



POTASSIUM ETHYL XANTHATE

GHS Safety Data Sheet

Version No:5.1.1.1

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

POTASSIUM ETHYL XANTHATE

OTHER NAMES

C3-H5-O-S2-K, CH3-CH2-O-CS-S-K, "carbonic acid, dithio-, O-ethyl ester, potassium salt", "carbonodithioic acid, O-ethyl ester, potassium salt", "potassium ethylxanthogenate", "potassium-O-ethyl carbonodithioate", "potassium-O-ethyl dithiocarbonate", "Aeroxanthate 303", PEX, Z3, "ethylxanthic acid, potassium salt", "potassium xanthate", "potassium xanthogenate", "potassium ethylxanthate"

PROPER SHIPPING NAME

XANTHATES

PRODUCT USE

■ Operators should be trained in procedures for safe use of this material.
Flotation agent for the froth separation of metal sulfide ores; pesticide; rubber chemical.

SUPPLIER

Company: S D FINE- CHEM LIMITED

Address:

315- 317, T.V.Ind.Estate,

248, Worli Road

Mumbai- 400030, India

www.sdfine.com

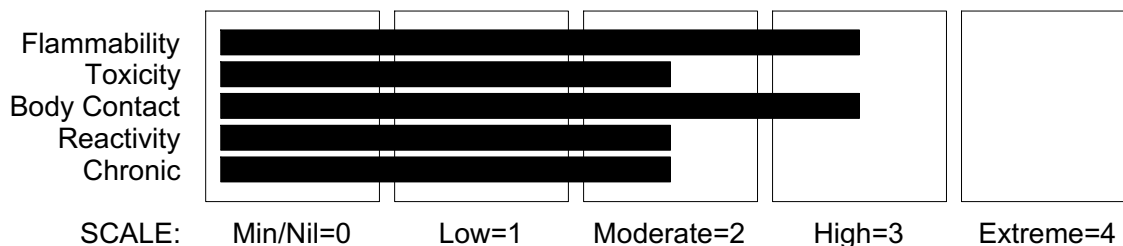
Telephone: 91- 22 24959898/99

Fax: 91- 22 2493 7232

Email: technical@sdfine.com

Section 2 - HAZARDS IDENTIFICATION

HAZARD RATINGS



GHS Classification

Acute Toxicity Category 4

continued...

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Section 2 - HAZARDS IDENTIFICATION

Chronic Aquatic Hazard Category 1
Eye Irritation Category 2A
Pyrophoric Solid Category 1
Skin Corrosion/Irritation Category 2
STOT - SE Category 3



EMERGENCY OVERVIEW

HAZARD DANGER

Determined by using GHS criteria

H250	Catches fire spontaneously if exposed to air.
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H410	Very toxic to aquatic life with long lasting effects.

PRECAUTIONARY STATEMENTS

Prevention

Code	Phrase
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P222	Do not allow contact with air.
P261	Avoid breathing dust/fume/gas/mist/vapours/spray.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well- ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing/eye protection/face protection.

Response

Code	Phrase
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P302+P352	IF ON SKIN: Wash with plenty of soap and water.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER or doctor/physician if you feel unwell.
P330	Rinse mouth.
P332+P313	If skin irritation occurs: Get medical advice/attention.
P335+P334	Brush off loose particles from skin. Immerse in cool water/wrap in wet bandages.
P337+P313	If eye irritation persists: Get medical advice/attention.
P362	Take off contaminated clothing and wash before re- use.
P391	Collect spillage.

Storage

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Section 2 - HAZARDS IDENTIFICATION

Code P403+P233 P405	Phrase Store in a well- ventilated place. Keep container tightly closed. Store locked up.
Disposal Code P501	Phrase Dispose of contents/container to ...

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
potassium ethyl xanthate	140-89-6	> 95
NOTE: product degrades to give carbon disulfide (CS ₂)	75-15-0	

Section 4 - FIRST AID MEASURES

SWALLOWED

- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- For advice, contact a Poisons Information Centre or a doctor.
- Urgent hospital treatment is likely to be needed.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.
- If the services of a medical officer or medical doctor are readily available, the patient should be placed in his/her care and a copy of the MSDS should be provided. Further action will be the responsibility of the medical specialist.
- If medical attention is not available on the worksite or surroundings send the patient to a hospital together with a copy of the MSDS.

Where medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:

- INDUCE vomiting with fingers down the back of the throat, ONLY IF CONSCIOUS. Lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

NOTE: Wear a protective glove when inducing vomiting by mechanical means.

EYE

- If in eyes, hold eyelids apart and flush the eye continuously with running water.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- 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.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

For THERMAL burns:

- Do NOT remove contact lens
- Lay victim down, on stretcher if available and pad BOTH eyes, make sure dressing does not press on the injured eye by placing thick pads under dressing, above and below the eye.
- Seek urgent medical assistance, or transport to hospital.

