

1,1-Dichloroethene

sc-255874



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key: **EXTREME** **HIGH** **MODERATE** **LOW**

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

1,1-Dichloroethene

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

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EMERGENCY:

ChemWatch
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SYNONYMS

C2-H2-Cl2, CH2CCl2, "1, 1-dichloroethylene", "1, 1-dichloroethene", "ethene, 1, 1-dichloro-", "vinylidene dichloride", VDC, VDCI, VDCCI, Sconatex

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max	
Flammability:	4		 
Toxicity:	3		
Body Contact:	0		
Reactivity:	2		
Chronic:	3		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4

CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful by inhalation.
Toxic if swallowed.
Limited evidence of a carcinogenic effect.
Possible risk of irreversible effects.
Extremely flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.
- At sufficiently high doses the material may be nephrotoxic(i.e. poisonous to the kidney).
- At sufficiently high doses the material may be hepatotoxic(i.e. poisonous to the liver).

EYE

- Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).
- The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

SKIN

- The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives .
- Repeated exposure may cause skin cracking, flaking or drying following normal handling and use.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

- Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.
- The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
- Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.
- Vapour concentrations of 400 ppm vinylidene chloride are said to induce symptoms of drunkenness leading to unconsciousness. Extensive haemorrhagic centrilobular liver necrosis was seen in rats 6 hours after a 4-hour exposure to 200 ppm.
- Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved.
- Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).

CHRONIC HEALTH EFFECTS

■ Strong evidence exists that the substance may cause irreversible but non-lethal mutagenic effects following a single exposure. Exposure to the material may result in a possible risk of irreversible effects. The material may produce mutagenic effects in man. This concern is raised, generally, on the basis of appropriate studies using mammalian somatic cells in vivo. Such findings are often supported by positive results from in vitro mutagenicity studies.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is some evidence that human exposure to the material may result in developmental toxicity. This evidence is based on animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.

Halogenated oxiranes may arise following epoxidation of haloalkenes.

The metabolism of haloethylenes by microsomal oxidation leading to epoxide formation across the double bond has been proposed. The resulting oxiranes are highly reactive and may covalently bind to nucleic acids leading to mutations and possible cancers. A measure of such potential carcinogenicity is the development of significant preneoplastic foci in livers of treated rats.

The carcinogenicity of halogenated oxiranes may lie in the reactivity of an epoxide intermediate. It is reported that 1,1-dichloroethylene, vinyl chloride, trichloroethylene, tetrachloroethylene and chloroprene, for example, are carcinogens in vivo - this may be a consequence of oxirane formation.

Symmetrically substituted oxiranes such as 1,2-dichloroethylene and 1,1,2,2-tetrachloroethylene are more stable and less mutagenic than unsymmetrical chlorinated oxiranes such as 1,1-dichloroethylene, 1,1,2-trichloroethylene and monochloroethylene (vinyl chloride).

The carcinogenicity of 1,1-dichloroethylene has primarily been associated with inhalation exposure while that of vinyl chloride, trichloroethylene and tetrachloroethylene occurs following exposure by both inhalation and oral routes. National Toxicology Program Toxicity

Report Series Number 55; April 2002

Various studies report an association between cancer and industrial exposure to tetrachloroethylene; IARC concluded that this evidence is sufficient to assign appropriate warnings. Similar warnings have been issued by IARC for vinyl fluoride. Similarly vinyl bromide exhibited neoplastic and tumorigenic activity in rats exposed by inhalation and is classified by various bodies as potentially carcinogenic.

Substances such as chloroprene (2-chloro-1,3-butadiene), are reported to produce an increased frequency of chromosomal aberrations in the lymphocytes of Russian workers. Russian epidemiological studies also suggest an increased incidence of skin and lung cancer following exposure to chloroprene, a result which is not supported by other studies.

Generally speaking, the monohalogenated substances exhibit higher carcinogenic potential than their dihalogenated counterparts. Whether additional substitution lessens such hazard is conjectural. Tetrafluoroethylene, for example, produced clear evidence of carcinogenic activity in a two-year inhalation study in rats and mice. National Toxicology Program Technical Report Series 450, April 1997.

