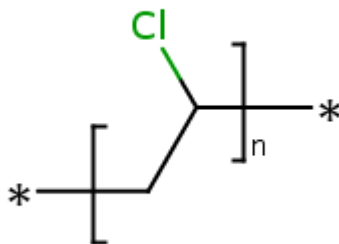


POLYVINYL CHLORIDE

CASRN: 9002-86-2

**FULL RECORD DISPLAY***Displays all fields in the record.**For other data, click on the Table of Contents*

Human Health Effects:

Evidence for Carcinogenicity:

Inadequate evidence of carcinogenicity in humans. Inadequate evidence of carcinogenicity in animals.

OVERALL EVALUATION: Group 3: The agent is not classifiable as to its carcinogenicity to humans.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. 57 70 (1987)] ****QC REVIEWED****

Human Toxicity Excerpts:

WORKERS EXPOSED TO POLYVINYL CHLORIDE DUST DURING THE MANUFACTURE OF ARTICLES MADE FROM PVC SHOWED ALTERATIONS IN THE RESPIRATORY ORGANS (EG CHANGED BRONCHOVASCULAR PATTERN, INCREASED PULMONARY VENTILATION AT REST).

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] ****PEER REVIEWED****

FIBROTIC LUNG CHANGES AND ALTERED PULMONARY FUNCTION TESTS HAVE BEEN REPORTED IN 96 WORKERS EXPOSED TO POLYVINYL CHLORIDE DUST; THE CHANGES WERE MORE PRONOUNCED IN THOSE WITH LONG EXPOSURE.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] ****PEER REVIEWED****

...POLYVINYL CHLORIDE TUBINGS CONTAINED TOXIC AGENT ETHYLENE CHLOROHYDRIN AFTER ETHYLENE OXIDE STERILIZATION.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 538] ****PEER REVIEWED****

FOR PLASTICIZED MATERIALS SUCH AS FLEXIBLE POLYVINYL CHLORIDE ITEMS PLASTICIZER

/ADDITIVE/ ENHANCES DIFFUSION OF TOXIC AGENT FROM MATERIAL TO TISSUE...EVEN THOUGH DIFFUSION OF ADDITIVE MAY OCCUR, LOCAL IRRITANT RESPONSE WILL DEPEND UPON INTRINSIC IRRITATING QUALITIES OF THE CHEMICAL.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 535] **PEER REVIEWED**

SEVERAL CASES OF ANGIOSARCOMA OF LIVER HAVE BEEN DETECTED AMONG LONG-TIME WORKERS IN PLANTS THAT MAKE PVC FROM MONOMERIC VINYL CHLORIDE. WHETHER POLYMER OR MONOMER /A PROVEN HUMAN CARCINOGEN/ IS INVOLVED IN GENESIS OF THIS MALIGNANCY IS NOT KNOWN.

[Gosselin, R.E., H.C. Hodge, R.P. Smith, and M.N. Gleason. Clinical Toxicology of Commercial Products. 4th ed. Baltimore: Williams and Wilkins, 1976., p. II-245] **PEER REVIEWED**

THE AVAILABLE STUDIES ON POLYVINYL CHLORIDE, WHICH INDICATE AN ELEVATED PROPORTION OF DIGESTIVE SYSTEM CANCER IN MALE AND FEMALE WORKERS AND POSSIBLY OF CANCERS OF THE BREAST AND URINARY ORGANS IN FEMALE WORKERS INVOLVED IN THE FABRICATION OF PLASTICS, INCLUDING POLYVINYL CHLORIDE, ARE INSUFFICIENT TO EVALUATE THE CARCINOGENICITY OF THIS COMPOUND.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 418] **PEER REVIEWED**

ENVIRONMENTAL ACCUMULATION: POLYMERIZED PRODUCT IS THE PRINCIPAL CONSTITUENT OF PLASTIC PIPE. IN SOME CASES, THERE IS A SMALL RESIDUAL OF UNPOLYMERIZED MONOMER IN THE FINISHED PIPE. SOME MONOMERS, SUCH AS UNPOLYMERIZED VINYL CHLORIDE IN PVC PIPE, HAVE TOXIC PROPERTIES AND ARE A POTENTIAL SOURCE OF CONCERN IF THEY LEACH OUT INTO POTABLE WATER.

[National Research Council. Drinking Water & Health, Volume 4. Washington, DC: National Academy Press, 1981., p. 77] **PEER REVIEWED**

Medical Surveillance:

...BEFORE BEING EMPLOYED AS POLYCLEANERS, WORKERS SHOULD BE EXAMINED FOR EVIDENCE OF COLLAGEN DISEASE, OSTEOLYSIS OF HANDS, OR ABNORMAL RESPONSE OF HANDS TO COLD. EVIDENCE OF EXISTENCE OF SUCH FACTORS SHOULD CONTRAINDICATE EMPLOYMENT ON THIS WORK.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 34] **PEER REVIEWED**

Probable Routes of Human Exposure:

EPIDEMIOLOGIC INVESTIGATIONS...IN...POLYVINYL PLANTS REVEAL THAT APPARENTLY ONLY THOSE WORKERS WHO CLEAN VATS WHERE POLYVINYL CHLORIDE IS MADE COME DOWN WITH.../ACROOSTEOLYSIS/.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 533] **PEER REVIEWED**

DURING POLYMERIZATION...INHALATION OF VINYL CHLORIDE MAY...BE HEALTH HAZARD. DUST COULD BE PROBLEM FOR EMPLOYEES FILLING SACKS WITH DRIED POLYMER.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New

York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

TOTAL OF 50 CASES /OCCUPATIONAL ACRO-OSTEOLYSIS/ HAVE...BEEN RECORDED, OF WHICH OVER 30 WERE FOUND IN USA; 1 STUDY SHOWED THAT LESS THAN 3% PVC POLYSCRAPERS PRESENT THIS SYNDROME. ... IN 1 SERIES OF CASES...AFFECTED WORKERS HAD OVER 12 MO POLYCLEANING EXPERIENCE.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 33] **PEER REVIEWED**

Emergency Medical Treatment:

Emergency Medical Treatment:

EMT Copyright Disclaimer:

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The following Overview, *** VINYL CHLORIDE ***, is relevant for this HSDB record chemical.

Life Support:

- o This overview assumes that basic life support measures have been instituted.

Clinical Effects:

0.2.1 SUMMARY OF EXPOSURE

0.2.1.1 ACUTE EXPOSURE

- A) SUMMARY: In acute exposure, deaths are most often due to CNS and respiratory depression. The primary toxic hazard is exposure to vinyl chloride monomer (VCM) gas rather than to poly vinyl chloride (PVC) products (except during pyrolysis). There may be a long latent period between exposure and symptom onset.
- B) ACUTE: The nervous system is the primary target of acute vinyl chloride exposure. Signs and symptoms following ingestion include weakness; ataxia; inebriation; headache; fatigue; numbness; tingling and pallor or cyanosis of the extremities; nausea; abdominal pain; GI bleeding; visual disturbances; cardiac dysrhythmias; narcosis and death. Vinyl chloride is a severe irritant of the eyes, skin, and mucous membranes.
- C) CHRONIC: Enhanced collagen deposition and thickening of the subepidermal layer of the skin, Raynaud's phenomenon, hepatomegaly, hepatic fibrosis, splenomegaly, thrombocytopenia, sensory-motor

polyneuropathy, trigeminal sensory neuropathy, minor pyramidal signs, cerebellar and extrapyramidal motor disorders, degenerative bone changes, and acro-osteolysis may occur with chronic exposure to vinyl chloride. Vinyl chloride is a known human carcinogen and has caused angiosarcoma of the liver in heavily exposed workers.