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Section 4 - FIRST AID MEASURES

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.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

In case of burns:

- Immediately apply cold water to burn either by immersion or wrapping with saturated clean cloth.
- DO NOT remove or cut away clothing over burnt areas. DO NOT pull away clothing which has adhered to the skin as this can cause further injury.
- DO NOT break blister or remove solidified material.
- Quickly cover wound with dressing or clean cloth to help prevent infection and to ease pain.
- For large burns, sheets, towels or pillow slips are ideal; leave holes for eyes, nose and mouth.
- DO NOT apply ointments, oils, butter, etc. to a burn under any circumstances.
- Water may be given in small quantities if the person is conscious.
- Alcohol is not to be given under any circumstances.
- Reassure.
- Treat for shock by keeping the person warm and in a lying position.
- Seek medical aid and advise medical personnel in advance of the cause and extent of the injury and the estimated time of arrival of the patient.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Transport to hospital, or doctor, without delay.

NOTES TO PHYSICIAN

- Carbon disulfide intoxication results in severe debilitating CNS symptoms (irritability, mania, hallucinations, tremors, memory loss).
- Chronic industrial exposures may cause neuropsychiatric changes, peripheral neuropathies and accelerated atherogenic changes.
- Peak blood concentrations appear 2 hours after inhalation. Plasma elimination half-life is about 1 hour. Metabolic products seen in urine include thiourea, 2-mercapto-2-thiazolin-5-one and 2-thiothiazolidine-4-carboxylic acid (TTCA). The iodine-azide test identifies these.
- Initial management of severe inhalation poisoning requires careful attention to airway, breathing and circulation. Treatment involves symptomatic care.

BIOLOGICAL EXPOSURE INDEX - BEI

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

Determinant	Index	Sampling Time	Comments
2- Thiothiazolidine- 4-carboxylic acid (TTCA) in urine	5mg/gm creatinine	End of shift	

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Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

■ For SMALL FIRES:

- Dry chemical, CO₂, water spray or foam.

For LARGE FIRES:

- Foam, fog or water spray
- DO NOT use water jets.

FIRE FIGHTING

- Wear SCBA and fully-encapsulating, gas-tight suits when handling these substances.
- Always wear thermal protective clothing when handling molten substances.
- Structural fire fighter's uniform will only provide limited protection.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Consider evacuation (or protect in place).
- Fight fire from a safe distance, with adequate cover.
- If safe, switch off electrical equipment until vapour fire hazard removed.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

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

FIRE/EXPLOSION HAZARD

- May ignite on contact with air leading to spontaneous combustion
- May decompose explosively when heated or involved in fire.
- May REIGNITE after fire is extinguished.
- Gases generated in fire may be poisonous, corrosive or irritating.
- Containers may explode on heating.
- Runoff may create multiple fire or explosion hazard.

Combustion products include:.

Combustible. Will burn if ignited., carbon monoxide (CO), carbon dioxide (CO₂), sulfur oxides (SO_x), metal oxides, other pyrolysis products typical of burning organic material.

Xanthates present of significant hazard when exposed to heat or flame. Heat produces decomposition resulting in the release of highly flammable and toxic carbon disulfide, hydrogen sulfide, carbonyl sulfide, the corresponding alkyl alcohol and a sulfide salt.

FIRE INCOMPATIBILITY

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

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Eliminate all ignition sources.
- Cover with WET earth, sand or other non-combustible material.
- Use clean, non-sparking tools to collect absorbed material

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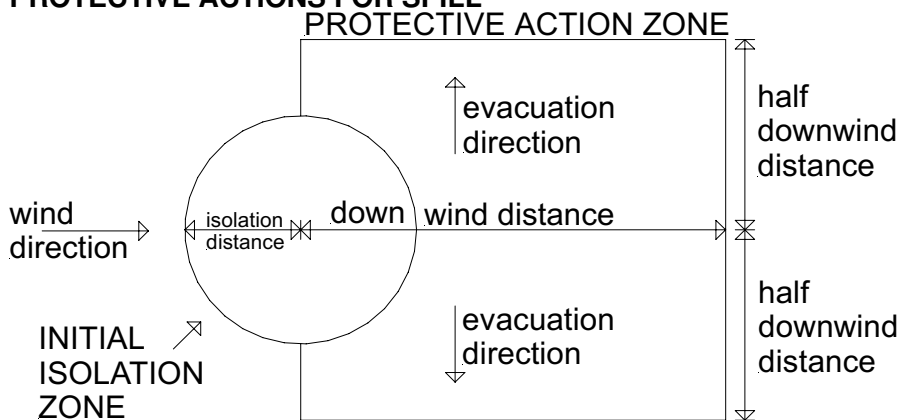
Section 6 - ACCIDENTAL RELEASE MEASURES

- Wear gloves and safety glasses as appropriate.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Eliminate all ignition sources (no smoking, flares, sparks or flames)
- Stop leak if safe to do so; prevent entry into waterways, drains or confined spaces.
- May be violently or explosively reactive.
- DO NOT walk through spilled material.
- DO NOT touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Cover with WET earth, sand or other non-combustible material.
- Use clean, non-sparking tools to collect absorbed material and place into loosely-covered metal or plastic containers ready for disposal.
- Alternately, the spill may be contained using WET earth, sand, or vermiculite and then covered with a high boiling point mineral oil.
- Recover the liquid using non-sparking appliances and place in labelled, sealable container.
- Water spray may be used to knock down vapours or divert vapour clouds.
- Wash area with water and dike for later disposal;
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



From IERG (Canada/Australia)

Isolation Distance	50 metres
Downwind Protection Distance	250 metres
IERG Number	25

FOOTNOTES

- 1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.
- 2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.
- 3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

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Section 6 - ACCIDENTAL RELEASE MEASURES

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills".

LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 135 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- For large scale or continuous use, spark-free, earthed ventilation system venting directly to the outside and separate from usual ventilation systems
- Provide dust collectors with explosion vents.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.
- Use in a well-ventilated area.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately and before re-use
- Use good occupational work practice.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

NOTE: The material may remove oxygen from the air thus producing a severe hazard to workers inside enclosed or confined spaces where the material might accumulate. Before entry to such areas, sampling and test procedures for low oxygen levels should be undertaken; control conditions should be established to ensure the availability of adequate oxygen supply.

- Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions)
- Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.
- Establish good housekeeping practices.
- Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds.
- Use continuous suction at points of dust generation to capture and minimise the accumulation of dusts. Particular attention should be given to overhead and hidden horizontal surfaces to minimise the probability of a "secondary" explosion. According to NFPA Standard 654, dust layers 1/32 in.(0.8 mm) thick can be sufficient to warrant immediate cleaning of the area.
- Do not use air hoses for cleaning.
- Minimise dry sweeping to avoid generation of dust clouds. Vacuum dust-accumulating surfaces and remove to a chemical disposal area. Vacuums with explosion-proof motors should be used.
- Control sources of static electricity. Dusts or their packages may accumulate static charges, and static discharge can be a source of ignition.
- Solids handling systems must be designed in accordance with applicable standards (e.g. NFPA including 654 and 77) and other national guidance.
- Do not empty directly into flammable solvents or in the presence of flammable vapors.

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Section 7 - HANDLING AND STORAGE

- The operator, the packaging container and all equipment must be grounded with electrical bonding and grounding systems. Plastic bags and plastics cannot be grounded, and antistatic bags do not completely protect against development of static charges.

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

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

SUITABLE CONTAINER

- Xanthate in pellet or powder form may be supplied in 110, 120 kg steel drums with an inner polyethylene liner. The inner lining is tied off while the drum lids are secured by ring clamps. The quality of the packaging of the chemical varies from batch to batch. It is imperative that quality control standards are imposed before shipment of such containers - exposure to the environment may introduce significant risks
- Xanthates may be stored and transported in certain composite Intermediate Bulk Carriers (IBCs), subject to the approval of a competent Authority
- Bulk packaging of xanthates, in plastic bulker bags containing 500, 700 kg, is common. The packaging consists of a polyethylene inner bag containing the xanthate enclosed in an outer hessian bag. The inner bag is manually tied. The hessian bag is a support for the inner bag and has lifting straps for transport. The hessian bag is not sealed. Difficulties in subsequent handling and exposure of the xanthate to the environment make this mode of packaging potentially hazardous
- Some bulker bags have been modified to include a double lined inner plastic bag enclosed in an outer polyethylene bag and the inner bag is heat sealed.

For low viscosity materials and solids:

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.

For materials with a viscosity of at least 2680 cSt. (23 deg. C):

- Removable head packaging and
- cans with friction closures may be used.

-

Where combination packages are used, there must be sufficient inert absorbent material to absorb completely any leakage that may occur, unless the outer packaging is a close fitting moulded plastic box and the substances are not incompatible with the plastic.

All combination packages for Packing group I and II must contain cushioning material.

STORAGE INCOMPATIBILITY

- Contact with water liberates highly flammable gases.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

Carbon disulfide:

- may decompose explosively when subject to shock, friction or concussion
- may ignite spontaneously on contact with air, or with hot surfaces releasing toxic and flammable hydrogen sulfide gas
- vapours may be ignited by contact with an ordinary light bulb, a warm steam pipe or a hot exhaust pipe
- the vapour or liquid may ignite in contact with hot steam pipes, particularly if rusted
- may release hydrogen sulfide on contact with acids or acid fumes
- contact with metal oxides may lower ignition point
- reacts with zinc with incandescence
- is incompatible with chemically active metals (sodium, potassium, aluminium, magnesium)
- ignites or reacts violently with alkali metals, strong oxidisers, reducing agents, including hydrides, nitrides and sulfides, alkali metals, nitrogen oxide
- vapour may cause ignition or explosion of finely divided aluminium, dichlorine oxide, fluorine, chlorine, phosphorus oxychloride
- mixtures with potassium-sodium alloy, potassium, sodium or lithium are capable of detonation by shock (the