Vinylidene chloride is toxic to the liver and kidneys. After exposure to 48 ppm continuously for 90 days, liver damage was evident in rats and deaths occurred among monkeys and guinea pigs. In this study only rats showed evidence of renal (kidney) tubular injury.

There has been concern that this material can cause cancer or mutations, but there is not enough data to make an assessment.

Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. [PATTYS].

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
vinylidene chloride	75-35-4	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY. · Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise: · Avoid giving milk or oils. · Avoid giving alcohol.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin or hair contact occurs: · Flush skin and hair with running water (and soap if available). · Seek medical attention in event of irritation.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ for intoxication due to Freons/ Halons;

A: Emergency and Supportive Measures

· Maintain an open airway and assist ventilation if necessary

· Treat coma and arrhythmias if they occur. Avoid (adrenaline) epinephrine or other sympathomimetic amines that may precipitate ventricular arrhythmias. Tachyarrhythmias caused by increased myocardial sensitization may be treated with propranolol, 1-2 mg IV or esmolol 25-100 microgm/kg/min IV.

· Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal dysfunction.

· Respiratory depression and cardiac dysrhythmias are an immediate threat to life.

Treatment follows that employed in carbon tetrachloride exposures.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	592.549 (25 C)
Upper Explosive Limit (%):	16.0
Specific Gravity (water=1):	1.2129
Lower Explosive Limit (%):	7.3

EXTINGUISHING MEDIA

· Foam.

· Dry chemical powder.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.

· May be violently or explosively reactive.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 1000 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Liquid and vapor are highly flammable.

· Severe fire hazard when exposed to heat, flame and/or oxidizers.

Combustion products include: carbon dioxide (CO₂), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.

Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.

WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

1.PVA 2.VITON

Respirator:

Type AX Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.
- May form explosive peroxides on standing or following concentration by distillation.
- Review of stocks and testing for peroxide content by given tested procedures at 3-monthly intervals is recommended, together with safe disposal of peroxidic samples.

[Peroxide-containing residues can often be rendered innocuous by pouring into an excess of sodium carbonate solution].

The substance forms explosive levels of peroxides without concentration by evaporation or distillation.

Purchases of peroxidisable chemicals should be restricted to ensure that the chemical is used completely before it can become peroxidised.

- A responsible person should maintain an inventory of peroxidisable chemicals or annotate the general chemical inventory to indicate which chemicals are subject to peroxidation. An expiration date should be determined. The chemical should either be treated to remove peroxides or disposed of before this date.
- The person or laboratory receiving the chemical should record a receipt date on the bottle. The individual opening the container should add an opening date.
- Unopened containers received from the supplier should be safe to store for 18 months.
- Opened containers should not be stored for more than 3 months.

Contains low boiling substance:

Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.

- Check for bulging containers.
- Vent periodically.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

■ DO NOT use aluminum or galvanized containers.

Packing as supplied by manufacturer. Plastic containers may only be used if approved for flammable liquid.

- For low viscosity materials (i): Drums and jerricans must be of the non-removable head type. (ii): Where a can is to be used as an inner package, the can must have a screwed enclosure.
- For materials with a viscosity of at least 2680 cSt. (23 deg. C).

STORAGE REQUIREMENTS

- Vinylidene chloride should not be stored for more than a day without a stabilizer, which does not need to be removed prior to use in polymer syntheses. However uninhibited monomer can be stored at -10 deg C in absence of light and water for maximum one week.
- The monomer should be blanketed with inert gas, stored (e.g., hermetically sealed steel containers) at a maximum of -10 C and protected from light, air, free radical initiators, copper, and aluminium. Under these conditions, inhibited vinylidene chloride can be transported and stored, though the length of the storage period should be minimal.
- A water-spray system should be available for cooling the tanks in the event of fire.

Inhibitor level should be regularly checked to maintain stability.

