

Sulfuryl chloride

sc-251097

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

Sulfuryl chloride

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
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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-O₂-S, SO₂Cl₂, "sulphuryl chloride", "sulfonyl chloride", "sulfuric oxychloride"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

	Min	Max
Flammability:	0	
Toxicity:	3	
Body Contact:	4	
Reactivity:	2	
Chronic:	2	

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



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Reacts violently with water.
Toxic by inhalation.
Causes burns.
Risk of serious damage to eyes.
Very toxic to aquatic organisms.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- The material can produce 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.
- Accidental ingestion of the material may be damaging to the health of the individual.

EYE

- The material can produce 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 chemical burns following direct contact with the skin.
 - The material may cause moderate inflammation of the skin either following direct contact or after a delay of some time.
- Repeated exposure can cause contact dermatitis which is characterized by redness, swelling and blistering.
- 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.
 - 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

- Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects.
 - 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.
- Inhalation hazard is increased at higher temperatures.
 - 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.
- Sulfur dioxide irritation probably results from the action of sulfurous acid as the highly soluble gas dissolves in mucous fluid.
- Short-term exposure causes bronchoconstriction measurable as an increase in flow-resistance.

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.

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

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.

Repeated exposure of animals to airborne sulfur dioxide (SO₂) can produce a thickening of the mucous layer in the trachea and an increase in goblet cells and mucous glands similar to pathological changes found in chronic human bronchitis.

Chronic exposure to sulfur dioxide (SO₂) particulate complexes, present in polluted air, have been associated with the aggravation of chronic cardiovascular diseases such as asthma, chronic pulmonary disease, and coronary artery disease (this may occur at levels of 6-10 ug/m³ for 24 hours). An association exists between persistent cough and sputum production, particularly in women and non-smokers. A 10-year follow study on workers exposed to a mean sulfur dioxide concentration of up to 33 ppm did not reveal an increased prevalence of chronic respiratory disease or decreased pulmonary function.

By contrast, studies of smelter workers, exposed to concentrations below 2 ppm, suggest that chronic respiratory disease may develop and that workers exposed at concentrations exceeding 1 ppm show accelerated loss of pulmonary function.

Although SO₂ is not a carcinogen, the apparent increases in mortalities amongst arsenic-exposed smelter workers was greater when exposures included both high arsenic concentrations and moderate to high SO₂ exposures, suggesting that SO₂ might act as a promoter.

Intermittent exposure of rats to benz[a]pyrene along with inhalation of SO₂ at 4-10 ppm, 1-6 hours per day, 5 days per week, produced substantial increases in respiratory tract squamous cell carcinomas compared to that associated with exposure to B[a]P or SO₂ alone.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
sulfuryl chloride	7791-25-5	>98
on prolonged standing forms		
sulfur dioxide	7446-09-5	
chlorine	7782-50-5	
contact with moist air or water produces		
hydrogen chloride	7647-01-0	
sulfuric acid	7664-93-9	

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

■ 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, haemophysis 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.

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.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	99.758 @ 17.8 C
Upper Explosive Limit (%):	Not applicable
Specific Gravity (water=1):	1.6674
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

· Non combustible.

· Not considered to be a significant fire risk.

Decomposition may produce toxic fumes of: hydrogen chloride, sulfur oxides (SOx).

FIRE INCOMPATIBILITY

- Keep dry.
- NOTE: May develop pressure in containers; open carefully. Vent periodically.
- None known.

PERSONAL PROTECTION

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

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
- Check regularly for spills and leaks.
- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.

MAJOR SPILLS

- DO NOT touch the spill material.
- 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 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.