- D) DERMAL: Direct contact with liquid vinyl chloride or escaping gas can cause frostbite injury.
- E) INHALATION: Inhalation may cause CNS and respiratory depression and seizures.

0.2.1.2 CHRONIC EXPOSURE

- A) CHRONIC/SUBACUTE: Target organ is the liver. Direct hepatotoxicity, hepatomegaly, and hepatic cancers, including angiosarcoma, have been reported. Vinyl chloride is a human carcinogen and causes cancer of the hepatic, hematopoietic, central nervous, respiratory, and digestive systems.
- B) VINYL CHLORIDE DISEASE is characterized by a scleroderma-like condition of the connective tissue of the fingers, Raynaud's phenomenon followed by acro-osteolysis, liver damage, and sometimes hematologic changes and pulmonary effects. It develops after exposures from 1 month to 3 years and is reversible after cessation of exposure.

0.2.4 HEENT

0.2.4.1 ACUTE EXPOSURE

- A) Contact with escaping, compressed gas may cause mechanical injury and frostbite. The vapor is irritating to the eyes.

0.2.5 CARDIOVASCULAR

0.2.5.1 ACUTE EXPOSURE

- A) VCM sensitizes animal hearts to epinephrine-induced dysrhythmias. Ventricular fibrillation may be a cause of sudden death.

0.2.6 RESPIRATORY

0.2.6.1 ACUTE EXPOSURE

- A) Various pulmonary abnormalities have occurred including dyspnea, asthma and pneumoconiosis.
- B) A chronic interstitial pulmonary change is thought to be caused by vinyl chloride monomer; this change is distinct from a pneumoconiosis.

0.2.7 NEUROLOGIC

0.2.7.1 ACUTE EXPOSURE

- A) VCM may cause CNS depression characterized by fatigue, headache, vertigo, ataxia, euphoria, visual disturbances, numbness and tingling in the extremities, narcosis, loss of consciousness, and death from respiratory failure.
- B) Seizures may occur following inhalational exposure of VCM.

0.2.8 GASTROINTESTINAL

0.2.8.1 ACUTE EXPOSURE

- A) Nausea, vomiting, diarrhea, and severe epigastric pain can result from ingestion of the liquid.

0.2.9 HEPATIC

0.2.9.1 ACUTE EXPOSURE

- A) In chronic/subacute exposures, the target organ is the liver. Direct hepatotoxicity, hepatomegaly, and hepatic cancers, including angiosarcoma, have been reported.
- B) Portal hypertension can result from liver injury.

0.2.10 GENITOURINARY

0.2.10.1 ACUTE EXPOSURE

- A) Decreased libido and sperm count have occurred following chronic exposures in men.

0.2.13 HEMATOLOGIC

0.2.13.1 ACUTE EXPOSURE

- A) Thrombocytopenia, porphyrinuria, and capillary abnormalities have also been reported.

0.2.14 DERMATOLOGIC

0.2.14.1 ACUTE EXPOSURE

- A) Scleroderma, frostbite, irritation and cyanosis have been reported. Vinyl chloride may be absorbed through the skin.
- B) Contact dermatitis has been associated with VCM or its plasticizers or additives.

0.2.15 MUSCULOSKELETAL

0.2.15.1 ACUTE EXPOSURE

- A) Acro-osteolysis, arthralgias, and cold extremities have been reported in workers exposed to VCM.

0.2.20 REPRODUCTIVE HAZARDS

- A) Fetotoxicity and congenital malformations have been seen in animals. Human birth defects have not been substantiated.

0.2.21 CARCINOGENICITY

0.2.21.1 IARC CATEGORY

- A) IARC Carcinogenicity Ratings for CAS75-01-4 (International Agency for Research on Cancer (IARC), 2016; International Agency for Research on Cancer, 2015; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2010; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2010a; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2008; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2007; IARC Working Group on the Evaluation of Carcinogenic Risks to Humans, 2006; IARC, 2004):

1) IARC Classification

- a) Listed as: Vinyl chloride
- b) Carcinogen Rating: 1

- 1) The agent (mixture) is carcinogenic to humans. The exposure circumstance entails exposures that are carcinogenic to humans. This category is used when there is sufficient evidence of carcinogenicity in humans. Exceptionally, an agent (mixture) may be placed in this category when evidence of carcinogenicity in humans is less than sufficient but there is sufficient evidence of carcinogenicity in experimental animals and strong evidence in exposed humans that the agent (mixture) acts through a relevant mechanism of carcinogenicity.

0.2.21.2 HUMAN OVERVIEW

- A) Vinyl chloride is a HUMAN CARCINOGEN inducing hepatic angiosarcoma, a rare form of liver cancer. Cancers of the brain, lungs, blood and digestive systems, and melanoma have also been associated with vinyl chloride monomer (VCM) exposure.

0.2.21.3 ANIMAL OVERVIEW

- A) Vinyl chloride has produced gastrointestinal, liver (including angiosarcoma), and kidney tumors and skin and appendage tumors in rats; respiratory system, liver, vascular and/or skin/appendage tumors in mice; and lymphomas and skin/appendage tumors in hamsters.

0.2.22 GENOTOXICITY

- A) Chromosomal aberrations have been found in workers exposed to vinyl chloride. It has induced DNA damage, unscheduled DNA synthesis, DNA inhibition, mutations, chromosome aberrations, sister chromatid exchanges, micronuclei, and oncogenic transformation in a variety of in vivo and in vitro assays.

- B) A specific ras mutation was found to be linked with occupational vinyl chloride exposure.

Laboratory:

- A) No toxic serum or blood level has been established.

Treatment Overview:

0.4.3 INHALATION EXPOSURE

- A) Monitor for CNS and respiratory depression after acute exposure. Treatment should focus on good supportive care such as appropriate airway management and aggressive treatment of neurologic symptoms.
- B) SEIZURES: Administer a benzodiazepine; DIAZEPAM (ADULT: 5 to 10 mg IV initially; repeat every 5 to 20 minutes as needed. CHILD: 0.1 to 0.5 mg/kg IV over 2 to 5 minutes; up to a maximum of 10 mg/dose. May repeat dose every 5 to 10 minutes as needed) or LORAZEPAM (ADULT: 2 to 4 mg IV initially; repeat every 5 to 10 minutes as needed, if seizures persist. CHILD: 0.05 to 0.1 mg/kg IV over 2 to 5 minutes, up to a maximum of 4 mg/dose; may repeat in 5 to 15 minutes as needed, if seizures continue).
- 1) Consider phenobarbital or propofol if seizures recur after diazepam 30 mg (adults) or 10 mg (children greater than 5 years).
 - 2) Monitor for hypotension, dysrhythmias, respiratory depression, and need for endotracheal intubation. Evaluate for hypoglycemia, electrolyte disturbances, and hypoxia.
- C) VCM and PVC dust may cause various respiratory abnormalities and respiratory cancers. Workers exposed to dust should have periodic chest x-rays.
- D) There is no specific test to detect VCM hepatic toxicity. Periodic monitoring of liver function tests in exposed workers is recommended, although there is disagreement about its utility.

0.4.4 EYE EXPOSURE

- A) DECONTAMINATION: Remove contact lenses and irrigate exposed eyes with copious amounts of room temperature 0.9% saline or water for at least 15 minutes. If irritation, pain, swelling, lacrimation, or photophobia persist after 15 minutes of irrigation, the patient should be seen in a healthcare facility.

