

Chromyl chloride

sc-268717



The Power is Question

Material Safety Data Sheet

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Chromyl chloride

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY

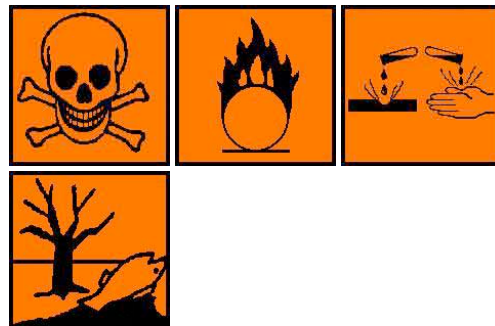
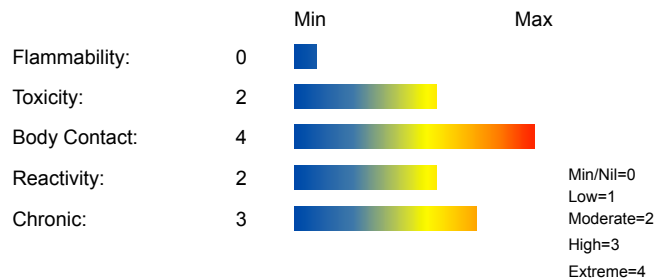
ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

Cl₂-Cr-O₂, "chromium, dichlorodioxo-", dichlorodioxochromium, "chlorochromic anhydride", "chromium chloride oxide", "chromium dichloride dioxide", "chromium (VI) dioxychloride", "chromyl chloride", chromooxychloride, dioxodichlorochromium

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Contact with combustible material may cause fire.

Causes severe burns.

Risk of serious damage to eyes.

May cause CANCER by inhalation.

May cause SENSITISATION by skin contact.

May cause heritable genetic damage.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ The material can produce severe chemical burns within the oral cavity and gastrointestinal tract following ingestion.

■ Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and esophagus.

■ The material has NOT been classified as "harmful by ingestion".

This is because of the lack of corroborating animal or human evidence.

■ Symptoms of exposure may be delayed.

EYE

■ The material can produce severe chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.

■ If applied to the eyes, this material causes severe eye damage.

■ Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns.

Mild burns of the epithelia generally recover rapidly and completely.

SKIN

■ The material can produce severe chemical burns following direct contact with the skin.

■ Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.

■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.

■ 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 can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage.

There may be dizziness, headache, nausea and weakness.

■ Not normally a hazard due to non-volatile nature of product.

■ Chlorine vapour is extremely irritating to the upper respiratory tract and lungs. Symptoms of exposure to chlorine include coughing, choking, breathing difficulty, chest pain, headache, vomiting, pulmonary oedema.

Inhalation may cause lung congestion, bronchitis and loss of consciousness.

■ Hydrogen chloride (HCl) vapour or fumes present a hazard from a single acute exposure.

Exposures of 1300 to 2000 ppm have been lethal to humans in a few minutes.

CHRONIC HEALTH EFFECTS

■ Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and or ulceration of mouth lining. Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs.

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.

Based on experiments and other information, there is ample evidence to presume that exposure to this material can cause genetic defects that can be inherited.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Reduced respiratory capacity may result from chronic low level exposure to chlorine gas. Chronic poisoning may result in coughing, severe chest pains, sore throat and haemoptysis (bloody sputum). Moderate to severe exposures over 3 years produced decreased lung capacity in a number of workers.

Delayed effects can include shortness of breath, violent headaches, pulmonary oedema and pneumonia.

Amongst chloralkali workers exposed to mean concentrations of 0.15 ppm for an average of 10.9 years a generalised pattern of fatigue (exposures of 0.5 ppm and above) and a modest increased incidence of anxiety and dizziness were recorded. Leukocytosis and a lower haematocrit showed some relation to exposure.

Chronic minor exposure to hydrogen chloride (HCl) vapour or fume may cause discolouration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.

