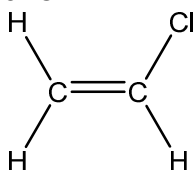




VINYL CHLORIDE

CAS Number: 75-01-4
Synonyms: Vinyl Chloride Monomer, chloroethylene, chloroethene, VC, VCM
Chemical Formula: C₂H₃Cl
Molecular Weight: 62.5
Chemical Structure:



Refer to the Safety Data Sheet (SDS) for additional information and before handling this material.

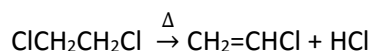
Description: Vinyl Chloride is a colorless gas with a slight, sweetish odor; it is a liquid under pressure or at reduced temperatures.

Product Overview

Vinyl Chloride is an organochlorine compound that is a colorless, flammable gas that readily forms a liquid under increased pressure or at reduced temperatures. It is the precursor to polyvinyl chloride (PVC), which is used extensively in the construction, automotive, and plastics industry. Vinyl Chloride is produced at several Westlake facilities: Calvert City, Kentucky; Geismar, Louisiana; Plaquemine, Louisiana; and at two locations in Lake Charles, Louisiana. With over 60 years of responsible production and handling experience, Westlake manufactures Vinyl Chloride with environmental and public safety consideration. Westlake personnel are experienced in handling and shipping Vinyl Chloride, and our engineers, scientists, and sales personnel can provide technical assistance to downstream customers.

Production

Westlake produces Vinyl Chloride through thermal cracking of ethylene dichloride. When heated under pressure in a cracking furnace, ethylene dichloride vapor decomposes to produce Vinyl Chloride and anhydrous hydrogen chloride.



Thermal cracking is a highly endothermic process, thus temperature and reaction time are carefully controlled. The resulting mixture is then purified to produce Vinyl Chloride.

Westlake typically supplies Vinyl Chloride without added inhibitor, although inhibited material is available for export shipments. The use of uninhibited Vinyl Chloride eliminates the need for subsequent processing to remove the inhibitor, increasing efficiency and saving resources.

Uses

Vinyl Chloride is primarily used as a chemical intermediate and not a final product. The majority of Vinyl Chloride is polymerized to produce polyvinyl chloride (PVC) or co-polymerized with other monomers to produce specialized polymers with specific properties. More than half of the total Vinyl Chloride consumption is for construction-related products.



Health Effects

Read and follow all instructions on the product label and review the Safety Data Sheet (SDS) to understand and avoid the hazards associated with Vinyl Chloride. Wear appropriate personal protective equipment and avoid direct contact. Eye or skin contact with or ingestion of Vinyl Chloride gas or liquefied gas will cause burns, severe injury and/or frostbite. Skin contact with Vinyl Chloride causes skin irritation. Vinyl Chloride is harmful if swallowed. Vinyl Chloride may be harmful if inhaled and can cause central nervous system (CNS) depression. In humans, inhalation of concentrations ranging from 12,000 to 20,000 ppm for 5 minutes may produce slight anesthetic effects, including dizziness, lightheadedness, sleepiness, headaches, and/or nausea. Levels above 20,000 ppm may cause weakness, unconsciousness, and possibly death. Deaths due to narcosis have been reported in humans.

Vinyl Chloride is a known human carcinogen. Long term overexposure to Vinyl Chloride in humans and laboratory animals has been known to cause angiosarcoma of the liver. Vinyl Chloride is listed by the U.S. Department of Health and Human Services National Toxicology Program (NTP) as a known human carcinogen, by the International Agency for Research on Cancer (IARC) as a Group 1 – carcinogenic to humans, by Occupational Safety and Health Administration (OSHA) as a specifically regulated carcinogen, by the American Conference of Governmental Industrial Hygienists® (ACGIH) as an A1 – confirmed human carcinogen, and the U.S. Environmental Protection Agency as a Group A - human carcinogen.

The United States Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists® (ACGIH) have established or recommended occupational airborne exposure limits for Vinyl Chloride. The OSHA Permissible Exposure Limit (PEL) is an 8-hour time-weighted average (TWA) of 1 ppm. OSHA's limits also include a short term exposure limit, or STEL, of 5 ppm for 15 minutes (see 29 CFR 1910.1017). The ACGIH currently recommends a Threshold Limit Value (TLV) of 1 ppm for an 8-hour TWA.

OSHA requires a program of initial monitoring to determine if there is any employee exposed to Vinyl Chloride, without regard to the use of respirators, in excess of the action level. The action level for Vinyl Chloride, per 29 CFR 1910.1017, means a concentration of 0.5 ppm averaged over an 8-hour work day. If initial monitoring shows employee exposures are in excess of the action level, a program for periodic monitoring to determine exposures for each such employee shall be established. Details of the monitoring requirements may be found at 29 CFR 1910.1017 (d)(2).

