

TO: Distribution Listed

FROM: J. D. Tanzilli

September 27, 1984

GEON® VINYL SAFETY DATA BULLETIN

Our present safety data bulletin for Geon® vinyls was published in 1980, and republished with minor revisions in January, 1981. As almost four years have passed, it is time to revise this document (i.e., Bulletin G-62, "Material Safety Data, Geon® Vinyl Resins and Compounds").

It has been reported that some customers are confused by Bulletin G-62, which combines resin and compound information into a single document. To eliminate confusion, I am proposing separate documents for resin and compound.

Enclosed are draft copies for the new bulletins. I would appreciate your help by reviewing them and offering comments as you deem appropriate. So the project can move along with minimal delay, please return any comments to me by October 15. At that time, final drafts will be prepared for review/approval.

Thank you for your help with this project.



James D. Tanzilli

JDT/jb/VS0184M

Enc.

Distribution

N. R. Aquino
W. C. Bachtel/T. S. Bialke
J. A. Baclawski
W. C. Becker
F. C. DeWolf
J. F. George
M. N. Johnson/R. K. Hinderer
R. C. Kaminski
D. P. Knechtges
F. E. Krause

P.F.V. Lloyd
R. S. Mather
A. J. Olson/G. A. Jones
M. M. O'Mara
D. E. Stroud
J. W. Summers/G. A. Small
M. Tawney
J. S. Trapp/R. M. Rosenau
J. L. Urbancic
H. Waltemate/L. A. Clark

25265001

BFG50417

(1)

Need resin definition to enable a neophyte to differentiate from a compound. Start out by describing mfg chain
DRAFT - 9/25/84 to produce a PVC compound.

ABOUT THIS BULLETIN

The data in this bulletin apply to all Geon® vinyl compounds, except polyblends (blend of polyvinyl chloride and nitrile rubber). Geon® vinyl compounds are a mixture of homopolymer polyvinyl chloride resin* with a variety of functional additives such as processing aid, heat stabilizer, plasticizer, lubricant, modifiers, pigments and/or other ingredients. Compounds may be prepared as either ~~cubical granules or~~ free-flowing powders, *cubical granules or pellets.*

Although the properties of ^{PVC} ~~various~~ compounds may ^{VARIOUS} vary greatly in terms of physical properties and other characteristics, safety and handling characteristics are similar for all compounds. Please note: ^{polycarbonate or} granular vinyl compounds do not represent any inhalation hazard because of their physical form. However, fine particle size additives in powder compounds may result in airborne dust concentrations. Additional precautions, primarily respiratory protection, may be necessary when handling powder compound.

The data in this bulletin does not include information on the suitability of vinyl compound for any particular application nor does it discuss any precautions that may apply to specific end products.

Moreover, this bulletin cannot cover all possible ~~individual~~ situations. All aspects of ^{each specific} individual operation should be examined to determine if, or where, precautions, in addition to those described herein, are required. All health hazard and safety information contained herein, should be provided to your employees or customers. BFGoodrich must rely on the user to utilize the information we have supplied to develop work practice guidelines and employee instructional programs for the ^{SPECIFIC} individual operation.

For material safety data information specifically related to Geon® vinyl resins, please read BFGoodrich Bulletin G-62 RES. For information about Geon® vinyl polyblend compounds, please read BFGoodrich Bulletin G-62 PLBD.

SPECIAL NOTE: Vinyl chloride and polyvinyl chloride (PVC) are not the same material. Vinyl chloride is a flammable gas that is strictly regulated by DOT, EPA and OSHA. Through a chemical reaction, this gas -- known as a monomer -- is converted to a non-hazardous white granular powder called polyvinyl chloride resin, PVC or simply, vinyl. PVC is not a cancer suspect agent. Moreover, the reaction is not reversible. That is, thermal processing or decomposition will not cause PVC to revert back to vinyl chloride monomer.

* Resin definition

BFG50418

26265002

SECTION I

<u>Manufacturer's Name</u> The BFGoodrich Company Chemical Group	<u>Telephone Number</u> (216) 447-6000	<u>Transportation Emergency Telephone</u> CHEMTREC: (800) 424-9300
<u>Address</u> 6100 Oak Tree Blvd. Cleveland, Ohio 44131	<u>Chemical Family</u> PVC resin: Ethene, chloro-, homo- polymer	<u>Trademark</u> Geon® Vinyl
<u>Chemical Name/Synonyms</u> Poly(vinyl chloride) compound, PVC, vinyl. <i>pvc compound</i>	<u>CAS Number</u> Not applicable to mixtures. CAS number for PVC resin: 9002-86-2	<u>Formula</u> PVC resin: (CH ₂ CHCl) _n

SECTION II - HAZARDOUS INGREDIENTS

- Geon® vinyl compounds are not hazardous materials under current provisions of the Occupational Safety and Health Administration's (OSHA) final rule for hazard communication (29CFR 1910.1200).
- Vinyl resins^{an ingredient} used in^{pvc} compound, contains a very small amount of residual vinyl chloride monomer (CAS Registry number: 75-01-4), a carcinogen. Today there is virtually no employee exposure to vinyl chloride above the permissible limit set by OSHA when handling or processing Geon® vinyl compound. Extensive product and process improvements have resulted in the reduction of residual monomer to average levels less than 1-5 parts per million (ppm) in the resins used to manufacture Geon® vinyl compounds. (Please read Appendix 1 for workplace exposure limits.)
- The sum total of all ingredients present in a compound will emit vapors and odors during processing. The visible fumes that occur during normal processing are mainly water vapor. Trace amounts of hydrogen chloride -- an irritant -- are possible if there is any hangup or stagnation of compound in processing equipment. Vapors from non-PVC components are principally trace amounts of volatiles from stabilizers, plasticizers, lubricants, etc. Some people may be hypersensitive to fumes from compounding ingredients. To better protect your health, always conduct any operation emitting fumes or vapors under well-ventilated conditions. *individuals*
- Solvent, Heavy Metals, Organics
No organic solvents, ~~and~~ ^{however} lead, mercury, other heavy metals or heavy metal compounds are used in the manufacture of Geon® vinyl resins.) Functional additives are mixed with vinyl resin to create vinyl compounds. These may include:

26265003

BFG50419

- by weight*
- Heavy metal stabilizers generally in amounts less than 5%. These may include organometallics such as tin, lead, cadmium, barium and zinc and metallic salts such as basic lead carbonate and basic lead sulfate.
 - Polymeric, monomeric or mixed ester plasticizer in amounts generally between 20%-50% in plasticized compound. These materials are volatile when heated, and will contribute to the sum total of the vapors released during processing.
 - Commonly available pigments based on lead, iron oxide, carbon black, chromium, ultramarines, titanium dioxide, ~~Mercuriums~~ phthalocyanines, molybdates, quinacridones and other organic or inorganic materials.

Please read Appendix 2 for more information about additives used in vinyl compound. Please also read Table 1.

or pellets
Please note: In granular compound, functional additives are bound-up in our the manufacturing process and are not expected to create any hazard in handling or processing. With powder compound, because of possible dust, respiratory protection may be required. (Please read Section VIII, Respiratory Protection.)

SECTION III - PHYSICAL DATA (Typical data, not specifications)

Solubility in Water
Slight

Specific Gravity
See product data sheet.

Particle Size

Cubes measuring approximately 3/16-inch per side; *or pellets?* or powder. Particle size of powder compound varies due to compounding ingredients.

Appearance and odor

Pigmented or unpigmented cubical granules, *or pellets,* or powder. Practically odorless or bland odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Ignition Characteristics (ASTM D-1929)

Rigid vinyl (no plasticizer) compound has a flash-ignition temperature of about 391°C (735°F) and a self-ignition temperature of about 454°C (850°F). When plasticizer is added, ignition temperatures decrease. At a 30% plasticizer content, the flash-ignition temperature will be about 321°C (610°F) and the self-ignition temperature will be about 435°C (815°F). Most vinyl compound (i.e., rigid compound and compound with less than about 35% plasticizer) by itself will not support combustion. Vinyl compound can be forced to burn by continuous application of intense heat. Like all combustible materials, protect from open flame and maintain proper clearance when using portable heat devices, etc. Safely store flammable liquids away from vinyl ~~resins~~ compounds.

Safely

BFG50420

26265001

Flash Ignition Temperature: The lowest initial temperature of air passing around the specimen at which sufficient combustible gas is evolved to be ignited by a small external pilot flame.

Self-Ignition Temperature: The lowest initial temperature of air passing around the specimen at which, in the absence of an ignition source, ignition occurs of itself, as indicated by an explosion, flame or sustained glow.

Extinguishing Media

Water is most effective for large and small fires. ABC dry chemical, AFFF, and protein type air foams are also effective for small fires. Geon® vinyls would be considered "ordinary combustibles" (NFPA defined Class A). Carbon dioxide is not generally recommended for use on Class A fires as a lack of cooling capacity may result in reignition.

Special Fire Fighting Procedure

Wear positive pressure, self-contained breathing apparatus (SCBA). Personnel not having suitable respiratory protection must leave the area to prevent significant exposure to toxic combustion gases from any source. Wear SCBA during overhaul as well as attack phase of firefighting operations.

Combustion Products

When forced to burn, the primary combustion gases from vinyl compound will be hydrogen chloride, carbon monoxide and carbon dioxide. Other gases will include small amounts of benzene and aromatic and aliphatic hydrocarbons. Plasticized compounds will also contribute aliphatic olefins.

The combustion products of vinyl, like those from most other natural and synthetic materials, must be considered toxic. Like most conventional materials including wood, paper and cotton, the major hazard is carbon monoxide. Carbon monoxide acts as an asphyxiant while hydrogen chloride is highly irritating. When burned, vinyl will have a detectable, pungent odor.

Contrary to some published statements, chlorine is not a combustion gas of vinyl. Moreover, definitive work at the National Bureau of Standards detected only insignificant amounts -- less than 1.5 ppm -- of phosgene in combustion gases of vinyl.

Unusual Fire and Explosion Hazards

- Corrosive fumes. Hydrogen chloride from burning or decomposing vinyl has a highly corrosive effect on many metals. Affected equipment surfaces and unprotected structural elements of buildings should be washed to remove corrosive deposits as soon as possible after depositions have occurred.
- Dust explosion hazard. Granular ^{or pelletized} compound does not represent any explosion risk because of its large particle size. Powder compound may have increased dust explosion potential because of fine particle size fillers and additives or liquids added to vinyl resin. Vinyl resin by itself does not represent a significant explosion risk.

26265005

BFG50421

Because of the wide variety of possible ingredient combinations, operations using plasticized or unplasticized powder compounds should be evaluated as the individual need exists.

For plasticized powder compound, the NFPA reports the following for a PVC (67%)/DOP (33%) mixture:*

Explosibility index	2.9 (Strong)
Ignition sensitivity	3.6 (Strong)
Explosion severity	0.8 (Moderate)
Ignition temp., dust cloud	320°C (608°F)

*NFPA 654-1975, "Prevention of Dust Explosions in the Plastics Industry."

For powder compound (plasticized powder compound in particular), implement precautions to control or eliminate likely sources of ignition, such as static build-up. Maintain good housekeeping, notably, ventilation, to prevent accumulation of potentially explosive dust concentrations. Properly maintain and operate dust control devices.

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value

None established.

Effects of Overexposure

- Inhalation of decomposition or combustion products, especially hydrogen chloride, will cause irritation of the respiratory tract, eyes and skin. Depending on the severity of exposure, physiological response to the inhalation of hydrogen chloride will be coughing, pain, inflammation, edema, and desquamation in the upper respiratory tract. Individuals with bronchial asthma and other types of chronic obstructive respiratory diseases may develop bronchospasm if exposure is prolonged.
- At normal processing temperatures, vinyl compound may emit vapors that are irritating to the respiratory tract, eyes or skin of some sensitive people. This depends upon the ^{techniques used in} method of processing (~~high~~ temperatures), volume processed and most importantly, the effectiveness of ~~exhaust~~ ^{hypersensitive} ventilation provided to the process.