Repeated exposures of animals to concentrations of about 34 ppm HCl produced no immediate toxic effects. Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported. Repeated or prolonged exposure to dilute solutions of HCl may cause dermatitis. Chronic inhalation exposure may result in nasal ulceration and/or perforation of nasal septum. Chromium(III) is an essential trace mineral. Chronic exposure to chromium(III) irritates the airways, malnourishes the liver and kidneys, causes fluid in the lungs, and adverse effects on white blood cells, and also increases the risk of developing lung cancer.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
chromium oxychloride	14977-61-8	>98
may decompose in the presence of water/moisture to		
hydrogen chloride	7647-01-0	
chlorine	7782-50-5	
chromium trioxide	1333-82-0	
chromic chloride	10025-73-7	

Section 4 - FIRST AID MEASURES

SWALLOWED

· For advice, contact a Poisons Information Center or a doctor at once. · Urgent hospital treatment is likely to be needed.

EYE

■ If this product comes in contact with the eyes: · Immediately hold eyelids apart and flush the eye continuously with running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin or hair contact occurs: · Immediately flush body and clothes with large amounts of water, using safety shower if available. · Quickly remove all contaminated clothing, including footwear.

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested. Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g.

NOTES TO PHYSICIAN

■ Depending on the degree of exposure, periodic medical examination is indicated. The symptoms of lung edema often do not manifest until a few hours have passed and they are aggravated by physical effort.

For acute or short term repeated exposures to strong acids:

- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

Excellent warning properties force rapid escape of personnel from chlorine vapour thus most inhalations are mild to moderate. If escape is not possible, exposure to high concentrations for a very short time can result in dyspnea, haemoptysis and cyanosis with later complications being tracheobroncho-pneumonitis and pulmonary oedema. Oxygen, intermittent positive pressure breathing apparatus and aerosolised bronchodilators are of therapeutic value where chlorine inhalation has been light to moderate. Severe inhalation should result in hospitalisation and treatment for a respiratory emergency.

Any chlorine inhalation in an individual with compromised pulmonary function (COPD) should be regarded as a severe inhalation and a respiratory emergency. [CCINFO, Dow 1988]

Effects from exposure to chlorine gas include pulmonary oedema which may be delayed. Observation in hospital for 48 hours is recommended

Diagnosed asthmatics and those people suffering from certain types of chronic bronchitis should receive medical approval before being employed in occupations involving chlorine exposure.

If burn is present, treat as any thermal burn, after decontamination.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG):	Not available
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	1.911
Lower Explosive Limit (%):	Not applicable

EXTINGUISHING MEDIA

· DO NOT use water.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.

· May be violently or explosively reactive.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Will not burn but increases intensity of fire.
 - Heating may cause expansion or decomposition leading to violent rupture of containers.
 - Non combustible.
 - Not considered to be a significant fire risk.
- Decomposition may produce toxic fumes of: hydrogen chloride, metal oxides.

FIRE INCOMPATIBILITY

- Keep dry.
 - NOTE: May develop pressure in containers; open carefully. Vent periodically.
- Can produce intense heat and toxic fumes.

PERSONAL PROTECTION

- Glasses:
Chemical goggles.
Full face- shield.
Gloves:
Respirator:
Type BE-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.

MAJOR SPILLS

- Environmental hazard - contain spillage.
- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin.
- Avoid personal contact and inhalation of dust, mist or vapors.
- Provide adequate ventilation.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

- DO NOT use aluminum or galvanized containers.

Check regularly for spills and leaks.

Glass container.