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Section 7 - HANDLING AND STORAGE

- explosive power decreases in that order), though not by heating
- explosively reacts with azides, active metals, metal oxides, metal azides, amines, imines, halogens, nitrogen oxides, permanganates and sulfuric acid.
- aqueous solutions with metal azides produce metal azodithioformates, most of which are explosive with varying degrees of power and sensitivity to shock or heat
- forms impact-sensitive explosive with potassium azide
- is incompatible with aliphatic amines, alkanolamines, carbon monoxide, chlorine monoxide, ethylene, diamine, ethyleneimine, halogens, organic amines
- attacks some forms of plastic, rubber and coatings
- flow or agitation may generate electrostatic charges.
- Avoid reaction with oxidising agents.
- Xanthate derivatives are hazardous as dusts, forming explosive suspensions in air.
- The lower alkyl salts are explosive in the solid state when dry.
- Diazonium salts of the xanthates are explosive and sensitive to shock, heat and radiation.

BREThERICK L.: Handbook of Reactive Chemical Hazards

- Xanthates should not be stored with oxidisers, combustible materials, acids, phosgene or sulfur chlorides.
- Contact with acids or oxidising material may cause fire and explosion due to very rapid decomposition.
- Contact with water and the salts of alkyl xanthates, produces the corresponding alkyl alcohol, a carbonate salt, trithiocarbonate and toxic, highly flammable carbon disulfide.
- Solid forms should be kept away from water and heat sources.
- A combination of water and hot weather can cause the material to spontaneously ignite. One of the factors involved in the formation of carbon disulfide is the moisture content of the product. Sodium ethyl xanthate powder and pellets, for example, contain up to 7% moisture. Damage to the packaging or inadequate packaging can lead to absorption of additional moisture and release of carbon disulfide. Defective packaging has resulted in damage to the drums and the lids working loose during transport. Bulker bags are more prone to puncture during transport and also during filling of the bags at the manufacturing site. In addition, both drum liners and inner bulker bags are usually manually tied and not sealed.
- Another significant risk during transport and storage is the potential of spontaneous combustion. Spontaneous combustion depends on the heat of the reaction involved, moisture content, ambient temperature and the size of the packaging. The larger the packaging size is the greater the risk of spontaneous combustion, hence bulker bags present a greater risk than steel drums. The risk is also increased due to the conditions in which the xanthate is stored. High temperatures in the holds of ships and storage areas on mining sites in hotter climates can lead to increased release of carbon disulfide.
- Decomposition of xanthate solutions is accelerated by the presence of metal salts, such as copper, iron, lead and zinc. Metal salts are often present in flotation tanks when xanthates are used.
- The rate of decomposition, in solution, decreases with the age of the solution. Decomposition is greatest during the first hour and then the rate decreases. The decrease in the rate of decomposition is due to the accumulation of reaction products which inhibit further decomposition. At mining sites, xanthate solutions are generally stored for one day.

STORAGE REQUIREMENTS

- Material is hygroscopic, i.e. absorbs moisture from the air. Keep containers well sealed in storage.
- Store under an inert gas, e.g. argon or nitrogen.
- Bulk xanthate storages should be blanketed with nitrogen and equipped with absorptive type breather valve(s) to prevent vapour emission.
- WARNING: Gradual decomposition in strong, sealed containers may lead to gradual but significant buildup of pressure and subsequent explosion.

FOR MINOR QUANTITIES:

- Store in an indoor fireproof cabinet or in a room of noncombustible construction.
- Provide adequate portable fire-extinguishers in or near the storage area.

FOR PACKAGE STORAGE:

- Store in original containers in approved flame-proof area.
- No smoking, naked lights, heat or ignition sources.
- DO NOT store in pits, depressions, basements or areas where vapours may be trapped.

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Section 7 - HANDLING AND STORAGE

- Keep containers securely sealed.
- Store away from incompatible materials in a cool, dry, well ventilated area.
- Protect containers against physical damage and check regularly for leaks.
- Protect containers from exposure to weather and from direct sunlight unless: (a) the packages are of metal or plastic construction; (b) the packages are securely closed and not opened for any purpose while in the area where they are stored and (c) adequate precautions are taken to ensure that rain water, which might become contaminated by the dangerous goods, is collected and disposed of safely.
- Ensure proper stock-control measures are maintained to prevent prolonged storage of dangerous goods.
- Observe manufacturer's storage and handling recommendations contained within this MSDS.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+: May be stored together

O: May be stored together with specific precautions

X: Must not be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

- potassium ethyl xanthate: CAS:140- 89- 6
- carbon disulfide: CAS:75- 15- 0

EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
carbon disulfide	1557	500 [Unch]

MATERIAL DATA

CARBON DISULFIDE:

POTASSIUM ETHYL XANTHATE:

■ for carbon disulfide:

Odour Threshold Value: 0.026-0.16 ppm

Based on industrial experience;

160-230 ppm : generally produces no acute symptoms in man

320-390 ppm : exposure may be bearable for several hours with headaches and unpleasant feeling resulting after 8 hours.

