPont
Material Safety Data Sheet

Page 1

6093FR "VERTREL" SMT
Revised 11-FEB-2005

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

"VERTREL" is a registered trademark of DuPont.

Formula : CF3CHFCHFCF2CF3,CC1H=CC1H(TRANS),CH3OH

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont
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	138495-42-8	49.0-55.0
TRANS, 1,2-DICHLOROETHYLENE	156-60-5	40.0-46.0
*METHANOL	67-56-1	2.0-6.0
NITROMETHANE	75-52-5	0.05-0.7

* Disclosure as a toxic chemical is required under Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR part 372.

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

(HAZARDS IDENTIFICATION - Continued)

heartbeat or heart rhythm, which may produce heart palpitation, dizziness, weakness, unconsciousness and death. 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.

The fatal dose of Methyl Alcohol by ingestion is from 60 to 250 ml. Inhalation of Methyl Alcohol may cause irritation of the nose and throat with sneezing, sore throat or runny nose. Skin contact with Methyl Alcohol may cause irritation with itching, burning, redness, swelling or rash. Skin permeation may occur in amounts capable of producing the effects of systemic toxicity. Eye contact with Methyl Alcohol may cause eye irritation with tearing, pain or

(HAZARDS IDENTIFICATION - Continued)

blurred vision. Ingestion of Methyl Alcohol may cause irritation of the digestive tract with stomach pain, heartburn, nausea, vomiting or diarrhea; however there may be no symptoms at all. Inhalation, ingestion or skin contact with Methyl Alcohol may cause temporary mild depression of the central nervous system with dizziness, confusion, incoordination or drowsiness followed by an asymptomatic period usually ranging from 12 to 24 hours. Metabolic acidosis develops followed by ocular toxicity (visual disturbance including blindness). Other effects include non-specific effects such as headache, nausea and weakness. Gross overexposure may cause pathological changes in the liver and kidneys; nerve damage with numbness, weakness or muscle rigidity; tremors; convulsions; and fatality. Increased susceptibility to the effects of Methyl Alcohol may be observed in persons with pre-existing disease of the nervous system, visual system, liver, kidneys, and cardiovascular system.

Short-term overexposure by inhalation to Nitromethane may cause irritation of the nose and throat with sneezing, sore throat or runny nose. Based on animal data repeated and/or prolonged exposure may cause irritation of nose, throat, and lungs with cough, difficulty breathing or shortness of breath, pathological changes in the liver, central nervous system depression with dizziness, confusion, incoordination, drowsiness or unconsciousness, peripheral nervous system effects with tingling, pain, or loss of sensation in extremities which may be accompanied by weakness or loss of muscle control, altered blood cell counts, impaired functioning of the blood-forming system with alterations in blood cell counts and/or anemia, effects on the nervous tissue, and clinical pathological changes of the thyroid. Skin contact with Nitromethane may cause skin irritation with itching, burning, redness, swelling or rash. Eye contact with Nitromethane may cause eye irritation with tearing, pain or blurred vision. Based on animal data, ingestion of Nitromethane may cause abnormal liver function with altered enzyme levels in blood, or abnormal kidney function with altered results on blood tests.

Carcinogenicity Information

The following components are listed by IARC, NTP, OSHA or ACGIH as carcinogens.

Material	IARC	NTP	OSHA	ACGIH
NITROMETHANE	2B	X		A3

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

If swallowed, immediately give 2 glasses of water and induce vomiting. Never give anything by mouth to an unconscious person. Call a physician.

Notes to Physicians

Ethanol (ETOH) is antidotal and should be administered early in the treatment. Ethanol is a potent inhibitor of Methanol metabolism because it is preferentially acted on by liver alcohol dehydrogenase, thus delaying or preventing toxic metabolites from Methanol.

Treatment is started after residual ingested substance is removed from the stomach. Ethanol is administered orally or IV with a goal of maintaining a blood alcohol level of approximately 22 mmol/L or 1.0 mg/L.

To prepare antidote, make a solution using 100 mL of 100 proof ethyl alcohol and 1900 mL of water. Give 1.5 mL/kg or 100 mL for an average adult. This may be mixed with orange juice for oral use if necessary. More Ethanol is to be given at 2 hour intervals to achieve and maintain the desired blood alcohol levels. Treatment may be necessary for several days.

The patient should be monitored for metabolic acidosis. Use of appropriate buffering solutions, such as bicarbonate, may be indicated.

Hemodialysis may be required.

(FIRST AID MEASURES - Continued)

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 : 7.0 %
UEL : 15.0 %

Flash Point : None

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

Flash Point : None

Method : Tag Open Cup (ASTM D 1310)

AUTOIGNITION TEMPERATURE:

Has not yet been determined for "Vertrel" SMT.

