

Vinyl Chloride

Chemicals

PPG

INDUSTRIES

In keeping with its position as a leading producer of vinyl chloride monomer for the merchant market only, PPG Industries expanded its Lake Charles, Louisiana, vinyl chloride plant in 1969. The Guayanilla, Puerto Rico plant, built in 1971, greatly increased PPG's capacity for making vinyl chloride monomer.

A new large tanker, the S.S. Puerto Rican, transports refrigerated vinyl chloride monomer to a terminal at Paulsboro, New Jersey, where it is stored under refrigeration.

PPG produces vinyl chloride monomer by the oxyhydrochlorination of ethylene and holds more than 400 domestic and foreign patents on this process.



At the PPG plant in Guayanilla, Puerto Rico, the company's modern 34,000-ton chemical tanker, S.S. Puerto Rican, receives a load of vinyl chloride monomer.



At the Paulsboro, New Jersey terminal, the S.S. Puerto Rican's load of vinyl chloride monomer is transferred to the refrigerated storage tanks in the background.

Uninhibited VCM is quite stable and can be routinely shipped, handled and stored provided proper procedures, outlined below, are followed. To prevent polymerization in transit or storage, it is essential that the monomer be protected at all times from contact with air, oxygen, moisture, catalytic impurities and light.

PPG normally supplies VCM uninhibited. The use of uninhibited VCM eliminates the need for subsequent processing to remove the inhibitor. If required, suitable inhibitors will be added.

More information appears in the PPG manual, "Vinyl Chloride Monomer Handling and Properties," form A-994-115R.

GRADES

PPG Industries produces only polymer-grade vinyl chloride monomer.

USES

Most vinyl chloride is polymerized to polyvinyl chloride (PVC) or copolymerized with other monomers such as PPG's vinylidene chloride. Vinyl chloride monomer should not be used as an aerosol propellant.

TOXICITY

The Occupational Safety and Health Standard on exposure to vinyl chloride published October 4, 1974, says: "Based on the demonstrated evidence of vinyl

PROPERTIES

Chemical Names: Vinyl chloride; vinyl chloride monomer; chloroethylene; chloroethene

Chemical Formula: CH_2CHCl

Molecular Weight: 62.5

Description:

At ordinary temperatures and pressures, vinyl chloride is a colorless gas with a mild, sweet odor. But as supplied in tank cars and trucks under pressure, it is a liquid. Vinyl chloride is highly volatile and its vapor is extremely flammable. Containers are labeled "cancer-suspect agent."

Boiling Point, °C	-13.8	Autoignition Temperature, °C	472
°F	+7.0	°F	882
Freezing Point, °C	-153.7	Liquid Density at 60°F	0.9192
°F	-245	Vapor Density, air=1	2.15
Flash Point, open cup °C	-78	Vapor Pressure, psia at 0°C	25.1
°F	-108.4	20°C	49.2
		40°C	87.6

Explosive Limits, volume % in air at 25°C (77°F) 3.6 to 33

Solubility, water in monomer, at 25°C (77°F), weight % 0.11

Solubility: Vinyl chloride is relatively insoluble in water but soluble in most organic solvents.

Reactivity: Vinyl chloride polymerizes exothermically in the presence of light, air, oxygen or catalysts. Heat alone will not initiate polymerization. Vinyl chloride is thermally stable to quite high temperatures. Although peroxide formation due to air exposure is a slow reaction, certain peroxide products are shock-sensitive. Vinyl chloride is noncorrosive to metals when dry at normal temperatures, but water and elevated temperatures accelerate corrosion. The double bond behaves as in other unsaturated compounds. The chlorine atom is relatively inactive and is more stable than in saturated or allylic compounds.