Emergency and First Aid Procedure

If irritation persists remove affected individual from the area. Call a physician. Provide protection before re-entry.

Toxicology Overview

? compounds Is there info on PVC compounds?
Geon® vinyl (resins) have been evaluated by studies involving the intracutaneous (skin) and intramuscular injection in rabbits, ^{thorough} studies involving dietary administration (i.e., injection) to rats for nearly the lifetime of the animals, and by numerous human patch tests using panels of 50 or more people. No significant reactions, skin irritation, sensitization, or other deleterious effects have been observed in these studies. These studies have shown that PVC resin is relatively inert. Detailed studies have not been performed on ^{each} of the many PVC compounds. Some formulations may contain ^{functional} ingredients which are toxic (see Section II) In general, PVC compound formulation should be treated

? FDA ~~same~~ ^{not} ~~use~~ ^{use} ~~consult~~ ^{consult} specific product

26265006

BFG50422

+ plasticized
Dust Exposure

Granular vinyl compounds do not represent any dust inhalation hazard because of their physical form.

Vinyl resin has little effect on the lungs and is not known to cause any disease when workplace exposures are controlled properly.

However, fine particle size additives in powder compounds may result in airborne dust concentrations. Breathing large amounts of any dust may result in a physical irritation of the nose or lungs and cause a physical blocking of the small airways in the lungs. Routine inhalation of dust of any kind should be avoided. Exercise care when dumping bags, sweeping, mixing or doing other tasks which can create dust in your workplace. Where large amounts of any dust unavoidably occur, respiratory protection against nuisance dust may be necessary.

SECTION VI - REACTIVITY

Stability

Stable

Hazardous Polymerization

Will not occur

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide, hydrogen chloride and small amounts of benzene and aromatic and aliphatic hydrocarbons. Plasticized compounds will also contribute aliphatic olefins.

Incompatibility (materials to avoid)

Avoid contact with acetal or acetal copolymers and with amine containing materials during processing. At processing conditions these materials are mutually destructive and involve rapid degradation. Thoroughly purge and mechanically clean processing equipment to avoid even trace quantities of these materials from coming in contact with each other. Prevent cross contamination of feedstocks.

SECTION VII - SPILL OR LEAK PROCEDURE

Steps to be taken in case material is released or spilled

Vacuum or sweep into a closed container for reuse or disposal. Store in a safe location. Use care to avoid dust generation.

Waste Disposal Method

Dispose of waste in a licensed landfill or by incineration in accordance with federal, state and local regulations. For waste disposal purposes, vinyl compounds not defined or designated as hazardous by current provisions of the Federal Resource Conservation and Recovery Act (RCRA -- 40CFR261). If incinerated, be aware that corrosive hydrogen chloride is generated.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation

Provide efficient exhaust ventilation to draw dust and ^{/or} fumes away from workers to prevent routine inhalation. ~~Work areas to consider include compounding,~~ hot melt processing (extruding, molding, etc.), cutting, machining, regrinding, thermoforming, and other ^{process areas} operations involving heat sufficient to result in polymer breakdown. ^{is} ~~be~~ examined ^{to ensure adequate ventilation}

2626E007

BFG50423

Respiratory Protection

Not normally required.

- If overheating or clean-up results more smoke or fumes than can be adequately exhausted by the plant ventilation system, a NIOSH/MSHA-approved combination high-efficiency particulate filter with organic vapor cartridge can be used.
- OSHA 1910.1000(a) requires wearing an approved respirator or implementing appropriate engineering controls if airborne concentrations of dust particles exceed 15 mg/m^3 of total dust, or 5 mg/m^3 of respirable dust. Workplace exposures are easily maintained below these levels with proper industrial ventilation. If respirators are required, comply with OSHA 1910.134.
- Abnormal conditions such as equipment malfunction or use of improper equipment or procedures may cause decomposition, resulting in generation of HCl and other gases irritating to skin, eyes or respiratory tract. Employees involved in removing decomposing material should be provided with NIOSH/MSHA-approved respirators.

Protective Equipment

Not normally required. Wear protective gloves when handling hot material during processing. Safety glasses are recommended for all industrial workplaces.

SECTION IX - SPECIAL PRECAUTIONS

Normal Melt Processing. Always use vinyl compound under well-ventilated conditions and avoid continued or prolonged breathing of process vapors. At processing temperatures, the sum total of all ingredients present (e.g., vinyl resin, stabilizer, lubricant, pigment, etc.) may emit odors and vapors irritating to the skin, eyes or respiratory tract of certain individuals. For personal hygiene, wash thoroughly after handling product, especially before eating, smoking or using toilet facilities. Do not store or consume food in processing areas. Do not use processing equipment to heat food.

Clean-up following normal melt processing should be performed under well-ventilated conditions. Vinyl compounds may be held at process temperatures for a short time without significant decomposition. However, it should be recognized that these compounds are designed for continuous processing, and that exposure for excessive times to processing temperatures may result in decomposition, and generation of HCl and other gases irritating to the skin, eyes and respiratory tract. Equipment should not be shut down for extended time periods with compound in it, or decomposition and possible corrosion of unprotected metal may result. PVC compound should be purged from processing equipment prior to shut down using a compatible thermoplastic material as recommended.

Post-processing operations involving temperatures sufficient to generate smoke or fumes should always be conducted so as to avoid significant employee exposure. Provide local exhaust ventilation as the need exists.