Easily peroxidizable. Products formed as a result of peroxidation are not only safety hazards but may chemically alter the chemical behavior of the parent compound.

- Storage requires stabilizing inhibitor content and dissolved oxygen content to be monitored. Refer to manufacturer's recommended levels.
- DO NOT overfill containers so as to maintain free head space above product.

Rotate all stock to prevent ageing. Use on FIFO (First In-First Out) basis.

- Store in original containers in approved flame-proof area.
- No smoking, naked lights, heat or ignition sources.
- Stable under controlled storage conditions provided material contains adequate stabilizer / polymerization inhibitor.
- Bulk storages may have special storage requirements.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
Canada - Ontario Occupational Exposure Limits	vinylidene chloride (Vinylidene chloride)		4		80				
US - Minnesota Permissible Exposure Limits (PELs)	vinylidene chloride (Vinylidene chloride (1,1-Dichloroethylene))	1	4						
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	vinylidene chloride (1,1-DICHLOROETHENE)	0.02							
Canada - Alberta Occupational Exposure Limits	vinylidene chloride (1,1-Dichloroethylene (Vinylidene chloride))	5	20						
Canada - British Columbia Occupational Exposure Limits	vinylidene chloride (Vinylidene chloride)	1							
Canada - Ontario Occupational Exposure Limits	vinylidene chloride (Vinylidene chloride)	1		20					
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	vinylidene chloride (Vinylidene chloride (1,1-Dichloro-ethylene))	1	4						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	vinylidene chloride (Vinylidene chloride (1,1-Dichloro-ethylene))	1	4						
US - California Permissible Exposure Limits for Chemical Contaminants	vinylidene chloride (Vinylidene chloride; 1,1-dichloroethylene)	1	4						
US - Alaska Limits for Air Contaminants	vinylidene chloride (Vinylidene chloride (1,1-Dichloroethylene))	1	4						
US - Michigan Exposure Limits for Air Contaminants	vinylidene chloride (Vinylidene chloride (1,1-Dichloroethylene))	1	4						
Canada - Northwest Territories Occupational Exposure Limits (English)	vinylidene chloride (1,1-Dichloroethylene (Vinylidene dichloride))	10	40	20	80				

US - Washington Permissible exposure limits of air contaminants	vinylidene chloride (1,1-Dichloroethylene (Vinylidene chloride))	1		3		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	vinylidene chloride (Vinylidene chloride)	5		10		
US - Hawaii Air Contaminant Limits	vinylidene chloride (Vinylidene chloride (1,1-Dichloro-ethylene))	1	4			
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	vinylidene chloride (1,1-Dichloroethylene)	1	4			
US ACGIH Threshold Limit Values (TLV)	vinylidene chloride (Vinylidene chloride)	5				TLV Basis: liver & kidney damage
Canada - Northwest Territories Occupational Exposure Limits (English)	vinylidene chloride (Vinylidene chloride)	10	36	20	72	
Canada - Nova Scotia Occupational Exposure Limits	vinylidene chloride (Vinylidene chloride)	5				TLV Basis: liver & kidney damage
Canada - Prince Edward Island Occupational Exposure Limits	vinylidene chloride (Vinylidene chloride)	5				TLV Basis: liver & kidney damage
US TSCA New Chemical Exposure Limits (NCEL)	vinylidene chloride (Halogenated alkene (P84-105))	0.05				

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

Type AX Filter of sufficient capacity
Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields
- Chemical goggles.

HANDS/FEET

■ Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

· When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.

· When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.

· Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

Wear chemical protective gloves, eg. PVC.

OTHER

· Overalls.

· PVC Apron.

· Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.