Specification and typical analysis:

	Specification	Typical Analysis
Appearance	clear, free of suspended matter	clear, free of suspended matter
Color	colorless, water-white	colorless, water-white
Acidity, as HCl, ppm	5 maximum	<1
Iron, as Fe, ppm (filtered sample)	0.5 maximum	0.1
Nonvolatile residue, weight %	0.05 maximum	0.0003
Water, ppm	100 maximum	34
Sulfur, as SO ₂ , ppm	3 maximum	<1
Acetaldehyde, ppm	5 maximum	<1
Acetylene, ppm	2 maximum*	<1

*This maximum is an industry standard; however, the PPG product contains no detectable amount of acetylene.

chloride monomer's carcinogenicity in three animal species (rats, mice and hamsters), and the substantial probability that vinyl chloride monomer had been the causal agent in the cases of liver angiosarcoma found in workers both here and abroad, OSHA . . . published a comprehensive proposal . . . to protect employees from hazards of exposure to vinyl chloride monomer."

Stated in this OSHA standard is the following "Permissible exposure limit scheduled to become effective January 1, 1975:

(1) No employee may be exposed to vinyl chloride at concentrations greater than 1 ppm (part per million by volume) averaged over any 8-hour period, and

(2) No employee may be exposed to vinyl chloride at concentrations greater than 5 ppm averaged over any period not exceeding 15 minutes.

(3) No employee may be exposed to vinyl chloride by direct contact with liquid vinyl chloride."

In cases where these limits of exposure are exceeded, the wearing of respirators will be mandatory for workers beginning January 1, 1976. Until then, the wearing of respirators is discretionary for exposures under 25 ppm.

Besides the suspected carcinogenicity, vinyl chloride monomer vapor can produce immediate symptoms in persons exposed to high concentrations.

The odor of vinyl chloride monomer

is sweetish and the sense of smell cannot be relied upon as a warning. High vapor concentrations may cause lung irritation, can cause dizziness and anesthesia, and may do other bodily damage in ways not yet ascertained. In all cases of overexposure, immediately remove the affected individual to fresh air and obtain medical attention.

Liquid vinyl chloride monomer may cause frostbite because it evaporates so fast. If a polymerization inhibitor is included, it may cause local skin burns. However, most vinyl chloride monomer shipped today is not inhibited.

Workers should wear eye protection and protective clothing to prevent skin contact with the liquid. If vinyl chloride gets on clothing or shoes, they should be removed immediately. If vinyl chloride contacts the skin, wash immediately with soap and water. If vinyl chloride contacts the eyes, the eyes should be washed immediately and thoroughly with water for at least 15 minutes. Get medical attention.

HANDLING AND STORAGE

Detailed information appears in the PPG manual, "Vinyl Chloride Monomer Handling and Properties," form A-994-115R.

Fire hazard

Vinyl chloride vapor is extremely flammable. Its explosive limits are between 3.6 and 33% by volume in air. Sufficient ventilation and the elimina-

tion of ignition sources are mandatory in areas where vapor concentrations may reach a flammable level. When a tank car is unloaded, both the car tank and the unloading pump must be electrically grounded.

The major products of combustion include toxic and corrosive hydrogen chloride as well as carbon monoxide and carbon dioxide. Under certain conditions, traces of phosgene may be produced.

Unloading tank cars

If tank car valves are defective or leaking, do not unload. Telephone the PPG Chemicals plant at Lake Charles, Louisiana, 318-882-1200. Information on unloading tank cars and trucks appears in the PPG manual, "Vinyl Chloride Monomer Handling and Properties," form A-994-115R.

Warning: 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 in empty tank car being returned.

PACKAGING AND SHIPPING

PPG Industries delivers vinyl chloride by ship, barge, tank car and tank truck. There are three shipping points: Lake Charles, Louisiana; Guayanilla, Puerto Rico; and Paulsboro, New Jersey.

PPG maintains a fleet of tank cars for vinyl chloride service only. All cars are equipped for top unloading. Tank car capacity is 180,000-pounds net weight. Tank trucks hold up to 40,000 pounds. Ships and barges hold up to several million pounds.

SAMPLES AND SERVICE

Samples of vinyl chloride are available on special request in returnable laboratory-size steel cylinders holding 5 pounds.

The technical service staff of PPG Industries' Chemical Division is available for consulting on handling, storage and use.