- 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.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Prince Edward Island Occupational Exposure Limits	sulfuryl chloride (Hydrogen chloride)					2			TLV Basis: upper respiratory tract irritation
Canada - Nova Scotia Occupational Exposure Limits	sulfuryl chloride (Hydrogen chloride)					2			TLV Basis: upper respiratory tract irritation
Canada - Northwest Territories Occupational Exposure Limits (English)	sulfuryl chloride (Hydrogen chloride)					5	7.5		

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

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

Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	sulfuryl chloride (Chlorine)	0.5		1		
US - Washington Permissible exposure limits of air contaminants	sulfuryl chloride (Chlorine)	0.5			1	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	sulfuryl chloride (Chlorine)	1	3	3	9	
US - Michigan Exposure Limits for Air Contaminants	sulfuryl chloride (Chlorine)	0.5	1.5	1	3	
US - Alaska Limits for Air Contaminants	sulfuryl chloride (Chlorine)	0.5	1.5	1	3	
US - Hawaii Air Contaminant Limits	sulfuryl chloride (Chlorine)	0.5	1.5	1	3	
US ACGIH Threshold Limit Values (TLV)	sulfuryl chloride (Chlorine)	0.5		1		TLV Basis: upper respiratory tract & eye irritation
US - California Permissible Exposure Limits for Chemical Contaminants	sulfuryl chloride (Chlorine)	0.5	1.5	1	3	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	sulfuryl chloride (Chlorine)	(C)1	(C)3			
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	sulfuryl chloride (Chlorine)	0.5	1.5	1	3	
US - Idaho - Limits for Air Contaminants	sulfuryl chloride (Chlorine)				1	3
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	sulfuryl chloride (CHLORINE)	0.00005				
Canada - British Columbia Occupational Exposure Limits	sulfuryl chloride (Chlorine)	0.5		1		
Canada - Alberta Occupational Exposure Limits	sulfuryl chloride (Chlorine)	0.5	1.5	1	2.9	

US NIOSH Recommended Exposure Limits (RELs)	sulfuryl chloride (Chlorine)	0.5	1.45	(Ceiling ([15-minute]))	
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	sulfuryl chloride (CHLORINE)	0.002			
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	sulfuryl chloride (CHLORINE)	0.07			
US - Minnesota Permissible Exposure Limits (PELs)	sulfuryl chloride (Chlorine)	0.5	1.5	1	3
Canada - British Columbia Occupational Exposure Limits	sulfur dioxide (Sulfur dioxide)	2		5	
Canada - Ontario Occupational Exposure Limits	sulfur dioxide (Sulfur dioxide / Soufre, dioxyde de)	2	5.2	5	10.4
US - Minnesota Permissible Exposure Limits (PELs)	sulfur dioxide (Sulfur dioxide)	2	5	5	13
US ACGIH Threshold Limit Values (TLV)	sulfur dioxide (Sulfur dioxide)			0.25	TLV Basis: pulmonary function; lower respiratory tract irritation
US NIOSH Recommended Exposure Limits (RELs)	sulfur dioxide (Sulfur dioxide)	2	5	5	13
Canada - Alberta Occupational Exposure Limits	sulfur dioxide (Sulphur dioxide)	2	5.2	5	13
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	sulfur dioxide (SULFUR DIOXIDE)	0.01			
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	sulfur dioxide (Sulfur dioxide)	2	5	5	10
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	sulfur dioxide (Sulfur dioxide)	5	13		
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air	sulfur dioxide (Sulfur dioxide)	2	5	5	10