0.4.5 DERMAL EXPOSURE

- A) OVERVIEW
- 1) DECONTAMINATION: Remove contaminated clothing and jewelry and place them in plastic bags. Wash exposed areas with soap and water for 10 to 15 minutes with gentle sponging to avoid skin breakdown. A physician may need to examine the area if irritation or pain persists (Burgess et al, 1999).

Range of Toxicity:

- A) TOXICITY: Airborne vinyl chloride may be narcotic in concentrations as low as 7% to 10%. Exposure to more than 120,000 ppm may be fatal in humans. Humans exposed to 4000 ppm for 5 minutes reported no effects; 8000 ppm for 5 minutes reported some dizziness; and 20,000 ppm for 5 minutes reported dizziness, light-headedness, nausea, and dulling of vision and auditory cues.

[Rumack BH POISINDEX(R) Information System Micromedex, Inc., Englewood, CO, 2017; CCIS Volume 172, edition expires May, 2017. Hall AH & Rumack BH (Eds): TOMES(R) Information System Micromedex, Inc., Englewood, CO, 2017; CCIS Volume 172, edition expires May, 2017.] **PEER REVIEWED**

Animal Toxicity Studies:

Evidence for Carcinogenicity:

Inadequate evidence of carcinogenicity in humans. Inadequate evidence of carcinogenicity in animals.

OVERALL EVALUATION: Group 3: The agent is not classifiable as to its carcinogenicity to humans.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. S7 70 (1987)] **QC REVIEWED**

Non-Human Toxicity Excerpts:

2...FLEXIBLE POLYVINYL CHLORIDE /URINARY BAGS WERE/...IMPLANTED INTO RABBIT MUSCLE FOR VARYING PERIODS OF TIME EXTENDING TO 6 WEEKS. ONE OF THE...BAGS WAS FOUND TO BE TOXIC.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 535] **PEER REVIEWED**

GROUPS OF 35 (MALE AND FEMALE) WISTAR RATS WERE GIVEN A SUBCUTANEOUS IMPLANT INTO THE ABDOMEN OF POLYVINYL CHLORIDE FILM 4X5X0.16 MM. A GROUP OF 25 CONTROL RATS RECEIVED AN IMPLANT OF GLASS OF SIMILAR SIZE. AFTER 300 DAYS, 30 AND 20 ANIMALS WERE STILL ALIVE IN THE TWO GROUPS...ALL SURVIVING RATS WERE KILLED 800 DAYS AFTER IMPLANTATION. ONE SARCOMA AND ONE FIBROMA WERE FOUND AFTER 580 DAYS IN THE PVC-TREATED RATS, WHEREAS NO LOCAL TUMORS DEVELOPED IN THE CONTROL GROUP.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 409] **PEER REVIEWED**

RATS AND GUINEA-PIGS EXPOSED CONTINUOUSLY TO POLYVINYL CHLORIDE DUST FOR 24 HOURS/DAY FOR PERIODS VARYING FROM 2-7 MONTHS WERE FOUND TO HAVE EXTENSIVE LUNG DAMAGE.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] **PEER REVIEWED**

THE GROWTH OF GRANULATION TISSUE AROUND POLYVINYL CHLORIDE PARTICLES IMPLANTED INTO THE MUSCLES OF RABBITS HAS BEEN REPORTED.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] **PEER REVIEWED**

IN RATS, INHALATION OF FUMES FROM HEATED POLYVINYL CHLORIDE PRODUCED INTERSTITIAL EDEMA, AS WELL AS FOCAL BRONCHIAL AND INTRA-ALVEOLAR HEMORRHAGE IN THE LUNGS OF SOME ANIMALS.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] **PEER REVIEWED**

ENZYMATIC & PATHOMORPHOLOGIC ALTERATIONS IN RAT LUNGS WERE STUDIED AT

DIFFERENT TIME INTERVALS UP TO 180 DAYS AFTER A SINGLE INTRATRACHEAL ADMIN OF 25 MG OF POLYVINYL CHLORIDE DUST. ACTIVITIES OF 2 ENERGY-LINKED ENZYMES, SUCCINIC DEHYDROGENASE & ATPASE, & 3 LYSOSOMAL ENZYMES, ACID PHOSPHATASE, BETA-GLUCURONIDASE & RNASE, WERE SIGNIFICANTLY INCR IN THE EARLY PERIOD & THEN STARTED TO DECLINE. PULMONARY RESPONSE WAS IN THE FORM OF ACUTE INFLAMMATORY CHANGES DURING THE EARLY STAGES OF DUST BURDEN, FOLLOWED BY THE DEVELOPMENT OF GRANULOMATOUS LESIONS.

[AGARWAL DK ET AL; SOME BIOCHEMICAL AND HISTOPATHOLOGICAL CHANGES INDUCED BY POLYVINYL CHLORIDE DUST IN RAT LUNG; ENVIRON RES 16(1-3) 333 (1978)] **PEER REVIEWED**

WHEN 1 G SAMPLES OF 25 THERMOPLASTIC & THERMOSET POLYMERS WERE TESTED FOR THE TOXICITY OF THEIR PYROLYSIS PRODUCTS TO MICE, TIMES TO DEATH RANGED FROM 10.26 & 10.57 MIN FOR THE S-CONTAINING POLYMERS POLYETHER SULFONE & POLYPHENYLENE SULFIDE, TO 24.80 & 21.76 FOR THE CL-CONTAINING POLYMERS CHLORINATED POLYETHYLENE & CHLORINATED PVC. THE LATTER 2 POLYMERS SHOWED THE SHORTEST TIMES TO INCAPACITATION, 7.50 & 6.29 MIN, RESPECTIVELY. POLY(VINYL FLUORIDE), POLY(VINYLDENE FLUORIDE), & CHLORINATED PVC WERE AMONG THE MATERIALS WITH THE APPARENT HIGHEST LETHAL CONC.

[KOURTIDES DA ET AL; RELATIVE TOXICITY OF THE PYROLYSIS PRODUCTS FROM SOME THERMOPLASTIC AND THERMOSET POLYMERS; POLYM ENG SCI 18(8) 674 (1978)] **PEER REVIEWED**

THE TOXICITY OF THE THERMAL DECOMPOSITION PRODUCTS OF POLYVINYL CHLORIDE (PVC) PLASTIC WERE STUDIED & THEIR PULMONARY EFFECTS IN GUINEA PIGS EVALUATED. ADVERSE PULMONARY MECHANICAL EFFECTS IN LUNG FUNCTION WERE OBSERVED, WHILE LUNG BIOCHEMICAL PARAMETERS WERE RELATIVELY UNCHANGED.

[JAEGER RJ ET AL; THERMAL DECOMPOSITION PRODUCTS OF PVC PLASTICS: EFFECTS ON GUINEA PIG LUNG MECHANICS AND PULMONARY MIXED FUNCTION OXIDASE ACTIVITY; AM IND HYG ASSOC J 43(12) 900 (1982)] **PEER REVIEWED**

Metabolism/ Pharmacokinetics:

Absorption, Distribution & Excretion:

INGESTED AND RECTALLY ABSORBED PVC PARTICLES (5-100 UM) WERE FOUND TO BE TRANSPORTED BY BOTH THE LYMPHATIC AND THE PORTAL SYSTEM FROM THE INTESTINAL WALL OF RATS, GUINEA-PIGS, RABBITS, CHICKENS, DOGS AND PIGS.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 410] **PEER REVIEWED**

PARTICLES OF POLYVINYL CHLORIDE HAVE BEEN DETECTED IN SEDIMENTS OF BLOOD, BILE, URINE, AND CEREBROSPINAL FLUID FROM ANIMALS THAT HAD BEEN FED PARTICLES OF 5-110 UM.