PPG INDUSTRIES, Inc.
Chemical Division
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Some of the materials mentioned above may be hazardous in nature and should be handled with care. Read the label carefully and observe and comply with all the label warnings and precautionary directions. Although these materials are not intended for household use, they, as all potentially hazardous materials, must be kept out of the reach of children.

L. *Bumhager*
Letter Request for O.C. on P.C.
in molding

UNION CARBIDE CORPORATION P. O. BOX 8361, SOUTH CHARLESTON, WV 25303
Health, Safety & Environmental
Affairs Department

December 16, 1981

RECEIVED

DEC 23 1981

M. G. MANETTI

Mr. Orvie Nicholson
BCM Laboratory Division
325 Thirteenth Street
Dunbar, West Virginia 25064

Re: Vinyl Chloride and Polyvinyl Chloride
Analytical Capability

Dear Mr. Nicholson:

Squire, Sanders and Dempsey, a Cleveland, Ohio law firm is seeking an independent laboratory to analyze an unsaturated polyester fiberglass molding for contained vinyl chloride monomer and for contained polyvinyl chloride resin. A representative formulation for the molding is as follows:

- 65 parts polyester resin
- 12 parts polyvinyl chloride copolymer
- 23 parts styrene monomer
- 200 parts hydrated alumina and calcium carbonate
- 1.5 parts tert butyl benzoate
- 10 parts carbon black
- 4 parts calcium stearate
- 0.5 part magnesium oxide
- 65 parts fiberglass

During molding, most of the styrene monomer reacts with the polyester yielding a cross-linked polymer.

The analysis for polyvinyl chloride content would confirm its presence in the molding and could obviate the need for revealing a proprietary formulation. Hopefully, this result would be to the nearest 0.1% by weight.

The analysis for vinyl chloride monomer is more difficult because it needs to be a great deal more sensitive, i.e., 10ppbw.

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Mr. Orvie Nicholson
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At the low concentration involved, specificity of the method becomes very important.

Attached for your consideration are the following analytical methods:

1. Union Carbide Standard Testing Method WV-294-A
Determination of Polyvinyl Chloride in Resins
(Equivalent to ASTM D 1303).
2. Proposed ASTM Standard Method
Determining > 5 ppb Residual Vinyl Chloride Content
of Vinyl Chloride Homo- and co-polymers by Head Space
Chromatography.
3. Union Carbide Corporation Method
Determination of Low Level Residual Vinyl Chloride
Monomer in Vinyl Chloride Copolymers by Automated
Headspace Chromatography with an Electrolytic
Conductivity Detector.
4. Dennison, et al, "Headspace Sampling and Gas-Solid
Chromatographic Determination and Confirmation of
 > 1 ppb Vinyl Chloride Residues in Polyvinyl Chloride
Food Packaging", J. Assoc. Off. Anal. Chem. Vol. 61,
No. 4, 1978.

The foregoing methods have a fault in that none have been used to analyze the material in question. Our analytical people prefer method three over methods two and four because it is more specific to vinyl chloride.

The project would involve a one time study of two polyester fiberglass molding samples, one containing polyvinyl chloride and one containing no polyvinyl chloride. The study will require a written report certified by a qualified chemist.

Currently, we would like to know if your laboratory has the facilities, equipment and personnel to do the study outlined and wishes to be considered for the work. If your answer is yes

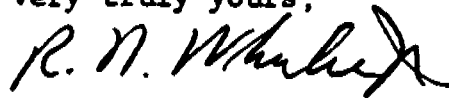
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then Mr. Robert Maynard of the law firm will contact you regarding cost, timing, etc. If you answer is no, then please return the attached material to me. I will be pleased to answer any questions you may have on the technical aspects of the work or on the definition of the job if they are not clear in my letter.

Very truly yours,



R. N. Wheeler, Jr.
Assistant Director of
Product Safety

RNWjr/dh

Attachments - *Attached*

cc: Robert Maynard, Esq.
M. G. Manetti, Esq.

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