- DO NOT use unlined steel containers.
- Lined metal can, Lined metal pail/drum
- Plastic pail.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

STORAGE REQUIREMENTS

- Store in original containers.
 - Keep containers securely sealed.
- Decomposes in light and in the presence of moisture.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
US NIOSH Recommended Exposure Limits (RELs)	chromium oxychloride (Chromyl chloride)		0.001						See Appendix A; See Appendix C; Ca; (TWA (as Cr(VI)))
US ACGIH Threshold Limit Values (TLV)	chromium oxychloride (Chromyl chloride)	0.025							TLV Basis: upper respiratory tract & skin irritation

Canada - Alberta Occupational Exposure Limits	chromium oxychloride (Chromyl chloride)	0.025	0.2	
US - California Permissible Exposure Limits for Chemical Contaminants	chromium oxychloride (Chromyl chloride)	0.025	0.15	
Canada - British Columbia Occupational Exposure Limits	chromium oxychloride (Chromyl chloride)	0.025		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	chromium oxychloride (Chromyl chloride)	0.025	0.16	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	chromium oxychloride (Chromyl chloride)	0.025		0.07
US - Washington Permissible exposure limits of air contaminants	chromium oxychloride (Chromyl chloride (as Cr) (see WAC 296-62-08003) (see WAC 296-62-08003))			0.005
US - Hawaii Air Contaminant Limits	chromium oxychloride (Chromyl chloride)	0.025	0.15	
Canada - Prince Edward Island Occupational Exposure Limits	chromium oxychloride (Chromyl chloride)	0.025		TLV Basis: upper respiratory tract & skin irritation
Canada - Nova Scotia Occupational Exposure Limits	chromium oxychloride (Chromyl chloride)	0.025		TLV Basis: upper respiratory tract & skin irritation
Canada - Prince Edward Island Occupational Exposure Limits	chromium oxychloride (Hydrogen chloride)			2 TLV Basis: upper respiratory tract irritation
Canada - Nova Scotia Occupational Exposure Limits	chromium oxychloride (Hydrogen chloride)			2 TLV Basis: upper respiratory tract irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	chromium oxychloride (Hydrogen chloride)		5	7.5
US OSHA Permissible Exposure Levels (PELs) - Table Z1	chromium oxychloride (Hydrogen chloride)		5	7
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	chromium oxychloride (Hydrogen chloride)		5	7,5

US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7
US - Oregon Permissible Exposure Limits (Z-1)	chromium oxychloride (Hydrogen chloride)					5	7
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	chromium oxychloride (Hydrogen chloride)					2	
US - Washington Permissible exposure limits of air contaminants	chromium oxychloride (Hydrogen chloride)					5.0	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	chromium oxychloride (Hydrogen chloride)	5	7	-	-		
US - Michigan Exposure Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7
US - Alaska Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7
US - Hawaii Air Contaminant Limits	chromium oxychloride (Hydrogen chloride)					5	7
US - Idaho - Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7
US - California Permissible Exposure Limits for Chemical Contaminants	chromium oxychloride (Hydrogen chloride; muriatic acid)	5	7			C	
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	chromium oxychloride (Hydrogen chloride)	(C)5	(C)7				
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	chromium oxychloride (Hydrogen chloride)					5	7

US NIOSH Recommended Exposure Limits (RELs)	chromium oxychloride (Hydrogen chloride)					5	7	
US ACGIH Threshold Limit Values (TLV)	chromium oxychloride (Hydrogen chloride)					2		TLV Basis: upper respiratory tract irritation
US - Minnesota Permissible Exposure Limits (PELs)	chromium oxychloride (Hydrogen chloride)					5	7	
Canada - British Columbia Occupational Exposure Limits	chromium oxychloride (Hydrogen chloride Revised 2003)					2		
Canada - Alberta Occupational Exposure Limits	chromium oxychloride (Hydrogen chloride)					2	3	
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	chromium oxychloride (Chlorine)	0.5	1.5	1	3			
Canada - Prince Edward Island Occupational Exposure Limits	chromium oxychloride (Chlorine)	0.5		1				TLV Basis: upper respiratory tract & eye irritation
Canada - Nova Scotia Occupational Exposure Limits	chromium oxychloride (Chlorine)	0.5		1				TLV Basis: upper respiratory tract & eye irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	chromium oxychloride (Chlorine)	1	3	3	8.7	3	8.7	
US OSHA Permissible Exposure Levels (PELs) - Table Z1	chromium oxychloride (Chlorine)					1	3	
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	chromium oxychloride (Chlorine)	0.5	1.5	1	2.9			
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	chromium oxychloride (Chlorine)					1	3	
US - Oregon Permissible Exposure Limits (Z-1)	chromium oxychloride (Chlorine)					1	3	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination	chromium oxychloride (Chlorine)	0.5		1				