[Clayton, G. D. and F. E. Clayton (eds.). Patty's Industrial Hygiene and Toxicology: Volume 2A, 2B, 2C: Toxicology. 3rd ed. New York: John Wiley Sons, 1981-1982., p. 4302] **PEER REVIEWED**

Environmental Fate & Exposure:

Probable Routes of Human Exposure:

EPIDEMIOLOGIC INVESTIGATIONS...IN...POLYVINYL PLANTS REVEAL THAT APPARENTLY ONLY THOSE WORKERS WHO CLEAN VATS WHERE POLYVINYL CHLORIDE IS MADE COME DOWN WITH.../ACROOSTEOLYSIS/.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 533] **PEER REVIEWED**

DURING POLYMERIZATION...INHALATION OF VINYL CHLORIDE MAY...BE HEALTH HAZARD. DUST COULD BE PROBLEM FOR EMPLOYEES FILLING SACKS WITH DRIED POLYMER.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

TOTAL OF 50 CASES /OCCUPATIONAL ACRO-OSTEOLYSIS/ HAVE...BEEN RECORDED, OF WHICH OVER 30 WERE FOUND IN USA; 1 STUDY SHOWED THAT LESS THAN 3% PVC POLYSCRAPERS PRESENT THIS SYNDROME. ... IN 1 SERIES OF CASES...AFFECTED WORKERS HAD OVER 12 MO POLYCLEANING EXPERIENCE.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 33] **PEER REVIEWED**

Environmental Fate:

ENVIRONMENTAL ACCUMULATION: IT HAS BEEN ESTIMATED THAT PRIOR TO 1975 MORE THAN 22.7 MILLION KG POLYVINYL CHLORIDE MAY HAVE BEEN DISCHARGED INTO THE ENVIRONMENT IN THE US. THESE LOSSES OCCURRED AS PARTICULATES IN AIR EMISSIONS, SUSPENDED SOLIDS IN WATER EFFLUENTS, AND COMPONENTS OF SOLID WASTES (US ENVIRONMENTAL PROTECTION AGENCY, 1974).

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 407] **PEER REVIEWED**

Environmental Standards & Regulations:

FDA Requirements:

THE US FOOD AND DRUG ADMINISTRATION PERMITS THE USE OF PVC AS A COMPONENT OF THE FOLLOWING PRODUCTS WHEN THEY ARE INTENDED FOR USE IN CONTACT WITH FOOD: (1) ADHESIVES; (2) RESINOUS AND POLYMERIC COATINGS; (3) PAPER AND PAPERBOARD (IN CONTACT WITH DRY FOOD ONLY); AND (4) SEMI-RIGID AND RIGID ACRYLIC AND MODIFIED ACRYLIC PLASTICS. THE AMOUNT PRESENT MAY NOT EXCEED THAT WHICH IS REASONABLY REQUIRED TO PRODUCE THE INTENDED EFFECT (USFDA, 1977).

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 407] **PEER REVIEWED**

Chemical/Physical Properties:

Molecular Formula:

(C2-H3-CL)X

PEER REVIEWED

Molecular Weight:

60,000-150,000

[U.S. Department of Health and Human Services, Public Health Service, Center for Disease Control, National Institute for Occupational Safety Health. Registry of Toxic Effects of Chemical Substances (RTECS). National Library of Medicine's current MEDLARS file., p. 83/8209] **PEER REVIEWED**

Color/Form:

WHITE THERMOPLASTIC SUBSTANCE

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

PLASTIC SOLID

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

UNMODIFIED, RIGID PVC IS TRANSPARENT, COLORLESS TO AMBER; PLASTICIZED (NONRIGID) PVC IS TRANSPARENT, COLORLESS TO AMBER

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

Odor:

ODORLESS

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

Density/Specific Gravity:

1.406

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

Solubilities:

HIGH MOL WT UNMODIFIED PVC SOL IN: CYCLOHEXANONE; METHYL CYCLOHEXANONE; DIMETHYL FORMAMIDE; NITROBENZENE; TETRAHYDROFURAN; ISOPHORONE; MESITYL OXIDE

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

LOW MOL WT PVC POLYMERS SOL IN: DIPROPYL KETONE; METHYL AMYL KETONE; METHYL ISOBUTYL KETONE; ACETONYLACETONE; METHYL ETHYL KETONE; DIOXANE; METHYLENE CHLORIDE

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

Other Chemical/Physical Properties:

DC RESISTIVITY: 1×10^{12} - 1×10^{16} OHM/CM; INDEX OF REFRACTION: 1.54 D; DIELECTRIC CONSTANT @ 60 CYCLES/SEC: 3.2-4.0; @ 1×10^{16} CYCLES/SEC: 3.0-4.0 /UNMODIFIED, RIGID PVC/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-787] **PEER REVIEWED**

DISSIPATION FACTOR @ 1×10^6 CYCLES/SEC: 0.006-0.02; @ 60 CYCLES/SEC: 0.01-0.02; YIELD STRAIN: 1.0-5.0%; MODULUS OF ELASTICITY @ 1×10^3 LB/SQ IN: 200-600; TENSILE STRENGTH: 5000-9000 LB/SQ IN; ULTIMATE ELONGATION: 2.0-40% /UNMODIFIED, RIGID PVC/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-787] **PEER REVIEWED**

NOTCHED IZOD IMPACT STRENGTH: 0.4-2.0 FT LB/IN; ROCKWELL HARDNESS: R110-R120; HEAT DISTORTION 264 LB/SQ IN: 60-80 DEG C; SPECIFIC HEAT: 0.2-0.28 CAL/G; LINEAR THERMAL EXPANSION COEFFICIENT, 1×10^{-5} ; 5.0-18 DEG C; MAX CONTINUOUS SERVICE TEMP: 70-74 DEG C; /UNMODIFIED, RIGID PVC/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-787] **PEER REVIEWED**

DC RESISTIVITY: 1×10^{11} - 1×10^{14} OHM/CM; DIELECTRIC CONSTANT @ 60 CYCLES/SEC: 5.0-9.0; DIELECTRIC CONSTANT @ 1×10^6 CYCLES/SEC: 3.0-4.0; DISSIPATION FACTOR @ 60 CYCLES/SEC: 0.03-0.05; DISSIPATION FACTOR @ 1×10^6 CYCLES/SEC: 0.06-0.1 /PLASTICIZED (NON RIGID) PVC/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-787] **PEER REVIEWED**

TENSILE STRENGTH: 1,500-3,000 LB/SQ IN; ULTIMATE ELONGATION: 200-400%; SPECIFIC GRAVITY: 1.15-1.35; SPECIFIC HEAT: 0.36-0.5 CAL/G; LINEAR THERMAL EXPANSION COEFFICIENT: 1×10^{-5} , 7.0-25 DEG C; MAX CONTINUOUS SERVICE TEMP: 80-105 DEG C; INDEX OF REFRACTION: 1.50-1.55/D /PLASTICIZED (NON RIGID) PVC/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-787] **PEER REVIEWED**

THERMOPLASTIC SUBSTANCE WITH HIGH RESISTANCE TO CHEMICALS; IT CAN WITHSTAND TEMPERATURES OF 65-80 DEG C VERY WELL; GOOD MECHANICAL & ELECTRICAL PROPERTIES

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

Chemical Safety & Handling:

Fire Potential:

FINISHED FOAM RESINS...BURN READILY... MOST FOAMED RESINS MELT WHEN THEY BURN & FIRE SPREAD IS ACCELERATED BY BURNING & DRIPPING OF FLAMING MELT. /FOAM RESINS/
 [International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

ALL FOAM RESINS ARE EXCELLENT THERMAL INSULATORS & RISK OF SPONTANEOUS IGNITION MAY ARISE IF FRESHLY MANUFACTURED MATERIAL IS NOT ALLOWED TO COOL THOROUGHLY BEFORE STACKING IN BULK. /FOAM RESINS/
 [International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

BURNING RATE FOR PLASTICIZED (NON RIGID) PVC IS SLOW TO SELF-EXTINGUISHING; UNMODIFIED, RIGID PVC, IS SELF-EXTINGUISHING. /FROM TABLE/
 [Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

Fire Fighting Procedures:

ONCE FIRE BECOMES ESTABLISHED IN STOCK OF FOAM RESIN OR RUBBER IT WILL DEVELOP RAPIDLY & APPLICATION OF LARGE QUANTITIES OF WATER AT EARLY STAGE IS NECESSARY TO EFFECT EXTINGUISHMENT. /FOAM RESINS/
 [International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

Toxic Combustion Products:

THERMAL DECOMPOSITION PRODUCTS /OF POLYVINYL CHLORIDE/ CAN INCLUDE ETHYLENE, BENZENE, TOLUENE, 1,3,5-TRICHLOROBENZENE, AND NAPHTHALENE.
 [IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 405] **PEER REVIEWED**

DURING THE PERIOD 1970-1975, 175 FIRE-FIGHTERS EXPERIENCED RESPIRATORY DISTRESS DUE TO THE TOXICITY OF HYDROGEN CHLORIDE GAS RELEASED FROM THE COMBUSTION OF POLYVINYL CHLORIDE PLASTICS. CARBON MONOXIDE, HYDROCHLORIC ACID AND PHOSGENE HAVE BEEN REPORTED AS THE MAJOR PVC PYROLYSIS PRODUCTS OF TOXICOLOGICAL IMPORTANCE, ALTHOUGH MORE THAN 75 COMPONENTS HAVE BEEN IDENTIFIED FOLLOWING THE THERMAL DEGRADATION OF PVC.

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 411] **PEER REVIEWED**

/AFTER ADDITION OF FIRE-RETARDANT ADDITIVES TO FOAM RESINS,/ IN PRESENCE OF FLAME

OR IN ESTABLISHED FIRE BURNING WILL CONTINUE & HALOGEN &/OR PHOSPHORUS COMPD RELEASED IN FIRE SMOKE HAVE DISADVANTAGE OF BEING IRRITANT & CORROSIVE.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

Explosive Limits & Potential:

DURING POLYMERIZATION...EXPLOSION HAZARD MAY EXIST...

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

Hazardous Decomposition:

WHEN HEATED TO DECOMP, IT EMITS HIGHLY TOXIC FUMES OF /HYDROGEN CHLORIDE AND PHOSGENE/.

[Lewis, R.J. Sax's Dangerous Properties of Industrial Materials. 9th ed. Volumes 1-3. New York, NY: Van Nostrand Reinhold, 1996., p. 2747] **PEER REVIEWED**

Protective Equipment & Clothing:

EMPLOYEES FILLING SACKS WITH DRIED POLYMER SHOULD WEAR RESPIRATORY PROTECTIVE EQUIPMENT.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1468] **PEER REVIEWED**

Preventive Measures:

OWING TO EXPLOSIVE HAZARD DURING POLYMERIZATION, TANKS SHOULD BE GUARDED BY WIRE NETTING. IT IS...ADVISABLE TO INSTALL REMOTE CONTROLS & TO PROVIDE ALARM SYSTEM IN PLANT TO DETECT ANY LEAKAGE OF VINYL CHLORIDE INTO WORKROOM AIR.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1468] **PEER REVIEWED**

ADEQUATE FIRE EXITS & ESCAPES SHOULD BE PROVIDED & ARRANGEMENTS SHOULD BE MADE FOR VENTING LARGE QUANTITIES OF SMOKE PRODUCED, PREFERABLY BY USE OF AUTOMATIC OR REMOTELY CONTROLLED EQUIPMENT. MEASURES SHOULD BE TAKEN TO LIMIT DRIPPING & FLOW OF BURNING MELT.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

Stability/Shelf Life:

STABILIZERS ARE NECESSARY TO PREVENT DISCOLORATION FROM EXPOSURE TO LIGHT OR HEAT

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

AT ORDINARY TEMPERATURES IT MAY UNDERGO SLOW DEHALOGENATION WITH EVOLUTION OF HYDROGEN CHLORIDE

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1136] **PEER REVIEWED**

Storage Conditions:

FOR THOSE...MATERIALS WHICH MAY PYROLYZE AT LOW TEMP, STORAGE & HANDLING CONDITIONS MUST ENSURE THAT TEMP OF MATERIAL IS MAINTAINED BELOW CRITICAL VALUE...

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1136] **PEER REVIEWED**

IT IS IMPORTANT TO ENSURE THAT STORAGE AREAS FOR FOAM RESINS ARE KEPT FREE OF PAPER OR TEXTILE WHICH COULD BE IGNITED BY SMOULDERING OBJECT & THEN ACT AS FUSE TO CARRY FIRE TO FOAM PRODUCT. /FOAM RESINS/

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

...INSTALLATION OF SPRINKLER SYSTEM IN WAREHOUSE USED FOR STORING FOAM RESINS IS ADVISABLE PRECAUTIONARY MEASURE BUT ABOVE-AVERAGE DENSITY OF SPRINKLER HEADS IS NECESSARY. /FOAM RESINS/

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

Disposal Methods:

SRP: At the time of review, criteria for land treatment or burial (sanitary landfill) disposal practices are subject to significant revision. Prior to implementing land disposal of waste residue (including waste sludge), consult with environmental regulatory agencies for guidance on acceptable disposal practices.

PEER REVIEWED

Incineration: Incineration, preferably after mixing with another combustible fuel. Care must be exercised to assure complete combustion to prevent the formation of phosgene. An acid scrubber is necessary to remove the halo acids produced.

[United Nations. Treatment and Disposal Methods for Waste Chemicals (IRPTC File). Data Profile Series No. 5. Geneva, Switzerland: United Nations Environmental Programme, Dec. 1985., p. 179] **QC REVIEWED**

Manufacturing/Use Information:

View products that contain this chemical: [POLYVINYL CHLORIDE](#)

Uses:

RUBBER SUBSTITUTES; PLIABLE THIN SHEETING; FILM FINISHES FOR TEXTILES; NONFLAMMABLE UPHOLSTERY; RAINCOATS; TUBING; BELTING; GASKETS; SHOE SOLES
[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

PIPING, PIPE FITTING & CONDUITS; FLOORING, WINDOWS, SIDINGS, & OTHER RIGID STRUCTURES; SWIMMING POOL LINERS; HOUSEHOLD PRODUCTS; CONSUMER GOODS; WIRE AND CABLE COATINGS; PACKAGING; UPHOLSTERY AND SEAT COVERS; AUTOMOBILE TOPS AND FLOOR MATS; RESIN IN THE CONSTRUCTION & BUILDING INDUSTRIES

[SRI] **PEER REVIEWED**

.../PVC/ TUBINGS ARE USED FOR MANY APPLICATIONS, SUCH AS PARTS OF ADMIN DEVICES, CATHETERS, PARTS OF DIALYSIS DEVICES & OTHER ITEMS REQUIRING CLEAR, FLEXIBLE TUBINGS.