Regrinding scrap for reprocessing or waste disposal normally results in generation of substantial heat. Cool regrind before placing it in containers. The excellent insulating quality of vinyl will prevent heat in the center of a container from escaping, potentially resulting in slow thermal decomposition of the material. This may not only render the product unsatisfactory for further processing but also result in fumes and vapors from all ingredients being released into the workplace atmosphere which can cause irritation of the respiratory tract, eyes and skin. (See Section V)

BFG50424

26265008

internal
Remove vinyl compound from walkways and floors to prevent slippery footing.

SPECIAL NOTE: Compound at or above normal processing temperature must never be allowed to accumulate in ^{thick} large masses, ~~or it~~ will begin to decompose internally, and to swell due to gassing. Gassing may cause a ^{thick} large mass to explode if its outside surface is hardened. ~~by sprinkling with water.~~ Molten waste should be collected as strands or flattened to 2 inches or less, and quenched in a drum of cold water provided for this purpose. Decomposing material should be removed to a well-ventilated area, preferably outdoors. Do not touch or attempt to wipe molten plastic from skin; it will stick to skin. Rapidly cool molten plastic on skin with water before attempting removal.

SECTION X - TRANSPORTATION

For domestic transportation purposes, vinyl compounds are not classified as hazardous by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations, 1983 Edition.

- DOT Proper Shipping Name: Not Applicable
- DOT Hazard Class: Not Applicable
- DOT Label: Not Applicable
- ~~UN/NA~~ Hazard No.: Not Applicable

- SPECIAL NOTE: Vinyl Chloride Warning Labels on Containers

residual VCM during
Based on modeling studies and actual measurements in warehousing, transporting and thermal processing, it is ^{judged} our judgment that Geon® vinyl compounds ^{containing} whenever they contain less than 8.5 ppm of residual vinyl chloride monomer will not trigger the 0.5 ppm "action level" established by OSHA and therefore do not require labeling. ~~Vinyl Prime, off-grade or scrap compounds will be labeled~~ with OSHA specified language if residual monomer level exceeds 8.5 ppm. (Please read Appendix 1.)

SECTION XI - HAZARD CODES

NFPA 704 (1980)¹

Health: 2
Flammability: 1
Reactivity: 1
Special: None

HMIS²

Health: 0
Flammability: 1
Reactivity: 1
Personal Protection: X (Wear safety glasses.
Wear gloves and/or dust
respirator when needed.)

- (1) National Fire Protection Association.
- (2) Hazardous Materials Identification System, National Paint and Coatings Association.

DISCLAIMER OF LIABILITY

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for ~~any~~ use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without warranty, express or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user.

26265009

BFG50425

APPENDIX 1 - VINYL CHLORIDE MONOMER (VCM)

Employee exposure to vinyl chloride monomer (CAS Registry number: 75-01-4) is regulated by OSHA Standard 1910.1017. The current regulation requires that no employee may be exposed to VCM concentrations greater than 1.0 ppm (part per million by volume) averaged over any eight-hour period or 5.0 ppm averaged over any period not exceeding 15 minutes. The action level is 0.5 ppm averaged over any eight-hour work day.

The regulation applies to the manufacture, ^{? Processing} ~~reaction~~, packaging, repackaging, storage, handling or use of vinyl chloride or polyvinyl chloride, but does not apply to the handling or use of fabricated products made of polyvinyl chloride. Typically, purchasers of vinyl compound are affected by this regulation. ^{unaffected?}
^{However, facility} ~~Moreover~~, the regulation requires a program of initial monitoring in each establishment to determine if there is any ^{employee} exposure without the use of respirators, (in excess of the action level). If monitoring does not find VCM above 0.5 ppm, no further action is necessary. Refer to OSHA regulations (including 1910.1017) for complete details. ^{initial}

WARNING LABELS RVCY

^{Is this true?} Monitoring of vinyl processing and fabricating plants and modeling studies show that the action level (0.5 ppm) is not exceeded when residual VCM is below 8.5 ppm in Geon® vinyl compound. Shipping containers for these compounds ~~are~~ ^{are} not ~~be~~ labeled by BFGoodrich unless a customer specifies otherwise. ^{GEON} Vinyl compound will be labeled if residual monomer exceeds 8.5 ppm. The federal regulation requires that the label say "Polyvinyl chloride contains vinyl chloride. (Vinyl chloride is a cancer suspect agent.)" ^{good}

^{which?} Polyvinyl chloride is not a cancer suspect agent. It is the small amount of unreacted ^{vinyl chloride} monomer that must be controlled, not the vinyl itself. ^{PVC compound itself.}

Although some containers may be labeled, this does not necessarily mean that employee exposure to VCM will exceed permissible exposure limits. Using "worst case" conditions, ^{see BFC} ~~our~~ studies show that more than 30 ppm of unreacted monomer in vinyl resin ^{are} needed to cause 0.5 ppm to be present in the workplace atmosphere as a result of thermal processing. ~~Good~~ Exhaust ventilation in those areas where VCM might concentrate -- such as where containers are stored and first opened, where materials are mixed and where compound is first melted -- will further ensure a work environment virtually free of VCM. ^{unusual}

APPENDIX 2 - FUNCTIONAL ADDITIVES USED IN PVC COMPOUND

Additives chosen for a specific compound ~~will~~ ^{ARE} vary according to processing and final product requirements. The following list does not represent all possible additives but it does represent typical ingredients which may be used in specific Geon® vinyl compounds.

^{once found} ~~It~~ is highly unlikely ^{appreciable levels of} ~~PVC~~ ^{PVC} will be released from a ~~compound~~ ^{compound} even at processing temperatures.

