

Poly(vinylidene fluoride)

sc-264080

Material Safety Data Sheet



The Power is Question

Hazard Alert Code
Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

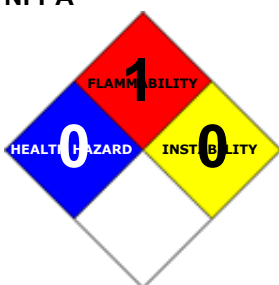
PRODUCT NAME

Poly(vinylidene fluoride)

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and

Canada: 877-715-9305

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2255 (1-800-CHEMCALL) or call +613 9573 3112

PRODUCT USE

Thermoplastic fluorocarbon suitable for compression and injection moulding and extrusion. Thermally stable from -62 deg C to 148 deg C. Used in insulation for high-temperature wire, tank linings, chemical tanks and tubing, protective coats and paints, shrinkage tubing to encapsulate resistors, diodes and sealants. Resists weathering and UV.

SYNONYMS

(C₂-H₂-F₂)_x, "ethene, 1, 1-difluoro-, homopolymer", "ethene, 1, 1-difluoro-, homopolymer", polyvinylidifluoride, "pol(vinylidene fluoride)", "1, 1-difluoroethene homopolymer", "1, 1-difluoroethene homopolymer", PVDF

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS

None

EMERGENCY OVERVIEW

RISK

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material has NOT been classified as "harmful by ingestion". This is because of the lack of corroborating animal or human evidence. The material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g. liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality (death) rather than those producing morbidity (disease, ill-health). Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, unintentional ingestion is not thought to be cause for concern.

EYE

■ Although the material is not thought to be an irritant, direct contact with the eye may cause transient discomfort characterized by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may

produce foreign body irritation in certain individuals.

SKIN

- The material is not thought to produce adverse health effects or skin irritation following contact (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

■ Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

■ Fumes from burning PTFE-containing materials are irritating to the upper respiratory tract and may be harmful if exposure is prolonged. When heated for a long time a very small amount of hydrogen fluoride, carbonyl fluoride and perfluoroisobutylene is generated. The higher the temperature the greater is the decomposition rate.

Symptoms of exposure to hydrogen fluoride and carbonyl fluoride include burning sensation, cough, dizziness, headache, labored breathing, nausea, shortness of breathe, sore throat and vomiting. Symptoms may be delayed. These substances are corrosive to the eyes, skin and respiratory tract. Inhalation may produce lung oedema. Prolonged exposures may produce hypocalcaemia High exposures may be fatal. Medical observation is indicated in the event of such exposures.

Symptoms of exposure to perfluoroisobutylene include cough, shortness of breathe, sore throat. Symptoms may be delayed. Symptoms of lung oedema often do not manifest until a few hours have passed and may be aggravated by physical effort. Rest and medical observation are essential. Immediate administration of an appropriate spray, or by the doctor authorised by him/ her, should be considered.

Overheated or burnt PTFE evolves highly irritating and corrosive hydrogen fluoride gas with small amounts of highly toxic carbonyl fluoride. Polymer decomposition starts at 400 deg. C. with rapid degradation at 540 deg. C.. Decomposition products are complex.

Solutions of hydrogen fluoride gas in mucous fluids form highly corrosive hydrofluoric acid so that inhalation of decomposition products can cause symptoms of choking, coughing and severe eye, nose and throat irritation. After a symptomless period of 1-2 days, exposed individuals may experience a set of symptoms described as "polymer fume fever"; this is a temporary flu-like illness with fever, chills and, sometimes, a cough and difficult breathing which lasts for approximately 24 hours.

Inhalation or skin contact with carbonyl fluoride vapour may cause irritation with discomfort and rash. In addition, carbonyl fluoride vapours may produce eye corrosion with corneal and conjunctival ulceration, nose and throat irritation, or temporary irritation of the lungs producing cough discomfort, difficult breathing and shortness of breath.

Individuals with pre-existing lung diseases may have increased susceptibility to the toxic effects of thermal decomposition products.