[Doull, J., C.D. Klaassen, and M. D. Amdur (eds.). Casarett and Doull's Toxicology. 2nd ed. New York: Macmillan Publishing Co., 1980., p. 541] **PEER REVIEWED**

IF ROLLED INTO SHEETS, PLASTICIZED PVC MAY BE USED AS IMITATION LEATHER OR AS FLOOR COVERING. IT MAY...BE MOLDED INTO ELECTRIC INSULATORS, WATER PIPES, HANDLES & VARIOUS CONSUMER GOODS.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

Manufacturers:

AIR PRODUCTS AND CHEMS, INC, PLASTICS DIV, CALVERT CITY, KY, PENSACOLA, FLA

[SRI] **PEER REVIEWED**

ATLANTIC TUBING & RUBBER CO, CRANSTON, RI

[SRI] **PEER REVIEWED**

BORDEN INC, BORDEN CHEM DIV, THERMOPLASTIC PRODUCTS, ILLIOPOLIS, ILL, LEOMINSTER, MASS

[SRI] **PEER REVIEWED**

CERTAIN-TEED PRODUCTS CORP, LAKE CHARLES, LA

[SRI] **PEER REVIEWED**

CONTINENTAL OIL CO, CONOCO CHEMS DIV, ABERDEEN, MISS, OKLAHOMA CITY, OKLA

[SRI] **PEER REVIEWED**

DIAMOND SHAMROCK CORP, DIAMOND SHAMROCK CHEM CO, PLASTICS DIV, DEER PARK, TEX, DELAWARE CITY, DEL

[SRI] **PEER REVIEWED**

ETHYL CORP, BATON ROUGE, LA

[SRI] **PEER REVIEWED**

THE FIRESTONE TIRE & RUBBER CO, FIRESTONE PLASTICS CO, DIV, PERRYVILLE, MD,
POTTSTOWN, PA
[SRI] **PEER REVIEWED**

THE GENERAL TIRE & RUBBER CO, CHEMICAL/PLASTICS DIV, ASHTABULA, OHIO, POINT
PLEASANT, W VA
[SRI] **PEER REVIEWED**

GEORGIA PACIFIC CORP, CHEM DIV, PLAQUEMINE, LA
[SRI] **PEER REVIEWED**

THE B F GOODRICH CO, B F GOODRICH CHEM CO, DIV, AVON LAKE, OHIO, HENRY, ILL, LONG
BEACH, CALIF, LOUISVILLE, KY, DEDRICKTOWN, NJ
[SRI] **PEER REVIEWED**

THE GOODYEAR TIRE & RUBBER CO, CHEM DIV, NIAGARA FALLS, NY, PLAQUEMINE, LA
[SRI] **PEER REVIEWED**

GREAT AMERICAN CHEM CORP, FITCHBURG, MASS
[SRI] **PEER REVIEWED**

KEYSOR-CENTURY CORP, SAUGUS, CALIF
[SRI] **PEER REVIEWED**

NATIONAL STARCH & CHEM CORP, MEREDOSIA, ILL
[SRI] **PEER REVIEWED**

OCCIDENTAL PETROLEUM CORP, HOOKER CHEM CORP, SUBSID, RUCO, SUBSID, BURLINGTON,
NJ, HICKSVILLE, NY
[SRI] **PEER REVIEWED**

THE PANTASOTE CO OF NEW YORK, INC, ELEONORA CHEM DIV, PASSAIC, NJ, PT PLEASANT, W
VA
[SRI] **PEER REVIEWED**

RHODIA INC, BRAZOSPORT, TEX
[SRI] **PEER REVIEWED**

RICO CHEMS CORP, GUAYANILLA, PR
[SRI] **PEER REVIEWED**

ROBINTECH INC, PAINESVILLE, OHIO
[SRI] **PEER REVIEWED**

SHINTECH INC, FREEPORT, TEX
[SRI] **PEER REVIEWED**

STAUFFER CHEM CO, PLASTICS DIV, POLYMERS EAST, DELAWARE CITY, DEL, POLYMERS WEST,
CARSON, CALIF
[SRI] **PEER REVIEWED**

TENNECO INC, TENNECO CHEMS, INC, ORGANICS AND POYMERS DIV, BURLINGTON, NJ,
FLEMINGTON, NJ, PASADENA, TEX
[SRI] **PEER REVIEWED**

UNION CARBIDE CORP, CHEMS AND PLASTICS DIV, INSTITUTE AND SOUTH CHARLESTON, W
VA, TEXAS CITY, TEX

[SRI] **PEER REVIEWED**

CONOCO CHEMICALS, 15990 N. BARKER'S LANDING RD, PO BOX 19029, HOUSTON, TX 77224, (713)531-3200

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

DOW CHEMICAL (HQ), 2020 DOW CENTER, MIDLAND, MI 48640, (517)636-1000;

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

ICI AMERICAS, (HQ), WILMINGTON, DE 19897, (302)575-3000

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

MONOCHEM, GEISMAR, LA

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

PPG INDUSTRIES, PPG PLAZA, PITTSBURGH, PA 15272, (412)434-3131

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

SHELL CHEMICAL, PO BOX 3105, HOUSTON, TX 77002, (713)241-5105

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

FORMOSA, PO BOX 271, BATON ROUGE, LA 70821, (504)356-3341

[CHEMICAL PROFILE: VINYL CHLORIDE, 1981] **QC REVIEWED**

MILLIKEN & CO, MILLIKEN CHEMICALS CO, PO BOX 817, INMAN, SC 29349, (803)472-9041

[USITC. SYN ORG CHEM-U.S. PROD/SALES 1984 p.142] **QC REVIEWED**

VISTA POLYMERS, INC, 15990 N. BARKER'S LANDING RD, PO BOX 19029, HOUSTON, TX 77224, (713)531-3200

[USITC. SYN ORG CHEM-U.S. PROD/SALES 1984 p.142] **QC REVIEWED**

ASHLEY POLYMERS, INC, 5114 FORT HAMILTON PKWY, BROOKLYN, NY 11214, (718)851-8111

[CHEMICYCLOPEDIA 1985 p.242] **QC REVIEWED**

Methods of Manufacturing:

BAUMANN, ANN 163, 308 (1872); SCHOENFELD, US PATENT 2,168,808 (1937 TO BF GOODRICH CO).

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

PVC IS PRODUCED BY POLYMERIZATION OF VINYL CHLORIDE IN PRESENCE OF INITIATORS SUCH AS 0.1-0.5% BENZOYL PEROXIDE. POLYMERIZATION IS CARRIED OUT CONTINUOUSLY OR INTERMITTENTLY IN ROTATING AUTOCLAVES.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

...MANUFACTURED BY DISSOLVING BLOWING AGENT IN POLYMER MELT & DEPRESSURIZING.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

PVC IS PRODUCED BY POLYMERIZATION OF VINYL CHLORIDE. MASS OR BULK POLYMERIZATION PROCESS ADDS FREE-RADICAL INITIATORS INTO THE LIQUID VC MONOMER IN TWO-STAGE PROCESS. SUSPENSION POLYMERIZATION DISPERSES VC MONOMER FINELY IN WATER, THEN STARTS THE POLYMERIZATION BY MONOMER-SOLUBLE INITIATORS.