Limits						
US - Washington Permissible exposure limits of air contaminants	chromium oxychloride (Chlorine)	0.5				1
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	chromium oxychloride (Chlorine)	1	3	3	9	
US - Michigan Exposure Limits for Air Contaminants	chromium oxychloride (Chlorine)	0.5	1.5	1	3	
US - Alaska Limits for Air Contaminants	chromium oxychloride (Chlorine)	0.5	1.5	1	3	
US - Hawaii Air Contaminant Limits	chromium oxychloride (Chlorine)	0.5	1.5	1	3	
US ACGIH Threshold Limit Values (TLV)	chromium oxychloride (Chlorine)	0.5		1		TLV Basis: upper respiratory tract & eye irritation
US - California Permissible Exposure Limits for Chemical Contaminants	chromium oxychloride (Chlorine)	0.5	1.5	1	3	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	chromium oxychloride (Chlorine)	(C)1	(C)3			
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	chromium oxychloride (Chlorine)	0.5	1.5	1	3	
US - Idaho - Limits for Air Contaminants	chromium oxychloride (Chlorine)					1 3
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	chromium oxychloride (CHLORINE)	0.00005				
Canada - British Columbia Occupational Exposure Limits	chromium oxychloride (Chlorine)	0.5		1		
Canada - Alberta Occupational Exposure Limits	chromium oxychloride (Chlorine)	0.5	1.5	1	2.9	
US NIOSH Recommended Exposure Limits (RELs)	chromium oxychloride (Chlorine)					0.5 1.45 (Ceiling ([15-minute]))
US ATSDR Minimal Risk Levels for Hazardous	chromium oxychloride (CHLORINE)	0.002				

Substances
(MRLs)

US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	chromium oxychloride (CHLORINE)	0.07			
US - Minnesota Permissible Exposure Limits (PELs)	chromium oxychloride (Chlorine)	0.5	1.5	1	3

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

- type be-p filter of sufficient capacity.
- Consult your EHS staff for recommendations

EYE

- Chemical goggles.
- Full face shield.

HANDS/FEET

- Elbow length PVC gloves.
- When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

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.

OTHER

- Overalls.
- PVC Apron.

ENGINEERING CONTROLS

- Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

CAUTION: Burns and blisters the skin: Handle ONLY in well-ventilated hood.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.
Corrosive.
Acid.

State	Liquid	Molecular Weight	154.90
Melting Range (°F)	-142	Viscosity	Not Available
Boiling Range (°F)	243	Solubility in water (g/L)	Reacts
Flash Point (°F)	Not Applicable	pH (1% solution)	Not available
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable

Autoignition Temp (°F)	Not applicable	Vapour Pressure (mmHG)	Not available
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	1.911
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	Not available	Evaporation Rate	Not available

APPEARANCE

Deep red liquid, appears black under reflected light. Reacts with water to produce acids and chlorine. Soluble in carbon tetrachloride, carbon disulfide, benzene, nitrobenzene, CHCl₃, POCL₃.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Contact with alkaline material liberates heat.

STORAGE INCOMPATIBILITY

- **WARNING:** Avoid or control reaction with peroxides. All transition metal peroxides should be considered as potentially explosive. For example transition metal complexes of alkyl hydroperoxides may decompose explosively.
- The pi-complexes formed between chromium(0), vanadium(0) and other transition metals (haloarene-metal complexes) and mono-or poly-fluorobenzene show extreme sensitivity to heat and are explosive.
- Avoid reaction with borohydrides or cyanoborohydrides.
- Inorganic acids are generally soluble in water with the release of hydrogen ions. The resulting solutions have pH's of less than 7.0.
- Inorganic acids neutralize chemical bases (for example: amines and inorganic hydroxides) to form salts.