CHRONIC HEALTH EFFECTS

- Long-term exposure to the product is not thought to produce chronic effects adverse to the health (as classified using animal models); nevertheless exposure by all routes should be minimized as a matter of course.
- Suburothelial injections of particulate poly(tetrafluoroethylene) (PTFE) is becoming a widely accepted treatment for a number of urological disorders. Mice received one subcutaneous dorsal injection each, rabbits received two subareolar injections each, and dogs received three subareolar injections each in addition to two periurethral injections. Histologic examination of the biopsy sites revealed a persistent chronic inflammatory reaction with progressive growth of the involved tissue volume. In addition to giant cells and macrophages, lymphocytes became apparent at 3 months.
- Repeated administration of 25% Teflon PFA (a derivative of PTFE) in animals produced liver and testicular changes. However, in a subsequent study at the same and lower doses, these effects were not reproducible.
- Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS

	Min	Max
Flammability:	1	
Toxicity:	0	
Body Contact:	0	
Reactivity:	1	
Chronic:	2	

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

NAME	CAS RN	%
vinyl fluoride homopolymer		>98
thermal decomposition occurs at 315 deg C and produces		
hydrogen fluoride	7664-39-3	

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

EYE

- If this product comes in contact with eyes:

- Wash out immediately with water.
- If irritation continues, seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

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

INHALED

- - If dust is inhaled, remove from contaminated area.
 - Encourage patient to blow nose to ensure clear passage of breathing.
 - If irritation or discomfort persists seek medical attention.

NOTES TO PHYSICIAN

- Treat symptomatically.

For polytetrafluoroethylene (PTFE) and other related polyfluorinated polymers:

Pyrolysis products of this material have been known to produce an influenza-like syndrome in man, lasting 24-48 hours. (ILO).

For acute or short term repeated exposures to fluorides:

- Fluoride absorption from gastro-intestinal tract may be retarded by calcium salts, milk or antacids.
- Fluoride particulates or fume may be absorbed through the respiratory tract with 20-30% deposited at alveolar level.
- Peak serum levels are reached 30 mins. post-exposure; 50% appears in the urine within 24 hours.
- For acute poisoning (endotracheal intubation if inadequate tidal volume), monitor breathing and evaluate/monitor blood pressure and pulse frequently since shock may supervene with little warning. Monitor ECG immediately; watch for arrhythmias and evidence of Q-T prolongation or T-wave changes. Maintain monitor. Treat shock vigorously with isotonic saline (in 5% glucose) to restore blood volume and enhance renal excretion.
- Where evidence of hypocalcemic or normocalcemic tetany exists, calcium gluconate (10 ml of a 10% solution) is injected to avoid tachycardia.

BIOLOGICAL EXPOSURE INDEX - BEI These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Fluorides in urine	3 mg/gm creatinine	Prior to shift	B, NS
	10mg/gm creatinine	End of shift	B, NS

B: Background levels occur in specimens collected from subjects NOT exposed

NS: Non-specific determinant; also observed after exposure to other exposures.

Thermal decomposition produces hydrofluoric acid.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Negligible
Upper Explosive Limit (%):	Not available
Specific Gravity (water=1):	1.7
Lower Explosive Limit (%):	Not available

EXTINGUISHING MEDIA

- - Foam.
 - Dry chemical powder.
 - BCF (where regulations permit).
 - Carbon dioxide.
 - Water spray or fog - Large fires only.

FIRE FIGHTING

- - Alert Emergency Responders and tell them location and nature of hazard.
 - Wear breathing apparatus plus protective gloves.
 - Prevent, by any means available, spillage from entering drains or water course.
 - Use water delivered as a fine spray to control fire and cool adjacent area.
 - DO NOT approach containers suspected to be hot.
 - Cool fire exposed containers with water spray from a protected location.
 - If safe to do so, remove containers from path of fire.
 - Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- - Combustible solid which burns but propagates flame with difficulty.
 - Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
 - Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
 - Build-up of electrostatic charge may be prevented by bonding and grounding.
 - Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO₂), hydrogen fluoride, other pyrolysis products typical of burning organic material.