SUSPENSION POLYMERIZATION IS USED FOR AN ESTIMATED 82% OF US PRODUCTION
[KIRK-OTMHER CONDENSED ENCYC CHEM TECH 1985 p.1231] **QC REVIEWED**

General Manufacturing Information:

IF HEATED TO APPROX 160 DEG C, IT DISINTEGRATES WITH RELEASE OF HYDROGEN CHLORIDE.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

CHEM RESISTANCE OF PLASTICIZED (NON RIGID) PVC: TO WEAK MINERAL ACIDS IS FAIR TO GOOD; TO STRONG MINERAL ACIDS IS FAIR TO GOOD; TO CONCEN OXIDIZING ACIDS IS POOR TO FAIR; TO WEAK ALKALIES, FAIR TO GOOD; TO STRONG ALKALIES IS FAIR TO GOOD; TO ALCOHOLS IS FAIR; TO KETONES IS POOR; TO ESTERS IS POOR; TO ALIPHATIC HYDROCARBONS IS POOR; TO AROMATIC HYDROCARBONS IS POOR; TO VEGETABLE, ANIMAL & MINERAL OILS IS POOR

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

CHEM RESISTANCE OF UNMODIFIED (RIGID) PVC: TO WEAK MINERAL ACIDS IS EXCELLENT; TO STRONG MINERAL ACIDS IS GOOD TO EXCELLENT; TO CONCEN OXIDIZING ACIDS IS FAIR TO GOOD; TO STRONG ALKALIES IS GOOD; TO ALCOHOLS IS EXCELLENT; TO KETONES IS POOR; TO ESTERS IS POOR; TO ALIPHATIC HYDROCARBONS IS EXCELLENT; TO AROMATIC HYDROCARBONS IS POOR; TO VEGETABLE, ANIMAL, MINERAL OILS IS EXCELLENT

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

FIRE HAZARD OF FOAM RESINS CAN BE REDUCED TO CERTAIN DEGREE BY INCORPORATING FIRE-RETARDANT ADDITIVES SUCH AS HALOGEN &/OR PHOSPHORUS COMPD INTO POLYMER. /FOAM RESINS/

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 562] **PEER REVIEWED**

UNMODIFIED, RIGID POLYVINYL CHLORIDE IS FABRICATED BY CALENDERING; CASTING, EXTRUSION, HOT FORMING OR DRAWING; IMPREGNATION; BLOW MOLDING; COMPRESSION MOLDING; INJECTION MOLDING; SPREADING. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

PLASTICIZED (NON RIGID) POLYVINYL CHLORIDE IS FABRICATED BY: CALENDERING; CASTING; EXTRUSION; BLOW MOLDING; COMPRESSION MOLDING; INJECTION MOLDING; SPREADING. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

FURTHER CHLORINATION OF PVC IN TETRACHLOROETHANE MEDIUM FORMS PRODUCT WHICH IS PRECIPITATED BY ADDITION OF EQUAL VOL OF METHYL ALCOHOL. AFTER DRYING, POWDER...OBTAINED...IS USED IN MFR OF FILMS OR SYNTHETIC FIBERS.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

AFTER IMMERSION IN ACETONE & CARBON DISULFIDE.../POWDER OBTAINED FROM FURTHER CHLORINATION OF PVC/ MAY BE SPUN & USED AS TEXTILE YARN.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

Formulations/Preparations:

PLASTICIZED (NON-RIGID) IS AVAILABLE AS FILM; LAMINATIONS; POWDER, PELLET OR GRANULES; RODS, TUBES OR OTHER EXTRUDED FORMS; SHEETS. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

PROPERTIES OF COMMERCIAL PVC PRODUCTS CAN BE MODIFIED BY ADDITION OF STABILIZERS, PLASTICIZERS, FILLING AGENTS & PIGMENTS, AS WELL AS BY COPOLYMERIZATION WITH OTHER MONOMERS.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

UNMODIFIED, RIGID POLYVINYL CHLORIDE IS AVAILABLE AS FILM; FIBERS; IMPREGNANTS; LACQUERS, MONOFILAMENTS; POWDER; PELLETS OR GRANULES; RODS, TUBES, OR OTHER EXTRUDED FORMS; SHEETS. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

...MARKETED UNDER NAMES RHOVYL, FIBRAVYL, THERMOVYL, ISOVYL.

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

BASIC GENERAL-PURPOSE FLEXIBLE PVC FORMULATION (PARTS BY wt): PVC RESIN 100.0; DIOCTYL PHTHALATE (PLASTICIZER) 30.0-80.0; EPOXIDIZED SOYBEAN OIL (PLASTICIZER PROCESSING AID) 5.0; BARIUM-CADMIUM (STABILIZER) 3.0; CALCIUM CARBONATE (FILLER) <30.0; STEARIC ACID (LUBRICANT) 0.5; PIGMENT < 3.0/FROM TABLE/

[KIRK-OTHMER CONDENSED ENCYC CHEM TECH 1985 p.1233] **QC REVIEWED**

Impurities:

ACETYLENE <2.0 ppm; ACIDITY, AS HCL BY wt <0.5 ppm; ALKALINITY, AS NaOH BY wt <0.3 ppm; BUTADIENE <6.0 ppm; 1-BUTENE <3.0 ppm; 2-BUTENE <0.5% ppm; ETHYLENE <4.0 ppm; ETHYLENE DICHLORIDE (EDC) <10.0 ppm; PROPYLENE <8.0 ppm; IRON, BY wt <0.25 ppm/IMPURITY LEVEL IN VINYL CHLORIDE/

[KIRK-OTHMER ENCYC CHEM TECH 3RD ED 1978-PRESENT V23 p.882] **QC REVIEWED**

SMALL AMOUNT OF UNPOLYMERIZED VINYL CHLORIDE

[GOSSELIN. CTCP 5TH ED 1984 p.II-413] **QC REVIEWED**

Consumption Patterns:

42% IN THE BUILDING & CONSTRUCTION INDUST (FOR PIPING, PIPE FITTINGS, CONDUITS, FLOORING, WINDOWS, SIDING, OTHER RIGID STRUCTURES, & SWIMMING POOL LINERS); 15%

IN HOUSEHOLD USES; 12% FOR CONSUMER GOODS; 11% FOR WIRE & CABLE COATINGS; 9% FOR PACKAGING; 6% FOR UPHOLSTERY & SEAT COVERS, AUTOMOBILE TOPS, & FLOOR MATS; 5% IN MISC APPLICATIONS (1972)

[SRI] **PEER REVIEWED**

53% FOR BUILDING & CONSTRUCTION; 11% FOR HOME FURNISHING, HOUSEWARES & APPAREL; 7% FOR PACKAGING; 7% FOR ELECTRICAL; 4% FOR RECREATION; 5% FOR TRANSPORTATION; 13% FOR MISCELLANEOUS & EXPORTS (1979) /POLYVINYL CHLORIDE RESINS/

[CHEMICAL PRODUCTS SYNOPSIS: VINYL CHLORIDE, 1980] **QC REVIEWED**

CHEMICAL PROFILE: Polyvinyl Chloride. Rigid pipe and tubing, including molded fittings, 41%; flooring, textile and other calendaring uses, 10%; siding and accessories, 8%; coatings and paste processes, 6%; wire and cable, 5%; film and sheet, 5%; other extrusions, 6%; exports, 6%; bottles, 3%; other molding uses, 2%; all other, 8%.

[Kavalier AR; Chemical Marketing Reporter 235 (23): 27 (1989)] **QC REVIEWED**

CHEMICAL PROFILE: Polyvinyl chloride. Demand: 1988: 8,350 million lb; 1989: 8,500 million lb; 1993 /projected/: 9,700 million lb. (Includes exports, but not imports, which totaled 113 million lb last year.)