· For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS

■ For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

State	Liquid	Molecular Weight	96.94
Melting Range (°F)	-188.5	Viscosity	Not Available
Boiling Range (°F)	89.06	Solubility in water (g/L)	Immiscible
Flash Point (°F)	-0.4 (open cup)	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	955.4	Vapor Pressure (mmHg)	592.549 (25 C)
Upper Explosive Limit (%)	16.0	Specific Gravity (water=1)	1.2129
Lower Explosive Limit (%)	7.3	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Not available	Evaporation Rate	Fast
Gas group	IIA		

APPEARANCE

■ Presence of a stabilizing inhibitor prevents/retards peroxide formation. Colourless highly flammable liquid with pleasant chloroform-like odour; does not mix with water. Soluble in organic solvents.

log Kow 1.66-2.13

Material	Value
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Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

■ Presence of a stabilizing inhibitor prevents/retards peroxide formation.

· Stable under controlled storage conditions provided material contains adequate stabilizer / polymerization inhibitor.

· Bulk storages may have special storage requirements.

· Presence of incompatible materials.

· Product is considered stable.

STORAGE INCOMPATIBILITY

■ Vinylidene chloride:

· readily forms explosive peroxides with air or contaminants (a white deposit may indicate the presence of explodable peroxides); inhibitors such as monomethyl ether or hydroquinone must be added to prevent polymerisation; when stored at between -40 and 25 C in the absence of an inhibitor and in the presence of air, vinylidene chloride rapidly absorbs oxygen with the formation of a violently explosive peroxide - this peroxide initiates polymerisation to produce an insoluble polymer which adsorbs the peroxide

· polymerises violently when heated or on contact with oxidisers, chlorosulfonic acid, nitric acid or oleum; or under the influence of oxygen,

sunlight, copper or aluminium - light or water tend to promote self-polymerisation

- reacts with aluminium to form reactive aluminium chloroalkyls and copper to give reactive acetylides
- reacts violently with alkali metals (lithium, sodium, potassium, rubidium, caesium and francium)
- is incompatible with ozone (reaction products are particularly dangerous)
- may react explosively with trichloroethylene above 180 C, perchloryl fluoride above 100 C
- may be corrosive or unstable in the presence of steel
- reacts with alcohols and halides to give carboxylic acids

· NOTE: Separation of the polymer in the dry state must be avoided since if more than 15% of the peroxide is present, the polymer may be detonatable by slight shock or friction. Hindered phenols have been used to prevent peroxidation.

Contamination with polymerization catalysts - peroxides, persulfates, oxidizing agents - also strong acids, strong alkalis, will cause polymerization with exotherm - generation of heat.

Polymerization of large quantities may be violent - even explosive.

· Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

VINYLDENE CHLORIDE

TOXICITY AND IRRITATION

VINYLDENE CHLORIDE:

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: 200 mg/kg	Nil Reported
Inhalation (human) TCLo: 25 ppm	
Inhalation (rat) LC50: 6350 ppm/4h	
Dermal (rabbit) LD50: 10000 mg/kg	
Inhalation (mouse) TCLo: 259 ppm/7h	
Oral (Mouse) LD50: 194 mg/kg	
Oral (Dog) LD: 5750 mg/kg	
Intravenous (Dog) LD: 225 mg/kg	
Subcutaneous (Rabbit) LD: 3700 mg/kg	
Intraperitoneal (Mouse) TDL: 50 mg/kg	
Inhalation (Human) TCLo: 25 ppm/4h	

■ For vinylidene chloride

In humans concentrations of vinylidene chloride of 16 000 mg/m³ (4000 ppm) cause intoxication that may lead to unconsciousness. Stabilised vinylidene chloride is also an irritant for the respiratory tract, eyes, and skin. Kidney and liver damage have been reported for sub-anaesthetic, prolonged or repeated short-term exposures.