Contaminants					
US - California Permissible Exposure Limits for Chemical Contaminants	sulfur dioxide (Sulfur dioxide)	2	5	5	10
US - Idaho - Limits for Air Contaminants	sulfur dioxide (Sulfur dioxide)	5	13		
US OSHA Permissible Exposure Levels (PELs) - Table Z1	sulfur dioxide (Sulfur dioxide)	5	13		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	sulfur dioxide (Sulphur dioxide)	2		5	
US - Hawaii Air Contaminant Limits	sulfur dioxide (Sulfur dioxide)	2	5	5	10
US - Alaska Limits for Air Contaminants	sulfur dioxide (Sulfur dioxide)	2	5	5	10
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	sulfur dioxide (Sulphur dioxide)	5	13	5	13
Canada - Yukon Carcinogens with a Permitted Exposure	sulfur dioxide (Arsenic trioxide production - (SO)2)	C5			
US - Washington Permissible exposure limits of air contaminants	sulfur dioxide (Sulfur dioxide)	2		5	
US - Michigan Exposure Limits for Air Contaminants	sulfur dioxide (Sulfur dioxide)	2	5	5	10
Canada - Prince Edward Island Occupational Exposure Limits	sulfur dioxide (Sulfur dioxide)			0.25	TLV Basis: pulmonary function; lower respiratory tract irritation
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	sulfur dioxide (Sulfur dioxide)	5	13		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	sulfur dioxide (Sulfur dioxide)	2	5.2	5	13
US - Oregon Permissible Exposure Limits (Z-1)	sulfur dioxide (Sulfur dioxide)	5	13		

Canada - Northwest Territories Occupational Exposure Limits (English)	sulfur dioxide (Sulphur dioxide)	2	5	5	13	
Canada - Nova Scotia Occupational Exposure Limits	sulfur dioxide (Sulfur dioxide)			0.25		TLV Basis: pulmonary function; lower respiratory tract irritation
US - Minnesota Permissible Exposure Limits (PELs)	sulfuric acid (Sulfuric acid)		1			
Canada - British Columbia Occupational Exposure Limits	sulfuric acid (Sulfuric acid, Thoracic Revised 2004)		0.2 (M)			A2, 1
US ACGIH Threshold Limit Values (TLV)	sulfuric acid (Sulfuric acid)		0.2			TLV Basis: pulmonary function. A2 = as contained in strong inorganic acid mists
US NIOSH Recommended Exposure Limits (RELs)	sulfuric acid (Sulfuric acid)		1			
Canada - Alberta Occupational Exposure Limits	sulfuric acid (Sulphuric acid)		1		3	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	sulfuric acid (Sulfuric acid)		1			
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			
US - Idaho - Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			
US - California Permissible Exposure Limits for Chemical Contaminants	sulfuric acid (Sulfuric acid)		1		3	
US - Hawaii Air Contaminant Limits	sulfuric acid (Sulfuric acid)		1		3	
US - Alaska Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			

US - Michigan Exposure Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	sulfuric acid (Sulphuric acid)	-	1	-	1	
US - Washington Permissible exposure limits of air contaminants	sulfuric acid (Sulfuric acid)		1		3	
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	sulfuric acid (Sulphuric acid, (thoracic fraction++))		0.2		0.6	T20, strong acid mists only
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	sulfuric acid (Sulfuric acid)		1			
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	sulfuric acid (Sulfuric acid)		1		3	
US OSHA Permissible Exposure Levels (PELs) - Table Z1	sulfuric acid (Sulfuric acid)		1			
Canada - Prince Edward Island Occupational Exposure Limits	sulfuric acid (Sulfuric acid)		0.2			TLV Basis: pulmonary function. A2 = as contained in strong inorganic acid mists
US - Oregon Permissible Exposure Limits (Z-1)	sulfuric acid (Sulfuric acid)	-	1			
Canada - Northwest Territories Occupational Exposure Limits (English)	sulfuric acid (Sulphuric acid)		1		3	
Canada - Nova Scotia Occupational Exposure Limits	sulfuric acid (Sulfuric acid)		0.2			TLV Basis: pulmonary function. A2 = as contained in strong inorganic acid mists

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.

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.

- Neoprene gloves.

OTHER

- Overalls.
- PVC Apron.

ENGINEERING CONTROLS

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

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Corrosive.

Acid.

Toxic or noxious vapours/gas.

Reacts violently with water.