Before handling, it is important that engineering controls are operating and protective equipment requirements and personal hygiene measures are being followed. People working with this chemical should be properly trained regarding its hazards and its safe use and should be given the opportunity to review this document and the safety data sheet. OSHA has published a comprehensive proposal to protect employees from hazards of exposure to Vinyl Chloride, specifically the Vinyl Chloride standard (29 CFR 1910.1017), which should be read and understood prior to handling this chemical.

Environmental Effects

Vinyl Chloride should be kept out of lakes, streams, ponds, or other water sources. Vinyl Chloride shows a low bioaccumulation potential.

Exposure Potential

Vinyl Chloride is used in the production of PVC which is then used to manufacture a number of industrial and consumer products. Since Vinyl Chloride is volatile and a demonstrated carcinogen, precautions should be taken



to minimize potential harm to people, animals and the environment. Potential for exposure may vary depending upon site-specific conditions. When handling Vinyl Chloride, refer to the Safety Data Sheet and Product Warning Label and follow all instructions and warnings. Based on the expected uses for Vinyl Chloride, exposure could be through:

- **Workplace exposure** - Exposure could occur in a Vinyl Chloride manufacturing facility or in the various industrial facilities that use Vinyl Chloride. Vinyl Chloride is handled in closed systems, so special precautions are typically required for employees involved in maintenance activities, sample collection, or similar activities. Good industrial hygiene practices and the use of personal protective equipment will, when combined with proper training and environment, health and safety practices, contribute to a safe work environment. The Occupational Safety and Health Administration (OSHA) maintains standard 29 CFR 1910.1017 which contains requirements for the control of employee exposure to Vinyl Chloride including personal protective equipment, medical surveillance, and training.
- **Environmental releases** – In the event of a release, prevent entry into waterways, sewers, basements or confined areas. Industrial releases should be controlled by workplace spill programs which include containment around loading and unloading operations and storage tanks and employee training. Many aspects of a spill control program are mandated by federal, state and local requirements. In addition, if a release occurs, governmental reporting may be required. Refer to the Safety Data Sheet for instructions to contain and clean up a spill to minimize exposure.
- **Consumer exposure** – Westlake does not sell Vinyl Chloride directly to consumers, so direct consumer contact with this product is unlikely. The majority of Westlake's Vinyl Chloride is polymerized to produce polyvinyl chloride (PVC) or co-polymerized with other monomers to produce specialized polymers with specific properties for other industrial markets. However it is an ingredient in some consumer products manufactured by our customers or their downstream customers. Westlake cannot and does not make any representation or conclusion about consumer exposure risks associated with its customers' products. In any case, keep all chemical products out of the reach of children.

Safe Handling and Storage

Vinyl Chloride is an extremely volatile and flammable gas, vapor, or liquefied gas. It should be stored away from direct sunlight in a dry, cool and well-ventilated area away from incompatible materials. Vinyl Chloride vapor concentrations between 3.6% and 33% by volume in air are explosive by ignition. When exposed to open flames, open electrical elements, or electrical arcs, Vinyl Chloride liquid or vapor can decompose to form toxic and corrosive fumes. Depending on conditions, when Vinyl Chloride is exposed to high temperatures, heat, or ignition, hydrogen chloride gas, which is highly irritating to the nose and throat, as well as trace levels of phosgene gas, may be produced. As a result, all heat and ignition sources should be eliminated during handling and storage. Fire and explosion hazards can be minimized by adequate ventilation, using the proper types and arrangement of equipment, and taking reasonable precautions and care in handling. All metal parts of equipment must be grounded to avoid ignition of vapors by static electricity discharge.

The following materials are incompatible with Vinyl Chloride, and contact can result in strong exothermic reactions: oxygen, moisture, polymerization additives, copper, aluminum, oxidizing agents, strong alkalis, and strong acids.

During Vinyl Chloride transfer operations, all equipment, including unloading pumps, must be properly grounded and bonded to prevent the buildup of static electricity. If tank car valves are defective or leaking, do not unload. Air should never be permitted to enter Vinyl Chloride tank cars or other containers during or after unloading.



Close and seal all openings. Leave at least 10 psig of Vinyl Chloride vapor pressure or nitrogen pressure in an empty tank car being returned, depending on the vinyl tank car unloading system setup.

Appropriate personal protective equipment, as described in the Vinyl Chloride Safety Data Sheet, should always be worn to avoid contact with the eyes, skin and clothing or to prevent the inhalation of the gas.