Segregate from alcohol, water.

- Avoid strong bases.

- **NOTE:** May develop pressure in containers; open carefully. Vent periodically.

Hydrogen chloride:

- reacts strongly with strong oxidisers (releasing chlorine gas), acetic anhydride, caesium cyanotridecahydrodecaborate(2-), ethylidene difluoride, hexalithium disilicide, metal acetylide, sodium, silicon dioxide, tetraselenium tetranitride, and many organic materials

- is incompatible with aliphatic amines, alkanolamines, alkylene oxides, aluminium, aluminium-titanium alloys, aromatic amines, amides, 2-aminoethanol, ammonia, ammonium hydroxide, calcium phosphide, chlorosulfonic acid, ethylenediamine, ethyleneimine, epichlorohydrin, isocyanates, metal acetylides, metal carbides, oleum, organic anhydrides, perchloric acid, 3-propiolactone, sulfuric acid, uranium phosphide, vinyl acetate, vinylidene fluoride

- attacks most metals forming flammable hydrogen gas, and some plastics, rubbers and coatings.

Reacts violently with liquid or gaseous ammonia.

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

Section 11 - TOXICOLOGICAL INFORMATION

chromium oxychloride

TOXICITY AND IRRITATION

- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

CHROMIUM TRIOXIDE:

CHROMIC CHLORIDE:

CHROMIUM OXYCHLORIDE:

- Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.

CHROMIC CHLORIDE:

CHROMIUM TRIOXIDE:

- Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.

- Attention should be paid to atopic diathesis, characterized by increased susceptibility to nasal inflammation, asthma and eczema.

- Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms.

- Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

CHROMIUM OXYCHLORIDE:

- The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may produce severe respiratory tract irritation, and result in damage to the lung including reduced lung function.

The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.

HYDROGEN CHLORIDE:

TOXICITY	IRRITATION
Inhalation (human) LCLo: 1300 ppm/30m	Eye (rabbit): 5 mg/30s - Mild
Inhalation (human) LCLo: 3000 ppm/5m	

Inhalation (rat) LC50: 3124 ppm/60m

■ The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
4701 ppm/30m

TOXICITY	IRRITATION
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CHLORINE:

Inhalation (human) LCLo: 500 ppm/5 minutes

Inhalation (rat) LC50: 293 ppm/1 hour

CHROMIUM TRIOXIDE:

Oral (rat) LD50: 80 mg/kg

Skin (human): corrosive

Inhalation (human) TCLo: 0.11 mg/m³

■ WARNING: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS.

CHROMIC CHLORIDE:

Oral (rat) LD50: 1790 mg/kg	Nil Reported
Oral (rat) LD50: 1870 mg/kg	
Inhalation (mouse) LC50: 31.5 mg/m³/2h	
Intraperitoneal (mouse) LD50: 434 mg/kg	
Intramuscular (mouse) LD50: 40 mg/kg	
Intravenous (Rabbit) LD: 288 mg/kg	
Intraperitoneal (Guinea pig) LD: 200 mg/kg	
Intraperitoneal (Mouse) LD50: 143 mg/kg	
Subcutaneous (Mouse) LD: 800 mg/kg	
Intravenous (Mouse) LD: 400 mg/kg	

■ For chrome(III) and other valence states (except hexavalent):

For inhalation exposure, all trivalent and other chromium compounds are treated as particulates, not gases.