State	Liquid	Molecular Weight	134.98
Melting Range (°F)	-65	Viscosity	Not Available
Boiling Range (°F)	157	Solubility in water (g/L)	Reacts
Flash Point (°F)	None	pH (1% solution)	Not available
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not available
Autoignition Temp (°F)	Not available	Vapor Pressure (mmHg)	99.758 @ 17.8 C
Upper Explosive Limit (%)	Not applicable	Specific Gravity (water=1)	1.6674
Lower Explosive Limit (%)	Not applicable	Relative Vapor Density (air=1)	4.65
Volatile Component (%vol)	100	Evaporation Rate	Not available

APPEARANCE

Colourless mobile liquid with very pungent odour; slowly decomposed by water. Yellows on standing as a result of the formation of SO₂ and Cl₂. Forms the hydrate (SO₂Cl₂·1.5H₂O) in ice-cold water which in appearance resembles camphor. Mixes with benzene, toluene, ether, glacial acetic acid and other organic solvents.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Contact with alkaline material liberates heat.

- Presence of incompatible materials.

STORAGE INCOMPATIBILITY

■ Chlorine:

- is a strong oxidiser
- reacts explosively with acetylene, boron, diborane, or other boron hydrides at ordinary temperatures
- forms easily ignited, sensitive explosive mixtures with gases and vapours such as anhydrous ammonia, benzene, butane, ethane, ethylene, fluorine, hydrocarbons, formaldehyde, hydrogen, hydrogen bromide, hydrogen chloride, oxygen, propane, propene in the presence of heat, hot surfaces, welding arc, sparks, strong sunlight, UV light, or a catalyst such as mercury oxide
- contact with 2-carboxymethylisothiuronium chloride or s-ethylisothiuronium hydrogen sulfate may form nitrogen trichloride. a dangerous explosive
- reacts violently with combustible materials, reducing agents, acetylene, molten aluminium (ignites on contact with the gas), alcohols, arsenic compounds, arsine, bismuth, boron, calcium compounds, carbon, diethylzinc, dimethylformamide, ether, ethyl phosphine, fluorine, germanium, hydrocarbons, hydrazine, hydrogen sulfide, hydroxylamine, iridium, lithium, lithium acetylide, magnesium, magnesium oxide, magnesium phosphide, mercury sulfide, methyl vinyl ether, metal carbides, molybdenum trioxide, potassium acetylide, sodium acetylide, sulfamic, sulfur dioxide, triethylborane and many other substances
- forms explosive mixtures with gasoline and petroleum products, such as mineral oil, , greases, phosphorus, silicones, turpentine, finely divided metals, organic compounds
- in its liquid form reacts explosively with carbon disulfide, linseed oil, propylene, rubber, wax, white phosphorus
- attacks some plastics and coatings
- may cause dangerous fires in contact with hot solid metals (especially steel - iron/ chlorine fire can cause the bursting of storage containers)
- when moist (150 ppm in water) is extremely corrosive to most metals especially in the presence of heat.
- reacts with water to give hydrogen chloride, with carbon monoxide to form phosgene, and with sulfur dioxide to give sulfuryl chloride

Chlorine storage areas shall be separated from anhydrous ammonia storage areas by a vapour path of at least 10 meters.

- 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.

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 with mild steel, galvanized steel / zinc producing hydrogen gas which may form an explosive mixture with air.

Sulfur dioxide:

- reacts with water or steam forming sulfurous acid; reaction may be violent
- reacts with acrolein, alcohols, aluminium powder, alkali metals, amines, bromine, pentafluoride, caustics, caesium, acetylene carbide, chlorates, chlorine trifluoride, chromium powder, copper or its alloy powders, diethylzinc, fluorine, lead dioxide, lithium acetylene carbide, metal powders, monolithium acetylide-ammonia, nitril chloride, potassium acetylene carbide, potassium acetylide, potassium chlorate, rubidium carbide, silver azide, sodium, sodium acetylide, stannous oxide; reaction may be violent
- decomposes above 60 deg. C releasing oxides of sulfur
- Incompatible with alkalis, alkylene oxides, ammonia, aliphatic amines, alkanolamines, amides, organic anhydrides, caesium monoxide, epichlorohydrin, ferrous oxide, halogens, interhalogens, isocyanates, lithium nitrate, manganese, metal acetylides, metal oxides, perbromyl fluoride, red phosphorus, potassium azide, rubidium acetylide, sodium hydride, sulfuric acid
- attacks some plastics, coatings and rubber
- attacks metals, especially chemically active metals, in the presence of moisture.