Packaging and Shipping

Westlake ships Vinyl Chloride in rail tank cars and ships.

- **Tank car** - Westlake maintains a fleet of tank cars reserved for Vinyl Chloride service only. All cars are equipped for top unloading. Single compartment rail cars are available with nominal capacities of 170M to 180M pounds, net weight.
- **Ships** - Westlake ships Vinyl Chloride in refrigerated ocean going vessels with a capacity of several million pounds.

Fire and Explosion Hazards

Vinyl Chloride is highly flammable. Since vapors are heavier than air, they will spread along the ground and may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

During a fire, promptly isolate the scene by removing all persons from the vicinity of the incident. No other action shall be taken without suitable training. Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Physical and Chemical Properties

Vinyl Chloride is extremely flammable and is a colorless gas at ambient temperatures and pressures. Under pressure or reduced temperatures, Vinyl Chloride is a liquid. Vinyl Chloride can be an explosion hazard at concentrations from approximately 3.6 percent to 33 percent Vinyl Chloride in air. Direct contact with open flames or a high energy heat source will result in combustion. Vinyl Chloride is practically insoluble in water.

Vinyl Chloride is highly reactive and can react with oxidizing agents and many other organic compounds. Vinyl Chloride polymerizes exothermically in the presence of light, air, oxygen, or catalysts. Inhibitors are often added to Vinyl Chloride to prevent polymerization during storage.

Properties of Vinyl Chloride	
Boiling Point	7°F (-13.4°C)
Freezing Point	-245°F (-153.8°C)
Auto-ignition temperature	882°F (472°C)
Flash Point, tag open cup	-108°F (-77.8°C)
Vapor Pressure at 20°C	2580 mm Hg
Specific Gravity of Vapor (air = 1)	2.15
Specific Gravity of Liquid (water = 1)	0.91



Regulatory Information

The following regulatory information is provided as a supplement to the information already included on the Vinyl Chloride safety data sheet.

North American Regulatory Information

- **CONEG Regulation/Model Toxics in Packaging Legislation** - Lead, cadmium, mercury and hexavalent chromium are not intentionally added to Vinyl Chloride, and based on the formula and Westlake's experience with the product, the sum of the incidental concentration levels of these metals is not expected to exceed 100 parts per million (ppm) by weight.
- **RCRA** - Commercial grade Vinyl Chloride, if discarded or spilled, would be a listed hazardous waste under 40 CFR 261.33, specifically U043 - Vinyl Chloride CAS 75-01-4. In addition, Vinyl Chloride, if discarded or spilled, as well as other wastes generated during use of Vinyl Chloride or containing Vinyl Chloride may exhibit one or more hazardous waste characteristics under 40 CFR 261.24, including D001 - ignitable and D043 - toxic. (Note: Westlake provides information on U.S. hazardous waste criteria for the product as manufactured. It remains the obligation of the user to evaluate their specific waste and to manage, treat, and dispose of unused material, residues, and containers in accordance with applicable federal, state, and local requirements.)
- **VOC Information** - Vinyl Chloride is a volatile organic compound (VOC) as defined in 40 CFR 51.100.
- **HAP Information** - Vinyl Chloride is a hazardous air pollutant (HAP) as listed in the Clean Air Act Amendments of 1990, 42 USC 7412 (b).
- **Ozone-Depleting Chemicals** - Vinyl Chloride is not/does not contain ozone depleting chemicals (40 CFR 82, Subpart A, Appendix F).
- **Toxic Pollutants / Priority Pollutants** - Vinyl Chloride is classified as a toxic pollutant under 40 CFR 401.15 and as a priority pollutant under 40 CFR 423 Appendix A.
- **CERCLA Hazardous Substance** - Vinyl Chloride appears in the List of Hazardous Substances and Reportable Quantities table (40 CFR 302.4) with a reportable quantity (RQ) of 1 pound (0.454 Kg).
- **TSCA Information** - All of the components of Vinyl Chloride are listed on the TSCA inventory as active under TSCA Section 8(b). Vinyl Chloride is not currently subject to any rule or order under TSCA Sections 4, 5(a), 5(e), 6(a), 7, or 12(b)
- **California Proposition 65** - Vinyl Chloride is a chemical known to the State of California to cause cancer.
- **Washington State Children's Safe Product Act (CSPA)** - Vinyl Chloride is listed under the Children's Safe Product Act (CSPA, 70.240).
- **U.S. Food and Drug Administration** - Vinyl Chloride is not listed as a chemical Generally Recognized as Safe (GRAS) and has not been manufactured under Good Manufacturing Practices (21 CFR 110).
- **Canada DSL/NDSL Inventory** - All components of Vinyl Chloride are listed on the Canadian Domestic Substances List (DSL); no components are listed on the Non-Domestic Substances List.