The mechanisms of chromium toxicity are very complex, and although many studies on chromium are available, there is a great deal of uncertainty about how chromium exerts its toxic influence. Much more is known about the mechanisms of hexavalent chromium toxicity than trivalent chromium toxicity. There is an abundance of information available on the carcinogenic potential of chromium compounds and on the genotoxicity and mutagenicity of chromium compounds in experimental systems. The consensus from various reviews and agencies is that evidence of carcinogenicity of elemental, divalent, or trivalent chromium compounds is lacking. Epidemiological studies of workers in a number of industries (chromate production, chromate pigment production and use, and chrome plating) conclude that while occupational exposure to hexavalent chromium compounds is associated with an increased risk of respiratory system cancers (primarily bronchogenic and nasal), results from occupational exposure studies to mixtures that were mainly elemental and trivalent (ferrochromium alloy worker) were inconclusive. Studies in leather tanners, who were exposed to trivalent chromium were consistently negative. In addition to the lack of direct evidence of carcinogenicity of trivalent or elemental chromium and its compounds, the genotoxic evidence is overwhelmingly negative.

The lesser potency of trivalent chromium relative to hexavalent chromium is likely related to the higher redox potential of hexavalent chromium and its greater ability to enter cells.

The general inability of trivalent chromium to traverse membranes and thus be absorbed or reach peripheral tissue in significant amounts is generally accepted as a probable explanation for the overall absence of systemic trivalent chromium toxicity. Elemental and divalent forms of chromium are not able to traverse membranes readily either. This is not to say that elemental, divalent, or trivalent chromium compounds cannot traverse membranes and reach

peripheral tissue, the mechanism of absorption is simply less efficient in comparison to absorption of hexavalent chromium compounds. Hexavalent chromium compounds exist as tetrahedral chromate anions, resembling the forms of other natural anions like sulfate and phosphate which are permeable across nonselective membranes. Trivalent chromium forms octahedral complexes which cannot easily enter through these channels, instead being absorbed via passive diffusion and phagocytosis. Although trivalent chromium is less well absorbed than hexavalent chromium, workers exposed to trivalent compounds have had detectable levels of chromium in the urine at the end of a workday. Absorbed chromium is widely distributed throughout the body via the bloodstream, and can reach the fetus. Although there is ample in vivo evidence that hexavalent chromium is efficiently reduced to trivalent chromium in the gastrointestinal tract and can be reduced to the trivalent form by ascorbate and glutathione in the lungs, there is no evidence that trivalent chromium is converted to hexavalent chromium in biological systems. In general, trivalent chromium compounds are cleared rapidly from the blood and more slowly from the tissues. Although not fully characterized, the biologically active trivalent chromium molecule appears to be chromodulin, also referred to as (GTF). Chromodulin is an oligopeptide complex containing four chromic ions. Chromodulin may facilitate interactions of insulin with its receptor site, influencing protein, glucose, and lipid metabolism. Inorganic trivalent chromium compounds, which do not appear to have insulin-potentiating properties, are capable of being converted into biologically active forms by humans and animals

Chromium can be a potent sensitizer in a small minority of humans, both from dermal and inhalation exposures.

The most sensitive endpoint identified in animal studies of acute exposure to trivalent chromium appears to involve the respiratory system. Specifically, acute exposure to trivalent chromium is associated with impaired lung function and lung damage.

Based on what is known about absorption of chromium in the human body, its potential mechanism of action in cells, and occupational data indicating that valence states other than hexavalent exhibit a relative lack of toxicity the toxicity of elemental and divalent chromium compounds is expected to be similar to or less than common trivalent forms.

Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

The substance is classified by IARC as Group 3:

NOT classifiable as to its carcinogenicity to humans.

Evidence of carcinogenicity may be inadequate or limited in animal testing.

for hexahydrate:

for anhydrous form:

Human cell mutagen

Paternal effect, effects on fertility, effects on embryo (extra embryonic

structures, foetotoxicity), specific developmental abnormalities (central

nervous system, eye, ear) recorded.