Segregate from alcohol, water.

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

Sulfuryl chloride:

- forms corrosive mixture with air
- reacts with water or steam producing heat and yielding sulfuric acid and hydrogen chloride vapours
- reacts violently with alkalis, alkali metals, dimethyl sulfoxide, dinitrogen pentoxide, lead dioxide, N-methylformamide, red phosphorus
- reacts possibly violently, with organic substances, strong acids, alcohols, amines, diethyl ether (especially if peroxides are present), glycols, peroxides
- attacks metals in the presence of moisture, producing hydrogen gas.

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

Section 11 - TOXICOLOGICAL INFORMATION

sulfuryl chloride

TOXICITY AND IRRITATION

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

■ 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.

HYDROGEN CHLORIDE:

SULFUR DIOXIDE:

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

SULFURYL CHLORIDE:

TOXICITY	IRRITATION
----------	------------

Inhalation (rat) LC50: 131 ppm/1h male *	Nil Reported
--	--------------

Inhalation (rat) LC50: 242 ppm/1h female* * [Sigma/Aldrich]

■ 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 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.

TOXICITY	IRRITATION
----------	------------

SULFUR DIOXIDE:

Inhalation (rat) LC50: 2520 ppm/1h

Nil
Reported

Inhalation (human) LCLo: 1000 ppm/10m

Inhalation (human) TCLo: 3 ppm/5d

400-500 ppm - immediately dangerous to life.

NOTE: Aggravates chronic pulmonary disease and increases the risk of acute

and chronic respiratory disease - condition aggravated by smoking.

CHLORINE:

Inhalation (human) LCLo: 500 ppm/5 minutes

Inhalation (rat) LC50: 293 ppm/1 hour

HYDROGEN CHLORIDE:

Inhalation (human) LCLo: 1300 ppm/30m

Eye
(rabbit):
5
mg/30s
- Mild

Inhalation (human) LCLo: 3000 ppm/5m

Inhalation (rat) LC50: 3124 ppm/60m

4701 ppm/30m

SULFURIC ACID:

Oral (rat) LD50: 2140 mg/kg

Eye
(rabbit):
1.38 mg
SEVERE

Inhalation (rat) LC50: 510 mg/m³/2h

Eye (rabbit): 5 mg/30sec SEVERE

Inhalation (human) TCLo: 3 mg/m³/24w

■ WARNING: For inhalation exposure ONLY: This substance has been classified by the IARC as Group 1: CARCINOGENIC TO HUMANS

The International Agency for Research on Cancer (IARC) has classified occupational exposures to respirable (<5 µm) crystalline silica as being carcinogenic to humans. This classification is based on what IARC considered sufficient evidence from epidemiological studies of humans for the carcinogenicity of inhaled silica in the forms of quartz and cristobalite. Crystalline silica is also known to cause silicosis, a non-cancerous lung disease.

Occupational exposures to strong inorganic acid mists of sulfuric acid:

CARCINOGEN

sulfuryl chloride	US - Rhode Island Hazardous Substance List	IARC	
sulfur dioxide	US - Rhode Island Hazardous Substance List	IARC	
chlorine	US - Rhode Island Hazardous Substance List	IARC	
hydrogen chloride	US - Rhode Island Hazardous Substance List	IARC	
sulfuric acid	US - Rhode Island Hazardous Substance List	IARC	
STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
STRONG INORGANIC ACID MISTS CONTAINING SULFURIC ACID	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
VPVB_(VERY~	US - Maine Chemicals of High Concern List	Carcinogen	CA Prop 65; IARC; NTP 11th ROC

Section 12 - ECOLOGICAL INFORMATION

Very toxic to aquatic organisms.