1150 ppm : produces giddiness

2000-3200 ppm: may produce light intoxication, paraesthesias and irregular breathing within 30-60 minutes.

4800 ppm : may be lethal

NOTE: Detector tubes for carbon disulfide, measuring in excess of 3 ppm, are commercially available. Long-term measurements (8 hrs) may be conducted to detect concentrations exceeding 1.3 ppm.

Exposure at or below the TLV-TWA is thought to protect the worker against cardiovascular, reproductive and central nervous system effects. Differences between the limits set by various agencies seem to reflect the response to carbon disulfide amongst workers in different countries (more adverse health effects are reported

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

in European workers than in U.S. workers under equivalent exposures). This difference may lie within worker population demographics, specific work practices, differences in the amount of carbon disulfide absorbed through the skin, interactions with other substances, nutritional status, genetic predisposition or differences in the sampling and analyses of workplace environments.

Odour Safety Factor(OSF)

OSF=45 (carbon disulfide).

CARBON DISULFIDE:

POTASSIUM ETHYL XANTHATE:

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

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

The Odour Safety Factor (OSF) is defined as:

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

Classification into classes follows:

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

POTASSIUM ETHYL XANTHATE:

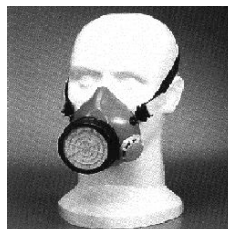
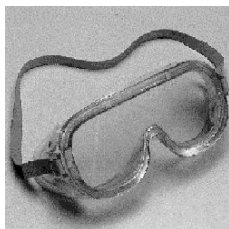
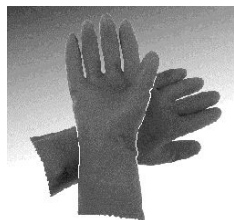
■ TWA: 1 mg/m³ (0.17 ppm) as xanthate (skin)

(

Exposure limits with "skin" notation indicate that vapour and liquid may be absorbed through intact skin.

Absorption by skin may readily exceed vapour inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

PERSONAL PROTECTION



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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE

- Safety glasses with side shields.
- Chemical goggles.
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent].

HANDS/FEET

■ NOTE:

- The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
- Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application. The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice. Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
 - frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexteritySelect gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).
- 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) 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.
- Fire resistant/ heat resistant gloves where practical, otherwise
- Heavy-duty chemically resistant gloves capable of providing short-term protection against spontaneous ignition.

OTHER

- Wear protective clothing appropriate for the work situation. For large scale or continuous use, when handling dry powder, wear :
 - non-sparking safety footwear,
 - tight-weave, non-static, noncombustible or flameproof clothing without cuffs, metallic fasteners, pockets, or laps in which powder may collect.
 - Protective overalls, closely fitted at neck and wrist.
 - Eye-wash unit.

IN CONFINED SPACES:

continued...

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

- Non-sparking protective boots
- Static-free clothing.
- Ensure availability of lifeline.

Staff should be trained in all aspects of rescue work.

Rescue gear: Two sets of SCUBA breathing apparatus Rescue Harness, lines etc.

RESPIRATOR

- Type A-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory. These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required. For further information consult your Occupational Health and Safety Advisor.

ENGINEERING CONTROLS

- Engineering controls which have been generally implemented at mining sites include:
 - enclosure and automation of the transfer and mixing process;
 - enclosure of the cabin of the fork-lift or crane used for drum tipping;
 - extraction ventilation systems above the area where drum contents are discharged into the mixing tank;
 - local exhaust ventilation system with a water scrubber system above the mixing tank to absorb dust and gases or exhaust vents to the atmosphere via a short stack;
 - bunding the area around the mixing tank so as to contain 100% of the tank volume;
 - remote controlled dosing pumps;
 - good general ventilation of the plant; and storage of solid sodium ethyl xanthate in well ventilated areas.
- The engineering controls vary at the different mine sites and all the listed controls are not present at all the sites.

Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment. Ventilation can remove or dilute an air contaminant if designed properly. The design of a ventilation system must match the particular process and chemical or contaminant in use.

Employers may need to use multiple types of controls to prevent employee overexposure.

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the

continued...

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

- workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:
 - (a): particle dust respirators, if necessary, combined with an absorption cartridge;
 - (b): filter respirators with absorption cartridge or canister of the right type;
 - (c): fresh-air hoods or masks
 - Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
 - Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

■ Material is hygroscopic, absorbs moisture from surrounding air.
Pale yellow deliquescent powder with an unpleasant odour. Very soluble in water. Soluble in alcohols, ketones, pyridine and acetonitrile. The hydrolysis of xanthate solutions is accelerated by acidic pH. Solids and solutions tend to release carbon disulfide (CS₂) which may accumulate.

PHYSICAL PROPERTIES

Solid.

Mixes with water.