CARCINOGEN

Chromium (VI) compounds	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	1
chromium oxychloride	US - Rhode Island Hazardous Substance List	IARC	
chromium oxychloride	US - Rhode Island Hazardous Substance List	IARC	C
CHROMYL CHLORIDE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65-MC
CHROMYL CHLORIDE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
CHROMIUM COMPOUNDS	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	HAZMAP, P65-MC
Chromium (hexavalent) (Oral)	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	
Chromyl chloride	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca
VPVB_(VERY~	US - Maine Chemicals of High Concern List	Carcinogen	CA Prop 65

Hydrochloric acid	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Acid mists, strong inorganic	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	1
Hydrogen chloride	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4
hydrogen chloride	US - Rhode Island Hazardous Substance List	IARC	
TWAPPM~	US - Maine Chemicals of High Concern List	Carcinogen	A4
Chlorine	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4
chlorine	US - Rhode Island Hazardous Substance List	IARC	
Chromium (VI) inorganic compounds - Water soluble (as Cr)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A1
chromium trioxide	US - Rhode Island Hazardous Substance List	IARC	
chromium trioxide	US - Rhode Island Hazardous Substance List	IARC	C
CHROMIUM TRIOXIDE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65-MC
CHROMIUM TRIOXIDE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65-MC
Polychlorinated biphenyls (PCBs) (high risk)(P)	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	2A
Polychlorinated biphenyls (PCBs) (low risk)(P)	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	
Chromium(VI) and its compounds - Water soluble (as Cr)	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca
TWAPPM~	US - Maine Chemicals of High Concern List	Carcinogen	A1
VPVB_VERY~	US - Maine Chemicals of High Concern List	Carcinogen	EU Carcinogen
Chromium (III) compounds	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Chromium (III) inorganic compounds (as Cr)	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4
chromic chloride	US - Rhode Island Hazardous Substance List	IARC	C

Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
This material and its container must be disposed of as hazardous waste.
Avoid release to the environment.
Refer to special instructions/ safety data sheets.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
chromium oxychloride	No Data Available	No Data Available		

hydrogen chloride	LOW	No Data Available	LOW	HIGH
chlorine	No Data Available	No Data Available	LOW	
chromium trioxide	No Data Available	No Data Available	LOW	
chromic chloride	No Data Available	No Data Available	LOW	

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)

Toxicity characteristic: use EPA hazardous waste number D007 (waste code E) if this substance, in a solid waste, produces an extract containing greater than 5 mg/L of chromium.

Disposal Instructions

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

! Puncture containers to prevent re-use and bury at an authorized landfill.

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. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. 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.

Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols: None Hazard class or Division: 8

Identification Numbers: UN1758 PG: I

Label Codes: 8 Special provisions: A3, A6,

A7, B10,

N34, T10,

TP2

Packaging: Exceptions: None Packaging: Non- bulk: 201

Packaging: Exceptions: None Quantity limitations: 0.5 L

Passenger aircraft/rail:

Quantity Limitations: Cargo 2.5 L Vessel stowage: Location: C aircraft only:

Vessel stowage: Other: 40, 66,

74, 89, 90

Hazardous materials descriptions and proper shipping names:

Chromium oxychloride

Air Transport IATA:

UN/ID Number: 1758 Packing Group: I

Special provisions: None

Cargo Only

Packing Instructions: 2.5 L Maximum Qty/Pack: 854

Passenger and Cargo Passenger and Cargo

Packing Instructions: 0.5 L Maximum Qty/Pack: 850

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden

Shipping Name: CHROMIUM OXYCHLORIDE

Maritime Transport IMDG:

IMDG Class: 8 IMDG Subrisk: None

UN Number: 1758 Packing Group: I

EMS Number: F-A , S-B Special provisions: None
Limited Quantities: 0 Marine Pollutant: Yes
Shipping Name: CHROMIUM OXYCHLORIDE