Acute inhalation toxicity in experimental animals was manifested as irritation of the mucous membranes, depression of the central nervous system, and progressive cardiotoxicity (sinus bradycardia and arrhythmias). Damage was caused to the liver, kidney, and lungs. In mice, which are more susceptible than rats to the hepatotoxicity and renal toxicity of vinylidene chloride, kidney damage and increased DNA replication were induced by exposure to as little as 40 mg vinylidene chloride/m³ (10 ppm) for 6 h. As with inhalation, the principal organs affected by oral administration of vinylidene chloride are the liver, kidney, and lungs. The sequelae of events leading to hepatotoxicity appear to involve an early change in the bile canaliculi, which is followed by signs of mitochondrial damage. This precedes damage to the endoplasmic reticulum and cell death. Vinylidene chloride-induced liver and renal toxicity are apparently not caused by lipid peroxidation. Raised intracellular Ca⁺⁺ concentrations may play a role in toxicity for the hepatocyte. The toxic effects of vinylidene chloride are at least partially dependent on cytochrome P-450 activity (which may also be involved in detoxification) and can be exacerbated by glutathione depletion. Hepatotoxicity may be enhanced by ethanol and thyroxine, inhibited by dithiocarb and (+)-catechin, and modulated by acetone.

Long-term studies of intermittent inhalation exposure to vinylidene chloride revealed that 300 mg/m³ (75 ppm) caused only mild reversible hepatic changes in rats. At 600 mg/m³ (150 ppm), the highest tolerable dose for long-term exposure in rats, liver damage with necrosis was evident. A high mortality rate with evidence of liver damage was observed in mice at 200 mg/m³ (50 ppm). Kidney toxicity was evident following long-term treatment of mice at 100 mg/m³ (25 ppm). Oral dosing of rats for one year with up to 30 mg vinylidene chloride/kg daily also produced minimal hepatic changes. These data do not provide a clear no-observed- effect level. There was some evidence from a separate study that renal inflammation and liver necrosis could be induced in rats and mice, respectively, following long-term oral administration of vinylidene chloride at daily dose levels of 5 mg/kg and 2 mg/kg, respectively.

Genotoxicity and carcinogenicity Vinylidene chloride was found to be mutagenic for bacteria and yeast, only in the presence of a mammalian microsomal metabolic activation system (S9). The compound induced unscheduled DNA synthesis in isolated rat hepatocytes and increased the frequency of sister chromatid exchanges and chromosomal aberrations in cell cultures with S9 included. In contrast, no increase in mammalian gene mutations was seen. A small, but statistically significant, increase in DNA binding after in vivo exposure has been reported. DNA binding was greater in mouse than in rat cells and greater in the kidneys than in the liver following 6-h exposures to 40 and 200 mg vinylidene chloride/m³ (10 and 50 ppm). Furthermore, vinylidene chloride slightly increased unscheduled DNA synthesis in mouse kidney. There was no evidence of a dominant lethal effect or cytogenetic effects after in vivo exposure of rodents, with the exception of one study showing the induction of chromosomal aberrations in the bone marrow of the Chinese hamster.

Carcinogenicity studies have been carried out on 3 animal species (rats, mice, and hamsters). In male Swiss mice, there was a clear indication of carcinogenicity (kidney adenocarcinoma) following long-term intermittent exposure to 100 or 200 mg vinylidene chloride/m³ (25 or 50 ppm) but not to 0 or 40 mg/m³ (0 or 10 ppm). The kidney tumours may be related in some way to observed kidney cytotoxicity and it is possible that repeated kidney damage either leads directly to the carcinogenic response by a non-genotoxic mechanism or facilitates the expression of the genotoxic potential of metabolites in this particular species, sex, and organ. However, this conclusion is uncertain in the light of the limited available data on genetic effects in vivo and the findings that vinylidene chloride may have acted as an initiator

Reproductive toxicity No evidence was found of effects on fertility in rats continuously exposed to vinylidene chloride (up to 200 mg/litre, 200 ppm) in drinking-water. Inhalation of up to 1200 mg vinylidene chloride/m³ (300 ppm), for 22-23 h, by rats and mice during various periods of organogenesis did not induce foetal abnormalities, other than those attributable to maternal toxicity. Inhalation of up to 640 mg vinylidene chloride/m³ (160 ppm) for 7 h/day in rats and rabbits or oral intake of approximately 40 mg/kg per day in rats during critical periods of gestation did not have any effects on embryos or fetuses at a level below that which produced maternal toxicity, but embryo and foetal toxicity and foetal abnormalities were seen at levels producing maternal toxicity, as evidenced by decreased weight gain.