[Kavalier AR; Chemical Marketing Reporter 235 (23): 27 (1989)] **QC REVIEWED**

U. S. Production:

(1972) 1.96X10+12 GRAMS

[SRI] **PEER REVIEWED**

(1984) 3.10X10+12 g

[USITC. SYN ORG CHEM-U.S. PROD/SALES 1984 p.136] **QC REVIEWED**

U. S. Imports:

(1972) NEGLIGIBLE

[SRI] **PEER REVIEWED**

(1986) No Data

QC REVIEWED

U. S. Exports:

(1972) 6.9X10+10 GRAMS

[SRI] **PEER REVIEWED**

(1984) 1.48X10+11 g/FOR BOTH UNCOMPOUNDED & COMPOUNDED POLYVINYL CHLORIDE & COPOLYMER RESINS/

[BUREAU OF THE CENSUS. U.S. EXPORTS, SCHEDULE E, 1984 p.2-122] **QC REVIEWED**

Laboratory Methods:

Analytic Laboratory Methods:

A RAPID AND SIMPLE WAY OF IDENTIFYING FIFTEEN PACKAGING FILMS, INCLUDING PVC, HAS BEEN DESCRIBED IN WHICH THE FILMS WERE TREATED WITH TEN DIFFERENT SOLVENTS AND THE SOLUBILITY AND PHYSICAL APPEARANCE OF THE FILM AT ROOM TEMPERATURE AND AT THE BOILING-POINTS OF THE SOLVENTS WERE NOTED. VAN GIESON P; PACKAGE ENG 14: 76 (1969).

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 408] **PEER REVIEWED**

PLASTICS, INCLUDING PVC, HAVE BEEN IDENTIFIED BY MEASUREMENT OF THE PH OF AN AQUEOUS SOLUTION OF THE PYROLYSIS PRODUCTS, FOLLOWED BY THIN-LAYER CHROMATOGRAPHY, AND BY REACTION OF PVC WITH PYRIDINE. BRAUN D, NIXDORF G; KUNSTSTOFFE 62: 187 (1972).

[IARC. Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans. Geneva: World Health Organization, International Agency for Research on Cancer, 1972-PRESENT. (Multivolume work). Available at: <http://monographs.iarc.fr/ENG/Classification/index.php> p. V19 408] **PEER REVIEWED**

A SIMPLE, FAST & ACCURATE CHROMATOGRAPHIC METHOD WAS ESTABLISHED FOR THE QUANTITATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN SMOKE PARTICULATES OBTAINED FROM PYROLYSIS & COMBUSTION OF POLY(VINYL CHLORIDE) UNDER SIMULATED FIRE CONDITIONS.

[LIAO JC, BROWNER RF; DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS IN POLY(VINYL CHLORIDE) SMOKE PARTICULATES BY HIGH PRESSURE LIQUID CHROMATOGRAPHY AND GAS CHROMATOGRAPHY-MASS SPECTROMETRY; ANAL CHEM 50(12) 1683 (1978)] **PEER REVIEWED**

Synonyms and Identifiers:

Synonyms:

L 5

PEER REVIEWED

U 1

PEER REVIEWED

ARMODOUR

PEER REVIEWED

BAKELITE

PEER REVIEWED

BOLTARON

PEER REVIEWED

CARINA

PEER REVIEWED

CHLOROETHYLENE POLYMER

PEER REVIEWED

CORVIC 55/9

PEER REVIEWED

DACOVIN

PEER REVIEWED

DARVIC 110

PEER REVIEWED

DYNADUR

PEER REVIEWED

EKAVYL SD 2

PEER REVIEWED

ETHYLENE, CHLORO-POLYMER

PEER REVIEWED

EXON 605

PEER REVIEWED

FC 4648

PEER REVIEWED

FLOCOR

PEER REVIEWED

GENOTHERM

PEER REVIEWED

GEON 51

PEER REVIEWED

HALVIC 223

PEER REVIEWED

HOSTALIT

PEER REVIEWED

KAYLITE

PEER REVIEWED

KOROSEAL

PEER REVIEWED

LUCOFLEX

PEER REVIEWED

LUCOVYL PE

PEER REVIEWED

MARVINOL

PEER REVIEWED

MYRAFORM

PEER REVIEWED

NCI-C60797

PEER REVIEWED

NIPOLIT SK

PEER REVIEWED

NORVINYL

PEER REVIEWED

OPALON

PEER REVIEWED

PEVIKON D 61

PEER REVIEWED

PLIOVIC S 50

PEER REVIEWED

POK 60

PEER REVIEWED

POLYVINYLCHLORID (GERMAN)

PEER REVIEWED

PVC

PEER REVIEWED

QSAH 7

PEER REVIEWED

QUIRVIL

PEER REVIEWED

RAVINYL R 100/65 D

PEER REVIEWED

RUCON B 20

PEER REVIEWED

SCON 5300

PEER REVIEWED

SICRON

PEER REVIEWED

SOLVIC 223

PEER REVIEWED

SUMILIT EXA 13

PEER REVIEWED

TS 1100

PEER REVIEWED

VESTOLIT GH

PEER REVIEWED

VINNOL Y

PEER REVIEWED

VINOFLEX

PEER REVIEWED

VINYLITE QYJV

PEER REVIEWED

VIPLAST RA/F

PEER REVIEWED

VYGEN 85

PEER REVIEWED

Formulations/Preparations:

PLASTICIZED (NON-RIGID) IS AVAILABLE AS FILM; LAMINATIONS; POWDER, PELLET OR GRANULES; RODS, TUBES OR OTHER EXTRUDED FORMS; SHEETS. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

PROPERTIES OF COMMERCIAL PVC PRODUCTS CAN BE MODIFIED BY ADDITION OF STABILIZERS, PLASTICIZERS, FILLING AGENTS & PIGMENTS, AS WELL AS BY COPOLYMERIZATION WITH OTHER MONOMERS.

[International Labour Office. Encyclopedia of Occupational Health and Safety. Volumes I and II. New York: McGraw-Hill Book Co., 1971., p. 1467] **PEER REVIEWED**

UNMODIFIED, RIGID POLYVINYL CHLORIDE IS AVAILABLE AS FILM; FIBERS; IMPREGNANTS; LACQUERS, MONOFILAMENTS; POWDER; PELLETS OR GRANULES; RODS, TUBES, OR OTHER EXTRUDED FORMS; SHEETS. /FROM TABLE/

[Weast, R.C. (ed.). Handbook of Chemistry and Physics. 60th ed. Boca Raton, Florida: CRC Press Inc., 1979., p. C-786] **PEER REVIEWED**

...MARKETED UNDER NAMES RHOVYL, FIBRAVYL, THERMOVYL, ISOVYL.

[The Merck Index. 9th ed. Rahway, New Jersey: Merck & Co., Inc., 1976., p. 986] **PEER REVIEWED**

BASIC GENERAL-PURPOSE FLEXIBLE PVC FORMULATION (PARTS BY wt): PVC RESIN 100.0; DIOCTYL PHTHALATE (PLASTICIZER) 30.0-80.0; EPOXIDIZED SOYBEAN OIL (PLASTICIZER PROCESSING AID) 5.0; BARIUM-CADMIUM (STABILIZER) 3.0; CALCIUM CARBONATE (FILLER) <30.0; STEARIC ACID (LUBRICANT) 0.5; PIGMENT < 3.0/FROM TABLE/

[KIRK-OTHMER CONDENSED ENCYC CHEM TECH 1985 p.1233] **QC REVIEWED**

Administrative Information:

Hazardous Substances Databank Number:

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Last Revision Date:

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