Fire and Explosion Hazards:

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

Extinguishing Media

Use media appropriate for surrounding material.

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 place.

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

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

TRANS, 1,2-DICHLOROETHYLENE

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

METHANOL

PEL (OSHA) : 200 ppm, 260 mg/m³, 8 Hr. TWA
 TLV (ACGIH) : 200 ppm, 8 Hr. TWA, Skin
 STEL 250 ppm
 AEL * (DuPont) : 200 ppm, 8 & 12 Hr. TWA, Skin

NITROMETHANE

PEL (OSHA) : 100 ppm, 250 mg/m³, 8 Hr. TWA
 TLV (ACGIH) : 20 ppm, 8 Hr. TWA, A3
 AEL * (DuPont) : 10 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 : 37 C (99 F)
Vapor Pressure : 470 mm Hg @ 25 C (77 F)
Vapor Density : 4.4 (Air=1.0)
Form : Liquid
Color : Colorless
Density : 1.37 g/cm³ @ 25 C (77 F)
11.4 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

(TOXICOLOGICAL INFORMATION - Continued)

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

Methyl Alcohol

Oral LD50: 9,100 mg/kg in rats
Dermal LD50: 15,840 mg/kg in rabbits
Inhalation 1 hour LC50: > 145,000 ppm in rats

Nitromethane

Inhalation 4 hour ALC: 6000 ppm in rats
Oral LD50: 1210 mg/kg in rats
Dermal LD50: > 2000 mg/kg in rabbits

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

(TOXICOLOGICAL INFORMATION - Continued)

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 Methyl Alcohol is an eye and skin irritant. Eye contact with Methyl Alcohol caused clouding of the eye (corneal opacity). Repeated skin contact with higher concentrations of Methyl Alcohol caused some mortality. Single exposure by ingestion caused narcosis, liver effects, and hypothermia. Repeated exposure caused pathological changes of the eyes and acidosis. Repeated exposure by inhalation caused irritation of the eyes, and blindness. No animal data are available to define the carcinogenicity of Methyl Alcohol. Exposure of pregnant rats shows the following developmental effects: reduced birth weight, bone abnormalities, and behavioral abnormalities. Exposure of pregnant mice shows the following developmental effects: reduced birth weight, resorption, and bone abnormalities. No adequate animal data are available to define the reproductive effects of Methyl Alcohol. Tests have shown that Methyl Alcohol does not cause genetic damage in bacterial or mammalian cell cultures, or in animals. Methyl Alcohol has not been tested for its ability to cause permanent genetic damage in reproductive cells of mammals (not tested for heritable genetic damage).

Nitromethane is a skin irritant, and a slight eye irritant, but is not a skin sensitizer in animals. Single inhalation exposure to Nitromethane caused upper respiratory tract irritation, liver and kidney effects, central nervous system depression, incoordination, eye irritation, and some mortality. Repeated inhalation exposures caused loss of mobility in the hind limbs, alterations to the blood-forming system, altered hematology and clinical chemistry, respiratory injury, testicular effects, reduced sperm counts, altered estrous cycle, degeneration of the sciatic nerve, and spinal cord. Long-term exposure caused reduced weight gain, altered hematology, increased thyroid weight, decreased thyroxine levels and pathological changes of the lungs. Single ingestion exposure to high doses caused histopathological changes of the liver and kidney injury. Repeated exposures caused reduced weight gain, and liver injury. Repeated dermal exposure caused no significant toxicological effects. In one study, Nitromethane produced evidence of carcinogenic activity in male and female mice exposed to concentrations of 188, 375, or 750 ppm for 2 years, and in female rats exposed to concentrations of 94, 188, or 375 ppm for 2 years. There was no evidence of carcinogenic activity in male rats exposed for 2 years to

(TOXICOLOGICAL INFORMATION - Continued)

concentrations of 94, 188, or 375 ppm. In a different study, with male and female rats exposure to concentrations of 100 or 200 ppm for 2 years did not produce evidence of carcinogenic activity. No adequate animal data are available to define the developmental or reproductive toxicity of Nitromethane. Tests have shown that Nitromethane did not cause genetic damage in bacterial or mammalian cell cultures.

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.

Methanol:

96 hour LC50 - fathead minnows: 28,100 mg/L.

Nitromethane:

96 hour LC50 - fathead minnows: 1710 mg/L.
48 hour LC50 - Daphnia magna: 100 mg/L.

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 2300 lbs. If greater than 2300 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
5000 lbs. (Methanol)
2300 lbs. ("Vertrel" SMT)

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*

*Methanol and Trans-1,2-Dichloroethylene

State Regulations (U.S.)

"WARNING - SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER - Nitromethane (75-52-5)"

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating
Health : 2
Flammability : 0
Reactivity : 1

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

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