- Polytetrafluoroethylene (PTFE) and related polyfluorinated polymers does not burn without an external flame.
- WARNING: Wear neoprene gloves when handling refuse from fire where polytetrafluoroethylene (PTFE) was present.

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

Respirator:

Type B-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

-
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Wear impervious gloves and safety glasses.
- Use dry clean up procedures and avoid generating dust.
- Sweep up or vacuum up (consider explosion-proof machines designed to be grounded during storage and use).
- Place spilled material in clean, dry, sealable, labeled container.

MAJOR SPILLS

-
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Control personal contact by using protective equipment and dust respirator.
- Prevent spillage from entering drains, sewers or water courses.
- Avoid generating dust.
- Sweep, shovel up.
- Recover product wherever possible.
- Put residues in labeled plastic bags or other containers for disposal.
- If contamination of drains or waterways occurs, advise emergency services.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

hydrogen

fluoride

AEGL Type	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	1	1	1	1	GALSYN~
AEGL 2	95	34	24	12	GALSYN~
AEGL 3	170	62	44	22	GALSYN~

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

-
- Limit all unnecessary personal contact.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

US - Michigan Exposure Limits for Air Contaminants	(Particulates not otherwise regulated, Respirable dust)			5		
US - Minnesota Permissible Exposure Limits (PELs)	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
Canada - Ontario Occupational Exposure Limits	hydrogen fluoride (Hydrogen fluoride (as F))	0.5				2
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	hydrogen fluoride (HYDROGEN FLUORIDE)	0.02				
US NIOSH Recommended Exposure Limits (RELs)	hydrogen fluoride (Hydrogen fluoride)	3	2.5		6	5
US ACGIH Threshold Limit Values (TLV)	hydrogen fluoride (Hydrogen fluoride)	0.5			2	Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis
Canada - British Columbia Occupational Exposure Limits	hydrogen fluoride (Hydrogen fluoride, as F)					2
Canada - Alberta Occupational Exposure Limits	hydrogen fluoride (Hydrogen fluoride, as F)	0.5	0.4		2	1.6
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
US - Idaho - Acceptable Maximum Peak Concentrations	hydrogen fluoride (Hydrogen Fluoride (Z37.26-1969))	3				
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))			See Table Z-2		
US - Idaho - Limits for Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))			[2]		
US - California Permissible Exposure Limits for Chemical Contaminants	hydrogen fluoride (Hydrogen fluoride, as F)	3	2.5		6	
US - Michigan Exposure Limits for Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
US - Alaska Limits for Air Contaminants	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
Canada - Northwest Territories Occupational Exposure Limits (English)	hydrogen fluoride (Hydrogen fluoride (as F))	3	2.5	6		4.9
US - Washington Permissible exposure limits of air contaminants	hydrogen fluoride (Hydrogen fluoride)					3
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	hydrogen fluoride (Hydrogen fluoride)	3	2	3		2
US - Hawaii Air Contaminant Limits	hydrogen fluoride (Hydrogen fluoride (as F))	3			6	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	hydrogen fluoride (Hydrogen fluoride, (as F))	0.5				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	hydrogen fluoride (Hydrogen fluoride (as F))				3	2.6
US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable	hydrogen fluoride (Hydrogen fluoride)	3				

maximum peak above the acceptable ceiling concentration for an 8-hr shift (Z37.28-1969))

Canada - Nova Scotia Occupational Exposure Limits	hydrogen fluoride (Hydrogen fluoride)	0.5	2	Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis
US - Oregon Permissible Exposure Limits (Z2)	hydrogen fluoride (Hydrogen fluoride (Z37.28-1969))	3		
Canada - Prince Edward Island Occupational Exposure Limits	hydrogen fluoride (Hydrogen fluoride)	0.5	2	Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
hydrogen fluoride		30 [Unch]

MATERIAL DATA

HYDROGEN FLUORIDE:

VINYLDENE FLUORIDE HOMOPOLYMER:

■ Odour Threshold for hydrogen fluoride: 0.042 ppm

NOTE: Detector tubes for hydrogen fluoride, measuring in excess of 1.5 ppm, are available commercially. Long-term measurements (8 hrs) may be conducted to detect concentrations exceeding 0.25 ppm.