Section 15 - REGULATORY INFORMATION

chromium oxychloride (CAS: 14977-61-8) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Nova Scotia 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 Ingredient Disclosure List (SOR/88-64)", "Canada Non-Domestic Substances List (NDSL)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "International Chemical Secretariat (ChemSec) REACH SIN* List (*Substitute It Now!) 1.1", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Massachusetts Oil & Hazardous Material List", "US - Minnesota Hazardous Substance List", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Washington Permissible exposure limits of air contaminants", "US ACGIH Threshold Limit Values (TLV)", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US NIOSH Recommended Exposure Limits (RELs)", "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Regulations for ingredients

hydrogen chloride (CAS: 7647-01-0) 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 - Prince Edward Island Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Industrial Hazardous Substances", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Controlled Drugs and Substances Act Schedule VI", "Canada Domestic Substances List (DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Prohibited Toxic Substances, Schedule 2, Concentration Limits (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "CODEX General Standard for Food Additives (GSFA) - Additives Permitted for Use in Food in General, Unless Otherwise Specified, in Accordance with GMP", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Council of Chemical Associations (ICCA) - High Production Volume List", "International Maritime Dangerous Goods Requirements (IMDG Code) - Goods Forbidden for Transport", "OECD Representative List of High Production Volume (HPV) Chemicals", "United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances - Table II", "United Nations List of Precursors and Chemicals Frequently used in the Illicit Manufacture of Narcotic Drugs and Psychotropic Substances Under International Control (Red List) - Table II", "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 - Florida Essential Chemicals", "US - Hawaii Air Contaminant Limits", "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 (Z-1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "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 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 ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "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 Drug Enforcement Administration (DEA) List I and II Regulated Chemicals", "US EPA Acute Exposure Guideline Levels (AEGs) - Final", "US EPA High Production Volume Chemicals Additional List", "US EPA Master Testing List - Index I Chemicals Listed", "US EPCRA Section 313 Chemical List", "US Food Additive Database", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA 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 Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US SARA Section 302 Extremely Hazardous Substances", "US Spacecraft Maximum Allowable Concentrations (SMACs) for Airborne Contaminants", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

chlorine (CAS: 7782-50-5) 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 - Prince Edward Island Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens","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 Ingredient Disclosure List (SOR/88-64)","Canada National Pollutant Release Inventory (NPRI)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","International Council of Chemical Associations (ICCA) - High Production Volume List","OECD Representative List of High Production Volume (HPV) Chemicals","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 - 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 (Z-1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","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 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 ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","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 Department of Transportation (DOT) Marine Pollutants - Appendix B","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA Acute Exposure Guideline Levels (AEGs) - Final","US EPA High Production Volume Chemicals Additional List","US EPA Master Testing List - Index I Chemicals Listed","US EPCRA Section 313 Chemical List","US Food Additive Database","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA 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 SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27","WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

chromium trioxide (CAS: 1333-82-0) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","International Chemical Secretariat (ChemSec) REACH SIN* List (*Substitute It Now!) 1.1","OECD Representative List of High Production Volume (HPV) Chemicals","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)","US - Maine Chemicals of High Concern List","US - Massachusetts Oil & Hazardous Material List","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US CERCLA Priority List of Hazardous Substances","US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances","US DOE Temporary Emergency Exposure Limits (TEELs)","US NFPA 1 Annex B Typical Oxidizers","US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements"

chromic chloride (CAS: 10025-73-7,10060-12-5) is found on the following regulatory lists;

"Canada Ingredient Disclosure List (SOR/88-64)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","US - Massachusetts Oil & Hazardous Material List","US - New Jersey Right to Know Hazardous Substances","US - Pennsylvania - Hazardous Substance List","US DOE Temporary Emergency Exposure Limits (TEELs)","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Contact with air may produce sufficient heat to ignite combustible materials.*.
 - Skin contact may produce health damage*.
 - Cumulative effects may result following exposure*.
 - Possible respiratory sensitiser*.
- *(limited evidence).

Ingredients with multiple CAS Nos

Ingredient Name CAS chromic chloride 10025-73-7, 10060-12-5

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 preparation 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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