State	Divided solid	Molecular Weight	160.30
Melting Range (°C)	210	Viscosity	Not Applicable
Boiling Range (°C)	Not applicable.	Solubility in water (g/L)	Miscible
Flash Point (°C)	- 29 (CS ₂)	pH (1% solution)	>7
Decomposition Temp (°C)	210	pH (as supplied)	Not applicable
Autoignition Temp (°C)	90 (CS ₂)	Vapour Pressure (kPa)	Not applicable.
Upper Explosive Limit (%)	50.0 (CS ₂)	Specific Gravity (water=1)	Not available.
Lower Explosive Limit (%)	1.3 (CS ₂)	Relative Vapour Density (air=1)	Not applicable.
Volatile Component (%vol)	Not available.	Evaporation Rate	Not available
Material		Value	
POTASSIUM ETHYL XANTHATE:			
log Kow		1.70- 4.16	

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- May heat spontaneously
- Identify and remove sources of ignition and heating.
- Incompatible material, especially oxidisers, and/or other sources of oxygen may produce unstable product(s).
- Hazardous polymerization will not occur.

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

continued...

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Section 11 - TOXICOLOGICAL INFORMATION

Health hazard summary table:

Acute toxicity	Acute Tox. (oral) 4
Skin corrosion/irritation	Skin Irrit. 2
Serious eye damage/irritation	Eye Irrit. 2A
Respiratory or skin sensitization	Not applicable
Germ cell mutagenicity	Not applicable
Carcinogenicity	Not applicable
Reproductive toxicity	Not applicable
STOT- single exposure	STOT SE 3
STOT- repeated exposure	Not applicable
Aspiration hazard	Not applicable

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

■ Ingestion of small amounts of carbon disulfide may result in headache, nausea, dizziness, abdominal pain, vomiting, diarrhoea, burns to the mouth and oesophagus, numbness of the limbs, dyspnea, dizziness, spasmodic terror, hyperactive tendon reflexes, hyperaesthesia, cardiac arrhythmias, hallucinations, prostration, peripheral vascular collapse, hypothermia, cyanosis, mydriasis, convulsions, coma, and death within a few hours, from respiratory paralysis. Non-fatal exposures may produce delayed effects including motor agitation, disorientation, psychic disturbances, narcosis, delirium, areflexia, mydriasis and permanent damage to the peripheral nervous system. Death has been reported following ingestion of doses as low as 1 gram.

EYE

■ Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals and/or may produce significant ocular lesions which are present twenty-four hours or more after instillation into the eye(s) of experimental animals.

Repeated or prolonged eye contact may cause inflammation characterised by temporary redness (similar to windburn) of the conjunctiva (conjunctivitis); temporary impairment of vision and/or other transient eye damage/ulceration may occur.

SKIN

■ Evidence exists, or practical experience predicts, that the material either produces inflammation of the skin in a substantial number of individuals following direct contact, and/or produces significant inflammation when applied to the healthy intact skin of animals, for up to four hours, such inflammation being present twenty-four hours or more after the end of the exposure period. Skin irritation may also be present after prolonged or repeated exposure; this may result in a form of contact dermatitis (nonallergic). The dermatitis is often characterised by skin redness (erythema) and swelling (oedema) which may progress to blistering (vesiculation), scaling and thickening of the epidermis. At the microscopic level there may be intercellular oedema of the spongy layer of the skin (spongiosis) and intracellular oedema of the epidermis.

■ The material may accentuate any pre-existing dermatitis condition.

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

■ Solution of material in moisture on the skin, or perspiration, may increase irritant effects.

■ Concentrated solutions of carbon disulfide may cause skin pain, erythema, and exfoliation. Several minutes of contact may cause blistering with second or third degree burns. Carbon disulfide may be directly toxic to the cutaneous nerves. Skin sensitisation may also occur.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

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Section 11 - TOXICOLOGICAL INFORMATION

■ Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds 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

■ Evidence shows, or practical experience predicts, that the material produces irritation of the respiratory system, in a substantial number of individuals, following inhalation. In contrast to most organs, the lung is able to respond to a chemical insult by first removing or neutralising the irritant and then repairing the damage. The repair process, which initially evolved to protect mammalian lungs from foreign matter and antigens, may however, produce further lung damage resulting in the impairment of gas exchange, the primary function of the lungs. Respiratory tract irritation often results in an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system.

■ Inhalation of dusts, generated by the material during the course of normal handling, may be damaging to the health of the individual.

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

If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.

■ Acute inhalation of carbon disulfide produces rapid onset of both local irritation and central nervous system symptoms ranging from pharyngitis, nausea, vomiting, dizziness, fatigue, headache, mood changes, lethargy and blurred vision, to agitation, uncontrollable anger, suicidal tendencies, delirium, hallucinations, convulsions, coma and death.

Carbon disulfide inhalation can result in local irritation and pharyngitis and central nervous system effects. Slight symptoms have been reported at doses of 320-390 ppm for several hours. Definite symptoms appear at 420-510 ppm for 30 min (total dose -11.9-14.4 mg/kg) . The symptoms become serious after exposure to 1150 ppm for 30 min.; dangerous to life after 30 min. at 3210-3850 ppm; and fatal in 30 min. at concentrations above 4815 ppm.