The substance is classified by IARC as Group 3:

NOT classifiable as to its carcinogenicity to humans.

Evidence of carcinogenicity may be inadequate or limited in animal testing.

CARCINOGEN

1,1-DICHLOROETHYLENE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	EPA-HEN, IRIS, OPP-CAN, SCDM
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Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
vinylidene chloride	HIGH		LOW	HIGH

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____
 _____ Vinyliden 140 738 2 1 1 NR 2 NI 2 0 (2) 2 2 M SD 3 e 6 chloride / CAS:75- 35- 4 / KV9275000

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships) NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation, B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg), C2=Acute mammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion, D2=Eye irritation& corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen, M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lunginjury, N=Neurotoxic, I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

Toxicity characteristic: use EPA hazardous waste number D029 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 0.7 mg/L of 1,1-Dichloroethylene.

B. Component Waste Numbers

When vinylidene chloride is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U078 (waste code T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also

be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

· Recycle wherever possible.

· Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.

Section 14 - TRANSPORTATION INFORMATION

DOT:

Symbols: None Hazard class or Division: 3

Identification Numbers: UN1303 PG: I

Label Codes: 3 Special provisions: T12, TP2, TP7

Packaging: Exceptions: 150 Packaging: Non- bulk: 201

Packaging: Exceptions: 150 Quantity limitations: 1 L

Passenger aircraft/rail:

Quantity Limitations: Cargo 30 L Vessel stowage: Location: E aircraft only:

Vessel stowage: Other: 40 S.M.P.: YES

Hazardous materials descriptions and proper shipping names:

Vinylidene chloride, stabilized

Air Transport IATA:

ICAO/IATA Class: 3 ICAO/IATA Subrisk: None

UN/ID Number: 1303 Packing Group: I

Special provisions: None

Cargo Only

Packing Instructions: 303 Maximum Qty/Pack: 30 L

Passenger and Cargo Passenger and Cargo

Packing Instructions: 302 Maximum Qty/Pack: 1 L

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: - Maximum Qty/Pack: -

Shipping Name: VINYLIDENE CHLORIDE, STABILIZED

Maritime Transport IMDG:

IMDG Class: 3 IMDG Subrisk: P

UN Number: 1303 Packing Group: I

EMS Number: F-E , S-D Special provisions: None

Limited Quantities: 0

Shipping Name: VINYLIDENE CHLORIDE, STABILIZED

Section 15 - REGULATORY INFORMATION

vinylidene chloride (CAS: 75-35-4) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Industrial Hazardous Substances", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada Domestic Substances List (DSL)", "Canada Environmental Quality Guidelines (EQGs) Water: Community", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Air Transport Association (IATA) Dangerous Goods Regulations", "International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Code of Regulation; Identification and Listing of Hazardous Waste, Table 1 - Maximum Concentrations for the Toxicity Characteristics", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous Waste - Maximum Contaminant Concentration for Toxicity", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)", "US CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)", "US

CERCLA Priority List of Hazardous Substances", "US Clean Air Act - Hazardous Air Pollutants", "US CWA (Clean Water Act) - Priority Pollutants", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US Department of Transportation (DOT) Marine Pollutants - Appendix B", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Carcinogens Listing", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks", "US EPA Voluntary Children's Chemical Evaluation Program (VCCEP)", "US EPCRA Section 313 Chemical List", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US NIOSH Recommended Exposure Limits (RELs)", "US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards", "US -Texas Air Monitoring Comparison Values for Evaluating Carbonyls", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements", "US TSCA Section 4/12 (b) - Sunset Date/Status", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List", "US TSCA Section 8 (d) - Health and Safety Data Reporting", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27", "WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

Section 16 - OTHER INFORMATION

Reasonable care has been taken in the preparation of this information, but the author makes no warranty of merchantability or any other warranty, expressed or implied, with respect to this information. The author makes no representations and assumes no liability for any direct, incidental or consequential damages resulting from its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

■ Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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