Hydrogen fluoride is a primary irritant which as a gas causes severe respiratory irritation and as a liquid which causes severe and painful burns to the skin and eyes. The recommendation for TLV-TWA is based on the results of controlled inhalation studies in human volunteers. The limit is thought to minimise the potential for occurrence of dental and/or osteofluorosis (systemic fluorosis) and to prevent the risk of primary irritation to the eyes, nose, throat and lower respiration system.

At concentrations exceeding 3 ppm there have been reports of skin reddening and burning of the nose and eyes.

Odour Safety Factor(OSF)

OSF=71 (HYDROGEN FLUORIDE).

HYDROGEN FLUORIDE:

VINYLDENE FLUORIDE HOMOPOLYMER:

■ Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odor Safety Factor (OSF) is determined to fall into either Class A or B.

The Odor Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odor Threshold Value (OTV) ppm

Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV-TWA for example) is being reached, even when distracted by working activities
B	26-550	Idem for 50-90% of persons being distracted
C	1-26	Idem for less than 50% of persons being distracted
D	0.18-1	0-50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	Idem for less than 10% of persons aware of being tested

Amoore and Hautala * have determined that it is only at an OSF value of 26 that 50% of distracted persons can detect the substance at the Exposure Standard value. In the case of alerted persons, an OSF of 26 means that 99% of them can detect the odor at the Exposure Standard value. It is ONLY for substances belonging to Class A and B that there is a reasonable chance of being warned in time, that the Exposure Standard is being exceeded. * Journal Applied Toxicology: Vol 3, 1983, p272

NOTE: The use of the OSF may be inappropriate for mixtures where substances mask the odor of others.

VINYLDENE FLUORIDE HOMOPOLYMER:

■ for polytetrafluoroethylene (PTFE) and other related polyfluorinated polymers

CEL-TWA: 10 mg/m3. 8 hr total dust

CEL-TWA; 5 mg/m3. 8 hr respirable dust * = [cf DUPONT recommendations]

For decomposition products of PTFE and other related polyfluorinated compounds, (substances of variable composition):

No TLV is recommended pending toxicity determination of decomposition products, but their concentration in air should be minimal. [ACGIH]

Products of combustion/ thermal decomposition include: hydrogen fluoride, carbonyl fluoride, perfluoroisobutylene.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

-
- Safety glasses with side shields
- Chemical goggles.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

HANDS/FEET

- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
 - frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexterity

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

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

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

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

OTHER

- No special equipment needed when handling small quantities.

OTHERWISE:

- Overalls.
- Barrier cream.
- Eyewash unit.
-
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

RESPIRATOR

- Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half-face Respirator	Full-Face Respirator
1000	10	B-1 P	-
1000	50	-	B-1 P
5000	50	Airline*	-
5000	100	-	B-2 P
10000	100	-	B-3 P
	100+		Airline* *

* - Continuous Flow ** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

- For polytetrafluoroethylene (PTFE) and other related polyfluorinated polymers:

In processes such as extrusion moulding, engineering controls should be designed to draw thermal degeneration products from the workers breathing zone.

NOTE: When hydrogen fluoride is first detected continue to run equipment with the heat source to the polymer turned off. Ventilate the area and remove non-essential personnel from the area. In case of a major decomposition event evacuate all personnel immediately.

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:

(a): particle dust respirators, if necessary, combined with an absorption cartridge;

(b): filter respirators with absorption cartridge or canister of the right type;

(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:	Air Speed:
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.

Does not mix with water.

Sinks in water.

State	Divided solid	Molecular Weight	534000 (typical)
Melting Range (°F)	329- 347	Viscosity	Not available
Boiling Range (°F)	Not available	Solubility in water (g/L)	Immiscible
Flash Point (°F)	None	pH (1% solution)	Not available
Decomposition Temp (°F)	Not available	pH (as supplied)	Not available
Autoignition Temp (°F)	Not available	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	Not available	Specific Gravity (water=1)	1.7
Lower Explosive Limit (%)	Not available	Relative Vapor Density (air=1)	Not available
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Odourless white powder; does not mix with water. Soluble in dimethylacetamide. Attacked by hot concentrated sulfuric acid, n-butylamine. Combustible, self-extinguishing and non-dripping. Resists oxidative degradation, electricity, acids, alkalies, oxidisers, halogens.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Product is considered stable and hazardous polymerization will not occur.