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
sulfuryl chloride	HIGH	No Data Available	LOW	HIGH
sulfur dioxide	LOW	No Data Available	LOW	HIGH
chlorine	No Data Available	No Data Available	LOW	
hydrogen chloride	LOW	No Data Available	LOW	HIGH
sulfuric acid	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)

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.

For small quantities:

- Neutralize an aqueous solution of the material.
- Filter solids for disposal to approved land fill.
- 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: + Hazard class or Division: 8

Identification Numbers: UN1834 PG: I

Label Codes: 8, 6.1 Special provisions: 1, B6, B9,

B10, B14,

B30, B77,

N34, T22,

TP2, TP38,

TP44

Packaging: Exceptions: None Packaging: Non- bulk: 226

Packaging: Exceptions: None Quantity limitations: Forbidden

Passenger aircraft/rail:

Quantity Limitations: Cargo Forbidden Vessel stowage: Location: C
aircraft only:

Vessel stowage: Other: 40

Hazardous materials descriptions and proper shipping names:

Sulfuryl chloride

Air Transport IATA:

ICAO/IATA Class: 6.1 (8) ICAO/IATA Subrisk: None

UN/ID Number: 1834 Packing Group: -

Special provisions: None

Cargo Only

Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden

Passenger and Cargo Passenger and Cargo

Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden

Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity

Packing Instructions: Forbidden Maximum Qty/Pack: Forbidden

■ Air transport may be forbidden if this material is flammable, corrosive or toxic gases may be released under normal conditions of transport.

Shipping Name: SULPHURYL CHLORIDE

Maritime Transport IMDG:

IMDG Class: 8 IMDG Subrisk: None

UN Number: 1834 Packing Group: I

EMS Number: F-A , S-B Special provisions: None

Limited Quantities: 0 Marine Pollutant: Yes

Shipping Name: SULPHURYL CHLORIDE

Section 15 - REGULATORY INFORMATION

sulfuryl chloride (CAS: 7791-25-5) is found on the following regulatory lists;

"Canada Ingredient Disclosure List (SOR/88-64)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "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 Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Interim", "US EPA High Production Volume Chemicals Additional List", "US Toxic Substances Control Act (TSCA) - Inventory", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

Regulations for ingredients

sulfur dioxide (CAS: 7446-09-5) 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 - Ontario 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 Carcinogens with a Permitted Exposure", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Environmental Protection Act (CEPA) 1999 - Schedule 1 Toxic Substances List", "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)", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "International Council of Chemical Associations (ICCA) - High Production Volume List", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "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 Permissible Exposure Limits for Chemical Contaminants", "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 Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Final", "US EPA High Production Volume Chemicals Additional List", "US FDA Direct Food Substances Generally Recognized as Safe", "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) - Inventory", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

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) - 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"

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 (AELs) - 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) - Inventory"

sulfuric acid (CAS: 7664-93-9) 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 - Saskatchewan Occupational Health and Safety Regulations - Designated Chemical Substances", "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 Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "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 Air Transport Association (IATA) Dangerous Goods Regulations", "International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List", "International Council of Chemical Associations (ICCA) - High Production Volume List", "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 Proposition 65 - Priority List for the Development of NSRLs for Carcinogens", "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 - Maine Chemicals of High Concern List", "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 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 Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US CWA (Clean Water Act) - List of Hazardous Substances", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "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) - Interim", "US EPA High Production Volume Chemicals Additional List", "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 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 NIOSH Recommended Exposure Limits (RELs)", "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 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 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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