BFG50426

26265010

- specific methyl tin are w also FDA acceptable as well as Cal zinc.*
- inhibits thermal*

● Stabilizer. Stabilizer controls degradation of the ~~entire~~ compound during processing and throughout the service life of the product. Stabilizers may be grouped into four classes: *organometallic* organic tin stabilizers, lead salts, mixed metal salts and special-purpose stabilizers. The most common *organometallic* organic tin stabilizers are tin mercaptides, mainly methyl tin and butyl tin. *Several organometallic* One type of tin mercaptide, di-n-octyl, *is* FDA acceptable for food contact applications. Lead salts like dibasic lead phosphite, are mainly organic lead compounds and include sulfates, silicates, phosphates, stearates, phthalates and maleates. Mixed metal salts include calcium-zinc and barium-cadmium systems. Special-purpose stabilizers include flame retardants such as antimony derivatives and ultraviolet light absorbers. Stabilizer is typically present at less than 5% in PVC compound. *by wt.*
 - Processing aids. The most common processing aids used with PVC are acrylic polymers present at levels between 0-5.0% depending on processing method (i.e., extrusion, molding, etc.) *? SAN*
 - Impact modifiers. Common impact modifiers for PVC include acrylates, chlorinated polyethylene, methacrylate-butadiene-styrene (MBS), acrylonitrile-butadiene-styrene (ABS), and rubber. Although not present in all compounds, when used, impact modifier concentration may range between 0-14%. *16%*
 - Fillers. Most common are metal carbonates, mainly calcium carbonate, which is unusually in the form of ground limestone and coated with stearic acid. Other fillers may be silicates, gypsum, clay, alum and barytes. *(Talc)*
 - Plasticizer. Phthalate esters such as dioctyl phthalate are most common. Many kinds of plasticizer are available such as dihexyl and dibutyl phthalates, phosphate esters such as tricresyl phosphate, aliphatic alcohol esters such as dioctyl adipate, polymeric plasticizer such as adipic acid, and monomeric esters such as trimellitate.
 - Lubricants. Lubricants include paraffin waxes, mineral oils, polyethylene, and fatty acids, esters and amides. Lubricants would be present at about 2%, or less. *to approximately 2%*
 - Pigment. A list of common pigments appears in Section II. Most pigments are present at 0.5-5% to achieve opacity and color. In weatherable compounds, titanium dioxide may be present at concentrations up to 15% to achieve acceptable ultraviolet light screening. *performance on exposure to U.V. light.*

JDT/jb/VS0181M/27

2626E011

BFG50427

ABOUT THIS BULLETIN

The data in this bulletin ^{apply} ~~applies~~ to all Geon® vinyl resins. Our resins are white free-flowing powders manufactured by suspension, dispersion or mass polymerization processes. Although the properties of the various grades of vinyl resin may vary greatly in terms of molecular weight, particle size, porosity and other characteristics, safety and handling precautions are similar for all ^{Geon® PVC} resins.

Geon® vinyl resins are 100% polyvinyl chloride homopolymer or ^{Vinyl} copolymer. As such, they will ~~not~~ normally be used ~~alone, but~~ in combination with functional additives such as stabilizers, lubricants, pigments, etc. When combined with these other ingredients, the resultant product is commonly called a vinyl "compound." This bulletin does not apply to vinyl compounds. For material safety data information applicable to Geon® vinyl compounds, please read BFGoodrich Bulletin G-62 CMPD.

Moreover, the data in this bulletin does not include information on the suitability of vinyl resin for any particular application nor does it discuss any precautions that may apply to specific end products.

Specific This bulletin cannot cover all possible ~~individual~~ situations. ^{EACH} ~~ALL~~ aspects of ~~an~~ ^{each} ~~individual~~ operation should be examined to determine if, or where, precautions, in addition to those described herein, are required. All health hazard and safety information contained herein, should be provided to your employees or customers. BFGoodrich must rely on the user to utilize the information we have supplied to ~~develop~~ work practice guidelines and employee instructional programs for the ^{specific} ~~individual~~ operation.

SPECIAL NOTE: Vinyl chloride and polyvinyl chloride (PVC) are not the same material. Vinyl chloride is a flammable gas that is strictly regulated by DOT, EPA and OSHA. Through a chemical reaction, this gas -- known as a monomer -- is converted to a non-hazardous white granular powder called polyvinyl chloride, PVC, or simply, vinyl. PVC is not a cancer suspect agent. Moreover, the reaction is not reversible. That is, thermal processing or decomposition will not cause PVC to revert back to vinyl chloride monomer.

BFG50428

26265012

SECTION I

<u>Manufacturer's Name</u> The BFGoodrich Company Chemical Group	<u>Telephone Number</u> (216) 447-6000	<u>Transportation Emergency Telephone</u> CHEMTREC: (800) 424-9300
<u>Address</u> 6100 Oak Tree Blvd. Cleveland, Ohio 44131	<u>Chemical Family</u> Ethene, chloro-, homopolymer	<u>Trademark</u> Geon® Vinyl
<u>Chemical Name/Synonyms</u> Poly(vinyl chloride), PVC, vinyl.	<u>CAS Number</u> Homopolymer resin: 9002-86-2	<u>Formula</u> Homopolymer resin: $(CH_2CHCl)_n$

SPECIAL NOTE: Virtually all Geon® vinyl resins are polyvinyl chloride homopolymers. ^{the} We do manufacture a limited number of copolymer dispersion resins. The copolymers are polymerized with another monomer, a vinyl ester (Geon® 138) or carboxylic acid (Geon® 137). The CAS Registry Number and formula listed above do not apply to copolymer resins.

SECTION II - HAZARDOUS INGREDIENTS

- Geon® vinyl resins are not hazardous materials under current provisions of the Occupational Safety and Health Administration's (OSHA) final rule for hazard communication (29CFR 1910.1200).
- Vinyl resins contain a very small amount of residual vinyl chloride monomer (CAS Registry number: 75-01-4), a carcinogen. Today there is virtually no employee exposure to vinyl chloride above the permissible limit set by OSHA when handling or processing Geon® vinyl resins. Extensive product and process improvements have resulted in the reduction of residual monomer to average levels less than 1-5 parts per million (ppm) in most prime grades of Geon® vinyl resins. (Please read Appendix for workplace exposure limits.)
- Solvent, Heavy Metals
No organic solvents, and no lead, mercury, other heavy metals or heavy metal compounds are used in the manufacture of Geon® vinyl resins. (Please also read Table 1.)