STORAGE INCOMPATIBILITY

- Avoid contamination of water, foodstuffs, feed or seed.

For PTFE-containing materials:

Avoid storage with strong oxidizing agents, tetrafluoroethylene, hexafluoroethylene, perfluoroisobutylene, carbonyl fluoride and hydrogen fluoride.

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

Section 11 - TOXICOLOGICAL INFORMATION

vinylidene fluoride homopolymer

TOXICITY AND IRRITATION

- No significant acute toxicological data identified in literature search.

CARCINOGEN

Fluorides (inorganic, used in drinking-water)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Fluorides (as F)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4

SKIN

hydrogen fluoride	US ACGIH Threshold Limit Values (TLV) - Skin	Skin Designation	Yes
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Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

VINYLLIDENE FLUORIDE HOMOPOLYMER:

- For polytetrafluoroethylene (PTFE) and other related polyfluorinated polymers:

Ecotoxicity is expected to be low based on the near zero water solubility of the polymer. Material is considered inert and is not expected to be biodegradable or toxic.

HYDROGEN FLUORIDE:

- | | |
|----------------------------|-----|
| ■ Hazardous Air Pollutant: | Yes |
|----------------------------|-----|
- Although small amounts of fluorides are conceded to have beneficial effects two forms of chronic toxic effect, dental fluorosis and skeletal fluorosis may be caused by excessive intake over long periods.
 - Prevent, by any means available, spillage from entering drains or watercourses.
 - DO NOT discharge into sewer or waterways.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
vinylidene fluoride	LOW		LOW	HIGH
homopolymer				
hydrogen fluoride			LOW	

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

B. Component Waste Numbers

When hydrogen fluoride is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U134 (waste code C,T).

Disposal Instructions

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

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

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

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

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

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

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

vinylidene fluoride homopolymer (CAS: 24937-79-9) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "US Toxic Substances Control Act (TSCA) - Inventory"

Regulations for ingredients

hydrogen fluoride (CAS: 7664-39-3) is found on the following regulatory lists;

"Canada - Alberta Ambient Air Quality Objectives", "Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational

Exposure Limits","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Domestic Substances List (DSL)","Canada Environmental Quality Guidelines (EQGs) Air","Canada Ingredient Disclosure List (SOR/88-64)","Canada National Pollutant Release Inventory (NPRI)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","OECD Representative List of High Production Volume (HPV) Chemicals","The Australia Group Export Control List: Chemical Weapons Precursors","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Toxic Air Contaminant List Category II","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Acceptable Maximum Peak Concentrations","US - Idaho - Limits for Air Contaminants","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Oregon Hazardous Materials","US - Oregon Permissible Exposure Limits (Z1)","US - Oregon Permissible Exposure Limits (Z2)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Hazardous Constituents","US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Dangerous waste constituents list","US - Washington Discarded Chemical Products List - ""U"" Chemical Products","US - Washington Permissible exposure limits of air contaminants","US - Wyoming List of Highly Hazardous Chemicals, Toxics and Reactives","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift","US ACGIH Threshold Limit Values (TLV)","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US Clean Air Act - Hazardous Air Pollutants","US CWA (Clean Water Act) - List of Hazardous Substances","US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances","US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Acute Exposure Guideline Levels (AEGs) - Final","US EPA Master Testing List - Index I Chemicals Listed","US EPCRA Section 313 Chemical List","US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act","US NFPA 45 Fire Protection for Laboratories Using Chemicals - Flammability Characteristics of Common Compressed and Liquefied Gases","US NIOSH Recommended Exposure Limits (RELs)","US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US OSHA Permissible Exposure Levels (PELs) - Table Z2","US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Inventory"

Section 16 - OTHER INFORMATION

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

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

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

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

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