European Regulatory Information

- **RoHS/WEEE** - Vinyl Chloride has been reviewed with regard to the EU Directive 2011/65/EU "Restriction on the Use of Certain Hazardous Substances" (RoHS 2). Based on our knowledge of this product and information on the raw material suppliers' Safety Data Sheets, this product does not contain cadmium, hexavalent chromium, lead, mercury, polybrominated biphenyls (PBBs) or polybrominated diphenyl ethers (PBDEs) at levels greater than the tolerated maximum concentration values established by the directive.



- **Europe REACH** - Vinyl Chloride is considered a substance under REACH. Vinyl Chloride does not contain Substances of Very High Concern (SVHC) as published in accordance with Article 59(10) of the REACH Regulation as of July 2017, nor does this product contain any substances on Annex XIV (Authorisation List). Vinyl Chloride has been registered in accordance to the REACH regulations. Westlake's customers importing Westlake's Vinyl Chloride may be covered by agreement under Westlake's REACH registration if requirements and uses are reviewed and approved by Westlake.
- **EU Food Additive** – Vinyl Chloride is not authorized for use as a food additive under EC No. 1333/2008.

Asia-Pacific Regulatory Information

- **Australia Inventory of Chemical Substances (AICS)** - All components of Vinyl Chloride are listed or compliant with the Australia Inventory of Chemical Substances.
- **China Inventory of Existing Chemical Substances (IECSC)** - All components of Vinyl Chloride are listed or compliant with the China Inventory of Existing Chemical Substances.
- **Japanese Existing and New Chemicals Inventory (ENCS)** - All components of Vinyl Chloride are listed or compliant with the Japanese Existing and New Chemicals Inventory.
- **Korean Existing Chemicals Inventory (KECI)** - All components of Vinyl Chloride are listed or compliant with the Korean Existing Chemicals Inventory.
- **New Zealand Inventory of Chemicals (NZIoC)** - All components of Vinyl Chloride are listed or compliant with the New Zealand Inventory of Chemicals.
- **Philippine Inventory of Chemicals and Chemical Substances (PICCS)** - All components of Vinyl Chloride are listed or compliant with the Philippine Inventory of Chemicals and Chemical Substances.
- **Taiwan Existing Chemical Notification List** - All components of Vinyl Chloride are listed or compliant with the Taiwan Existing Chemical Notification List.
- **Turkey Chemical Inventory** - All components of Vinyl Chloride are listed or compliant with the Turkey Chemical Inventory.

Product Certifications and Listings

- **Kosher Certification** - Vinyl Chloride is not Kosher Certified. However Vinyl Chloride, including the equipment used in its manufacture, does not come into contact with or contain any animal by-products, animal fats, or animal products, nor does it contain chemical additives that are organic in nature.
- **Halal Certification** - Vinyl Chloride is not Halal certified. However, Vinyl Chloride does not contain natural L-cysteine extracted from hair or feathers, animal fats and/or extracts, blood of any origin, blood plasma, pork, or other meat byproducts.
- **ISO 9001 Certification** – The following Vinyl Chloride manufacturing facilities are ISO 9001 certified: Calvert City, KY.



Additional Product Information

- **Source** - Vinyl Chloride is derived from mineral and petroleum sources and has not been derived from plant, animal, synthetic or fermentation sources.
- **Allergenic Materials** – The following are not used in the manufacture of Vinyl Chloride:

Potential Allergen	Including
Bee Products & Derivatives	honey, pollen, propolis, royal jelly
Buckwheat Products & Derivatives	
Celery Products & Derivatives	celery seeds
Cocoa Products & Derivatives	
Coconut Products & Derivatives	
Crustacean Products & Derivatives	crab, crayfish, lobster, shrimp/prawn
Dairy Products & Derivatives	cow's milk/cream, goat's milk/cream, powdered milk, butter/butter solids, butterfat, buttermilk, milk fat, casein, whey, curds, custard, cheese, yogurt, lactalbumin, lactoglobulin, lactose
Egg Products & Derivatives	albumin, egg whites, egg yolks, eggnog, ova albumin, ovomucoid, powdered eggs, mayonnaise, meringue
Fish Products & Derivatives	abalone, anchovy, bass, cod, flounder, herring, mackerel, pollock, salmon roe, sardine, tuna, whitefish
Fruit Products & Derivatives	apple, apricot, banana, cherry, grapefruit, kiwi, orange, peach, plum, tomato
Grain Products & Derivatives	wheat, rice, rye, oats, barley, spelt, kamut
Cinnamon Products & Derivatives	
Legume Products & Derivatives	alfalfa, beans (green, kidney, lima, navy, wax)
Carob	
Lentils	
licorice	
locust bean gum	
Peas	
Lupin Products & Derivatives	
Meat Products & Derivatives	beef, chicken, pork
Mollusk Products & Derivatives	abalone, clam, cuttlefish, mussel, octopus, oysters, periwinkle, sassia scallops, snail, squid, whelk
Mushroom Products & Derivatives	matsutake
Mustard Products & Derivatives	
Peanut Products & Derivatives	peanut butter, peanut meal, peanut protein, peanut flour
Plant Nuts/Seeds/Oils	safflower, canola
Potato Products & Derivatives	
Seed Products & Derivatives	cotton, poppy, sesame, sunflower
Protein Hydrolysates, Soybean Products & Derivatives	soy, miso, tofu, bean cured, edamame, isolated soy protein, hydrolyzed soy protein, textured soy protein, soy milk, soy sauce, soy nuts, soy flour, soy lecithin
Spices	
Sulfates/Sulfites & Derivatives	sulfur dioxide, sodium metabisulfites, sodium bisulfite
Tree Nut Products & Derivatives	almonds, brazil nut, cashew, chestnut, filberts, hazelnut, hickory, macadamia, pecans, pine nuts, pistachio, queensland nut, walnuts
Yam Products & Derivatives	



Additives/Preservatives/Flavorings - The following are not used by Westlake facilities in the manufacture of Vinyl Chloride:

Adipate	Ethylene Oxide	PAH
Artificial Colors/Color Additives	Free Glutamate	Phosphates
Benzopyrene	Gelatin	Phthalates
BPA (Bisphenol A)	Hormones	Potassium Bromate
Caramel Color	Iodine	Psyllium
Chloramphenicol	Jatropha Plant	Sodium Benzoate
DEHP	Lactose	Sorbic Acid
Diacetyl	Latex	Starch
Diethylene Glycol	Maleic Acid	Sudan Red
Dioxin	Melamine	Titanium Dioxide
Diphenylamine	MSG	4-Methylimidazole
DMAA	Palm Oil	
Dyes/Food Dyes	Parabens	

- **Bovine Spongiform Encephalopathy** - Vinyl Chloride is not of animal origin, and, to Westlake's knowledge, does not contribute to Transmissible Spongiform Encephalopathy (TSE)/Bovine Spongiform Encephalopathy (BSE).
- **Genetically Modified Organisms (GMOs)** - Vinyl Chloride is not manufactured with and does not contain genetically modified organisms.
- **Natural Latex Rubber** - Vinyl Chloride is not manufactured with and does not contain natural latex rubber as defined in 21 CFR 801.437(b)(1).
- **Nutritional Value** - Vinyl Chloride does not have nutritional value.
- **Partially Hydrogenated Oils (PHOs)** - Vinyl Chloride is not manufactured with and does not contain Partially Hydrogenated Oils (PHOs).



Product Stewardship

Westlake Chemical is committed to managing Vinyl Chloride so that it can be safely used by its employees and customers. Westlake's relationships with its customers encourage communication about safety and environmental stewardship.

Additional Information

For more information regarding Westlake's Vinyl Chloride, contact our customer service department by calling (713) 960-9111.

References

- Westlake Chemical website: www.westlake.com

Notice

Prior to its use, the user is responsible for determining the suitability of the product or products covered by this Product Stewardship Summary and for complying with all federal, state, and local laws and regulations in connection with its use. Neither Westlake Corporation nor any of its affiliates shall be responsible for any damages of any kind whatsoever resulting from the use of or reliance on this Product Stewardship Summary or product or products to which it refers.

This Product Stewardship Summary is intended only to provide a general summary of the potential hazards associated with the product or products described herein. It is not intended to provide detailed information about potential health effects and safe use and handling information and, although Westlake Corporation believes this information is correct, Westlake Corporation makes no warranties as to its completeness or accuracy. Appropriate literature has been assembled which provides information concerning the health and safety precautions that must be observed when handling the Westlake Corporation product(s) mentioned in this document. Before working with any of these products, users must read and become familiar with the available information on product hazards, proper use, and handling. Information is available in several forms, such as safety data sheets (SDS) and product labels. A copy of Westlake's SDS for Vinyl Chloride can be obtained by going to the company's website www.westlake.com.

This information is subject to change without notice.

Issue Date: May 2018