? Trace amounts of heavy metals are ubiquitous

26265013

BFG50429

SECTION III - PHYSICAL DATA (Typical data, not specifications)

Inherent Viscosity

0.50 - 1.16

Specific Gravity

1.40

Particle Size, microns

Dispersion resin: 0.2-15

Blending resin: 25-130

Suspension resin: 70-150

Solubility in Water

Slight

Appearance and odor

White, free-flowing powder. Practically odorless or bland odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

in normal oxygen level environments
~~*at normal environments*~~

Ignition Characteristics (ASTM D-1929)

Vinyl resin has a flash-ignition temperature of about 391°C (735°F) and a self-ignition temperature of about 454°C (850°F). Vinyl resin by itself will not support combustion. Vinyl resins can be forced to burn by continuous application of intense heat. Like all combustible materials, protect from open flame and maintain proper clearance when using portable heat devices, etc. Safely store flammable liquids away from vinyl resins.

Flash Ignition Temperature: The lowest initial temperature of air passing around the specimen at which sufficient combustible gas is evolved to be ignited by a small external pilot flame.

Self-Ignition Temperature: The lowest initial temperature of air passing around the specimen at which, in the absence of an ignition source, ignition occurs of itself, as indicated by an explosion, flame or sustained glow.

Extinguishing Media

Water is most effective for large and small fires. ABC dry chemical, AFFF, and protein type air foams are also effective for small fires. Geon® vinyls would be considered "ordinary combustibles" (NFPA defined Class A). Carbon dioxide is not generally recommended for use on Class A fires as a lack of cooling capacity may result in reignition.

Special Fire Fighting Procedure

Wear positive pressure, self-contained breathing apparatus (SCBA). Personnel not having suitable respiratory protection must leave the area to prevent significant exposure to toxic combustion gases from any source. Wear SCBA during overhaul as well as attack phase of firefighting operations.

Combustion Products

When forced to burn, about 97% of the combustion gases from vinyl resin will be hydrogen chloride, carbon monoxide and carbon dioxide. Other gases will include small amounts of benzene and aromatic and aliphatic hydrocarbons.

BFG50430

26265014

vinyl is The combustion products of vinyl resin, like those from most other natural and synthetic materials, must be considered toxic. Like most conventional materials including wood, paper and cotton, the major hazard is carbon monoxide. Carbon monoxide acts as an asphyxiant while hydrogen chloride is highly irritating. When burned, ~~vinyl will have a detectable~~ pungent odor. *is detected.*

Contrary to some published statements, chlorine is not a combustion gas of vinyl resin. Moreover, definitive work at the National Bureau of Standards detected only insignificant amounts -- less than 1.5 ppm -- of phosgene in combustion gases of vinyl.

Unusual Fire and Explosion Hazards

- Corrosive fumes. Hydrogen chloride from burning or *degrading?* decomposing vinyl resin has a highly corrosive effect on many metals. Affected equipment surfaces and unprotected structural elements of buildings should be washed to remove corrosive deposits as soon as possible after depositions have occurred.
- Dust explosion hazard. Vinyl resins are not a significant explosion risk. The potential hazard has been evaluated using the Hartmann Vertical Tube Apparatus. Data has also been reported by the National Fire Protection Association (NFPA).

(1) In the Hartmann apparatus, Geon® vinyl resins representing fine particle size (2 Microns: Geon® 121), medium particle size (75 Microns: Geon® 140X31) and large particle size (130 Microns: Geon® 103EPF76) neither ignited nor exploded in a test range of 0.1-2.0 gm/liter using standard conditions of test. Fluidization becomes difficult at and above 2.0 gm/liter making it impractical to test at greater volumes.

(2) The NFPA shows "fine" particle size homopolymer PVC resin ^{to} have a low order of risk.*

Explosibility index < < 0.1 (Weak)
Ignition sensitivity < < 0.1 (Weak)
Explosion severity < 0.1 (Weak)
Ignition temp., dust cloud 660°C (1220°F)

*Source: NFPA 654-1975, "Prevention of Dust Explosions in the Plastics Industry." < < 0.1 means that ignition of the dust cloud is not obtained by a spark or flame source.

As a precaution, it is prudent to employ standard safety measures used in handling finely divided organic powders.

BFG50431

2626E015

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value

None established

Effects of Overexposure ^{degradation} ?

- Inhalation of ~~decomposition~~ or combustion products, especially hydrogen chloride, will cause irritation of the respiratory tract, eyes and skin. Depending on the severity of exposure, physiological response to the inhalation of hydrogen chloride will be coughing, pain, inflammation, edema, and desquamation in the upper respiratory tract. Individuals with bronchial asthma and other types of chronic obstructive respiratory diseases may develop bronchospasm if exposure is prolonged.
- At normal processing temperatures, vinyl resin ^{formulations which include} ~~plus the sum total of all other ingredients present~~ (e.g., stabilizer, lubricant, modifiers, etc.) may emit vapors that are irritating to the respiratory tract, eyes or skin of some sensitive people. This depends upon the ~~method of~~ processing ^(higher technique temperatures), volume processed and most importantly, the effectiveness of exhaust ventilation provided to the process area. ^{In general higher temperatures result in evolution of greater amounts of volatile vapors.}

Emergency and First Aid Procedure

If irritation persists remove affected individual from the area. Call a physician. Provide protection before re-entry.

Take appropriate precautionary measures before reentry.

Toxicology Overview

Geon® vinyl resins have been evaluated by studies involving the intracutaneous (skin) and intramuscular injection in rabbits, ^{thorough} studies involving dietary administration (i.e., injection) to rats for nearly the lifetime of the animals, and by numerous human patch tests using panels of 50 or more people. No significant reactions, skin irritation, sensitization, or other deleterious effects have been observed in these studies. These studies have shown that PVC resin is relatively inert.

Dust Exposure

Vinyl resin has little effect on the lungs and is not known to cause any disease when workplace exposures are controlled properly.