CHRONIC HEALTH EFFECTS

■ 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.

There exists limited evidence that shows that skin contact with the material is capable either of inducing a sensitisation reaction in a significant number of individuals, and/or of producing positive response in experimental animals.

Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray.

Long-term exposure to carbon disulfide (CS₂) may cause serious damage to the central nervous system (degeneration of the peripheral nerves), vision problems, liver and kidney damage, anaemia, fatigue and debility. Other symptoms of chronic exposure include insomnia, nightmares, defective memory and impotency. Coronary heart disease has also been significantly linked to CS₂ exposure.

A daily four hour exposure at concentrations exceeding 150 ppm produces chronic intoxication after a few months; 100-150 ppm is thought to produce chronic poisoning after a year or more whilst 50-100 ppm produces sporadic cases of mild intoxication.

Exposure to 144-321 ppm (445-1000 mg/m³) for 5 years or longer resulted in polyneuritis in 88 of 100 workers. Encephalopathy was observed in 43 cases. Also seen were tremors, vertigo, psychosis, and myopathy. Polyneuritis has been reported following exposure to 5 ppm (15.6 mg/m³), and reductions in nerve fiber conduction velocity have been reported after exposure to 1.0-7.6 ppm for an average of about 12 years. Persons with pre-existing central nervous system, gastrointestinal tract, liver, kidneys, skin and blood disorders are potentially more susceptible to symptoms of exposure and should be excluded from all forms of exposure. The toxic effects of carbon disulfide, particularly on the nervous system, can be intensified by

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Section 11 - TOXICOLOGICAL INFORMATION

consumption of alcohol or simultaneous exposure to hydrogen sulfide.

Concentrations as low as 20 ppm may produce neurological damage - women appear to be more susceptible to the neurological effects of carbon disulfide. These effects include headache, apprehension, lethargy, sleepiness, hearing and position sense loss, paraesthesias, muscle pain, tremors, ataxia, staggering gait, weakness, loss of lower extremity reflexes, and paralysis. Visual disturbances include decreased visual acuity, impaired recognition of red and green, nystagmus, diplopia, disturbed pupillary reaction to light - optic nerve atrophy may also occur. A decrease in corneal reflex may be an indication of chronic intoxication.

Psychiatric symptoms may include loss of memory, nightmares leading to loss of sleep, mental deterioration, acoustic and visual hallucinations, rapid mood changes ranging from irritability to manic-depressive psychoses, and suicidal tendencies. Disturbances to the libido and impotence (with effects on sperm) have also been recorded. Menstrual and ovarian function disorders and an increased risk of spontaneous abortion may also occur.

Liver damage may be indicated by a palpable, tender liver and minor derangement of liver function. Chronic renal dysfunction may occur at concentrations not sufficiently great to produce neurological damage. Gastric or duodenal ulcers may also be produced as a result of chronic exposure.

Coronary heart disease has been significantly linked to carbon disulfide. A series of studies in Finland showed a significant excess mortality from cardiovascular disease in workers exposed to carbon disulfide for at least 5 years to concentrations estimated to range from 20-40 ppm in the 1950's and 10-30 ppm in the 1960's. Most workers, however, had been exposed repeatedly to far higher concentrations at various times. Nutritional factors may account for variations in response shown amongst workers. Experimental rabbit diets reinforced with a high mineral mixture, especially copper and zinc, permitted daily exposures at 1100 ppm CS₂ without the observed effects seen in the controls (body weight loss, serum lipoprotein and total cholesterol increase, adrenal hypertrophy and pathological changes to the brain and spinal cord).

Epidemiology studies revealed no definitive increased risk for cancer among workers who were exposed to carbon disulfide for up to 15 years. Other studies reported no association between occupational exposure to carbon disulfide and cancer mortality. In some cases mortality due to cancer was less in the carbon disulfide population than in the control group.

Prolonged inhalation exposure to low levels of carbon disulfide can cause adverse reproductive system effects in humans. An increased incidence of fetal resorptions has been reported in rabbits exposed to carbon disulfide. Inhalation exposure does not appear to damage the developing offspring of laboratory animals.

A number of epidemiological studies have reported that inhalation exposure to 13-77 ppm carbon disulfide resulted in changes in sperm morphology, decreased hormone levels, and decreased libido in males; and menstrual irregularities in females. One report indicated increased menstrual disorders and greater incidence of toxemia in pregnancy after occupational exposure to about 12-18 ppm carbon disulfide. An increase in spontaneous abortions was reported in one study following occupational exposure to about 9 ppm. There are no data that indicate an increase in congenital malformations in children born to mothers exposed by any route to carbon disulfide.