While there is no evidence of a substantial risk to health, a British study found a small decrease in breathing capacity for workers who smoked and were exposed to PVC dust. This decrease was about one-seventh of that caused by normal aging and about equal to that expected with a one-pack-a-day cigarette smoker. There was no significant decrease from inhalation of PVC dust by non-smokers.

Breathing large amounts of any dust may result in a physical irritation of the nose or lungs and cause a physical blocking of the small airways in the lungs. Routine inhalation of dust of any kind should be avoided. Exercise care when dumping bags, sweeping, mixing or doing other tasks which can create dust in your workplace. Where large amounts of any dust unavoidably occur, respiratory protection may be necessary. (See Section VIII, Respiratory Protection.)

BFG50432

26265016

SECTION VI - REACTIVITY

Stability

Stable

Hazardous Polymerization

Will not occur

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide, hydrogen chloride and small amounts of benzene and aromatic and aliphatic hydrocarbons.

Incompatibility (materials to avoid)

Avoid contact with acetal or acetal copolymers and with amine containing materials during processing. At processing conditions these materials are mutually destructive and involve rapid degradation. Thoroughly purge and mechanically clean processing equipment to avoid even trace quantities of these materials from coming in contact with each other. Prevent cross contamination of feedstocks.

SECTION VII - SPILL OR LEAK PROCEDURE

Steps to be taken in case material is released or spilled

Vacuum or sweep into a closed container for reuse or disposal. Store in a safe location. Use care to avoid dust generation.

Waste Disposal Method

Dispose of waste in a licensed landfill or by incineration in accordance with federal, state and local regulations. For waste disposal purposes, vinyl resins are not defined or designated as hazardous by current provisions of the Federal Resource Conservation and Recovery Act (RCRA -- 40CFR261). If incinerated, be aware that corrosive hydrogen chloride is generated.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation

Provide efficient exhaust ventilation to draw dust and fumes away from workers to prevent routine inhalation. ^{to} ~~Work areas to consider include~~ ^{for} Compounding, hot melt processing (extruding, molding, etc.), cutting, machining, regrinding, thermoforming, and other ^{area} operations involving heat sufficient to result in polymer breakdown ~~should be examined to ensure~~ ^{adequate ventilation.}

26265017

BFG50433

Respiratory Protection
Not normally required.

- OSHA 1910.1000(e) requires wearing an approved respirator or implementing appropriate engineering controls if airborne concentrations of dust particles exceed 15 mg/m³ of total dust, or 5 mg/m³ of respirable dust. Workplace exposures are easily maintained below these levels with proper industrial ventilation. If respirators are required, comply with OSHA 1910.134.

Health authorities recognize respirable dust to be particles 10 microns or smaller in size. Typical particle size for suspension and mass PVC resin is 130-150 microns; blending resin 25-130 microns. Dispersion resins have an average particle size below 5 microns.

- Abnormal conditions such as equipment malfunction or use of improper equipment or procedures may cause decomposition, resulting in generation of HCl and other gases irritating to skin, eyes or respiratory tract. Employees involved in removing decomposing material should be provided with NIOSH/MSHA-approved respirators.

Protective Equipment

Not normally required. Wear protective gloves when handling hot material during processing. Safety glasses are recommended for all industrial workplaces.

SECTION IX - SPECIAL PRECAUTIONS

Normal Melt Processing. Always use vinyl resins under well-ventilated conditions and avoid continued or prolonged breathing of process vapors. At processing temperatures, the sum total of all ingredients present (e.g., vinyl resin, stabilizer, lubricant, pigment, etc.) may emit odors and vapors irritating to the skin, eyes or respiratory tract of certain individuals. For personal hygiene, wash thoroughly after handling product, especially before eating, smoking or using toilet facilities. Do not store or consume food in processing areas. Do not use processing equipment to heat food.

Clean-up following normal melt processing should be performed under well-ventilated conditions. Vinyl compounds may be held at process temperatures for a short time without significant decomposition. However, it should be recognized that they are designed for continuous processing, and that exposure for excessive times to processing temperatures may result in decomposition, and generation of HCl and other gases irritating to the skin, eyes and respiratory tract. Equipment should not be shut down for extended time periods with compound in it, or decomposition and possible corrosion of unprotected metal may result. PVC formulations

should be purged from processing equipment prior to shut down using compatible thermoplastic material as required.

all formulations based upon PVC resin

26265018

BFG50434

Exposure to either elevated temperature or excessive heat history (time)

Post-processing operations involving temperatures sufficient to generate smoke or fumes should always be conducted so as to avoid significant employee exposure. Provide local exhaust ventilation as the need exists.

friction
Regrinding scrap for ^{reprocessing} reextrusion or waste disposal ^{normally generates} generally results in substantial heat. Cool regrind before placing it in containers. The excellent insulating quality of vinyl will prevent heat in the center of a container from escaping, potentially resulting in slow thermal decomposition of the material. This may not only render the product unsatisfactory for further processing but also result in fumes and vapors from all ingredients being released into the workplace atmosphere, ~~which can cause irritation of the respiratory tract, eyes and skin.~~ (See Section V)

Remove vinyl resin from walkways and floors to prevent slippery footing.

Compounding vinyl resin. Many of the common compounding ingredients ^{which are mixed with} ~~you may~~ purchased to ~~be added to~~ vinyl resin may require special handling, especially respiratory protection. It is the user's responsibility to obtain and follow the recommended precautions of the individual additive supplier.

SPECIAL NOTE: ^{PVC FORMULATIONS} Compound at or above normal processing temperature must never be allowed to accumulate in ^{thick} large masses, or it will begin to ^{thermally} decompose internally, and to swell due to ^{internal} gassing. Gassing may cause a ^{thick} large mass to explode if its outside surface is hardened by ~~sprinkling with water~~. Molten waste should be collected as strands or flattened to 2 inches or less, and quenched in a drum of cold water provided for this purpose. ^{thermally} Decomposing material should be removed to a well-ventilated area, preferably outdoors. Do not touch or attempt to wipe molten plastic from skin; it will stick to skin. Rapidly cool molten plastic on skin with water before attempting removal.

SECTION X - TRANSPORTATION

For domestic transportation purposes, vinyl resins are not classified as hazardous by the U.S. Department of Transportation under Title 49 of the Code of Federal Regulations, 1983 Edition.

- DOT Proper Shipping Name: Not Applicable
- DOT Hazard Class: Not Applicable
- DOT Label: Not Applicable
- ~~US/UN~~ Hazard No. ^{2.} Not Applicable

- SPECIAL NOTE: Vinyl Chloride Warning Labels on Containers
Based on modeling studies and actual measurements in warehousing, transporting and thermal processing, it is ^{judged} ~~our~~ judgment that Geon® vinyl suspension, dispersion, mass and blending resins ~~whenever they contain~~ less than 8.5 ppm of residual vinyl chloride monomer will not trigger the 0.5 ppm "action level" established by OSHA and therefore do not require labeling. Vinyl prime, off-grade or scrap ^{Geon} resins ^{will} be labeled with OSHA specified language if residual monomer level exceeds 8.5 ppm. (Please read Appendix.)

26265019

BFG50435

SECTION XI HAZARD CODES

NFPA 704 (1980)¹

Health: 2
Flammability: 1
Reactivity: 1
Special: None

HMIS²

Health: 0
Flammability: 1
Reactivity: 1
Personal Protection: X (Wear safety glasses.
Wear gloves and/or dust
respirator when needed.)

- (1) National Fire Protection Association.
- (2) Hazardous Materials Identification System, National Paint and Coatings Association.

DISCLAIMER OF LIABILITY

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for ~~any~~ use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without warranty, express or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof. Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user.

APPENDIX - VINYL CHLORIDE MONOMER (VCM)

Employee exposure to vinyl chloride monomer (CAS Registry number: 75-01-4) is regulated by OSHA Standard 1910.1017. The current regulation requires that no employee may be exposed to VCM concentrations greater than 1.0 ppm (part per million by volume) averaged over any eight-hour period or 5.0 ppm averaged over any period not exceeding 15 minutes. The action level is 0.5 ppm averaged over any eight-hour work day.

The regulation applies to the manufacture, ~~reaction~~ ^{PROCESSING}, packaging, repackaging, storage, handling or use of vinyl chloride or polyvinyl chloride, but does not apply to the handling or use of fabricated products made of polyvinyl chloride. Typically, purchasers of vinyl resin to be compounded or further processed are affected by this regulation. ~~Moreover~~ ^{HOWEVER}, the regulation requires a program of initial monitoring in each establishment to determine if there is any exposure ^{IN ANY FACILITY} without the use of respirators, in excess of the action level. If monitoring does not find VCM above 0.5 ppm, no further action is necessary. Refer to OSHA regulations (including 1910.1017) for complete details.

initial

BFG50436

26265020

WARNING
LABELING

RSCM

Monitoring of vinyl processing and fabricating plants and modeling studies show that the action level (0.5 ppm) is not exceeded when residual VCM is below 8.5 ppm in Geon® vinyl resins. Shipping containers for these resins ^{are not} shall not be labeled by BFGoodrich unless a customer specifies otherwise. Vinyl resin will be labeled if residual monomer exceeds 8.5 ppm. The federal regulation requires that the label say "Polyvinyl chloride contains vinyl chloride. Vinyl chloride is a cancer suspect agent."

Polyvinyl chloride resin is not a cancer suspect agent. It is the small amount of unreacted monomer that must be controlled, not the resin itself.

unfused
Although some containers may be labeled, this does not necessarily mean that employee exposure to VCM will exceed permissible exposure limits. Using "worst case" conditions, ⁸⁷⁵⁶⁶ studies show that more than 30 ppm of unreacted monomer in vinyl resin is needed to cause 0.5 ppm to be present in the workplace atmosphere as a result of thermal processing. Good exhaust ventilation in those areas where VCM might concentrate -- such as where containers are stored and first opened, where materials are mixed and where resin is first melted -- will further ensure a work environment virtually free of VCM.

JDT/jb/VS0157M/27

Once fused, it is highly unlikely that any appreciable level of VCM will be released from PVC compound even at processing temperatures.

TABLE # CARCINOGENIC COMPOUNDS

None of the following substances are used in the manufacture of Geon® vinyls nor are they anticipated by-products in our production process. Although the following materials do not represent any official governmental list nor all possible carcinogenic compounds, they do represent specific substances our customers have typically inquired about.

Some of these materials are ubiquitous and trace quantities may be found in the environment or as impurities in ingredients used in compounding.

	OSHA 1910.1001
Asbestos	.1002
Coal tar pitch volatiles	.1003
4-Nitrobiphenyl	.1004
alpha-Naphthylamine	.1005
4, 4' — Methylene (bis) 2-chloroaniline	.1006
Methyl Chloromethyl Ether	.1007
3, 3' — Dichlorobenzidine (and its salts)	.1008
bis-chloromethyl ether	.1009
beta — Naphthylamine	.1010
Benzidine	.1011
4 — Aminodiphenyl	.1012
Ethyleneimine	.1013
beta-Propiolactone	.1014
2-Acetylaminofluorene	.1015
4 — Dimethylaminoazobenzene	.1016
N-Nitrosodimethylamine	.1018
Inorganic arsenic	

1,2-dibromo-3-chloropropane .1044

Acrylonitrile .1045

Ethylene oxide .1047

Benzene ~~.1028~~

Polybrominated biphenyls
Polychlorinated biphenyls*

EPA (40 CFR Part 761)

*Polychlorinated biphenyls (PCB) may be present as impurities in certain phthalocyanine and diarylide pigments. Our suppliers have notified us that the pigments we purchase comply with the 50 ppm maximum allowable limit found in the EPA final rule to be published under Title 49 of the Code of Federal Regulations Part 761

26265021

BFG50437