Foetal resorption was reported in rabbits exposed orally to 25 mg/kg/day during gestation, but was not seen in rats exposed to 100 mg/kg/day. The 25 mg/kg/day dose was a frank-effect-level (FEL) for fetal resorption in rabbits. Inhalation experiments failed to show any effects on foetal development in rats or rabbits exposed to 62.3 or 124.6 mg/m³ (5 and 10 mg/kg/day, rats; 11, 22 mg/kg/day, rabbits) given from 34 weeks before breeding through the entire gestation period. The highest no-observed- adverse effect level (NOAEL) for the study was 22 mg/kg/day; however, this NOAEL was close to the FEL seen in the previous experiment.

TOXICITY AND IRRITATION

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

POTASSIUM ETHYL XANTHATE:

■ 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

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Section 11 - TOXICOLOGICAL INFORMATION

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.

CARBON DISULFIDE:

TOXICITY

Oral (human) LDLo:14 mg/kg
Oral (human) TLo:40 mg/m³
Oral (rat) LD50:3188 mg/kg
Inhalation (human) LLo:4000 ppm/30 min
Inhalation (human) LLo:2000 ppm/5 min
Inhalation (rat) LC50:25000 mg/m³/2 h
Inhalation (Human) LC:10000 mg/m³/4h
Inhalation (Human) TLo:0.08 mg/m³/4h
Oral (Rat) LD50:1200 mg/kg
Intraperitoneal (Guinea pig) LD:400 mg/kg
Oral (Mouse) LD50:2780 mg/kg
Oral (Guinea pig) LD50:2125 mg/kg
Oral (Rabbit) LD50:2550 mg/kg
Inhalation (Mouse) LC50:10000 mg/m³/4h
Inhalation (Rat) LC50:25000 mg/m³/4h

IRRITATION

Nil Reported

■ NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.

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

Fatty liver degeneration, paternal effects, effects on fertility, foetotoxicity, effects on newborn recorded.

REPROTOXIN

carbon disulfide	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	H A si
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SKIN

carbon disulfide	GESAMP/EHS Composite List - GESAMP Hazard Profiles	D1: skin irritation/corrosion	3A
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Section 12 - ECOLOGICAL INFORMATION

CARBON DISULFIDE:

POTASSIUM ETHYL XANTHATE:

■ DO NOT discharge into sewer or waterways.

■ for carbon disulfide:

log Kow : 1.70-4.16

Koc : 63

Henry's atm m³ /mol: 0.0014

Bioaccumulation : not sig

BCF : 7-9

Environmental fate:

continued...

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Section 12 - ECOLOGICAL INFORMATION

Releases of carbon disulfide (CS₂) to the environment as a result of industrial activity are expected to be primarily to the atmosphere. Any carbon disulfide released to surface waters in effluent streams is expected to partition rapidly to the atmosphere as a result of the high ratio of vapor pressure to the solubility (Henry's law constant = 1.01×10^{-2} atm m³/mol) of the compound. Hydrolysis is not a significant removal mechanism since the evaporation half-life from a saturated solution is estimated to be 11 minutes. CS₂ is stable to hydrolysis in the pH region of environmental concern (pH 4-10). At pH 13, CS₂ has a hydrolysis half-life at of about 1 hour at 25 deg C; by extrapolation, at pH 9, CS₂ has a half-life of 1.1 years. In oxygenated seawater, CS₂ was found to be stable for over 10 days.

CS₂ is not expected to be removed significantly from the aquatic phase through adsorption. The low K_{oc} value, calculated from water solubility data, is 54 indicates high soil mobility, but it probably will be less mobile in soils of high organic content.

CS₂ released to soils in spills should rapidly volatilise to the atmosphere, but a portion of the compound remaining on soil surfaces could be available for transport into groundwater since it does not have much affinity for soil particles.

Estimated bioconcentration factor (BCF) values (equal to 2.94×10^3) were calculated from solubility and K_{ow}, (log K_{ow} is 2.16) data. The calculated values, 6.8 and 25.8 respectively for solubility and K_{ow} data, indicate that CS₂ will not significantly bioaccumulate in aquatic organisms.

CS₂ reacts with hydroxyl radicals in the troposphere to produce carbonyl sulfide. The lifetime of CS₂ in the troposphere, assuming a reaction rate constant of 4.3×10^{-13} cm³ molecule⁻¹ s⁻¹, is 73 days (uncertain); other estimates (assuming different reaction rate constants) range from less than 1 week to more than 10 weeks. The photo-oxidation products of carbon disulfide in the laboratory were identified as carbon monoxide, carbonyl sulfide, sulfur dioxide, and a polymer that adhered to the sides of the reaction vessel. Although CS₂ absorbs light at wavelengths between 280 and 350 nm, dissociation does not occur under environmental conditions because of low molar absorptivity. Direct photolysis of CS₂ in the atmosphere does not appear to be significant. Available information indicates that CS₂ is relatively persistent in the atmosphere. For the atmospheric oxidation of CS₂ to sulfur dioxide, carbonyl sulfide, and carbon monoxide, the half-life was estimated to be about 12 days. This is too short a time to reach the stratosphere. Removal was suggested to occur by a hydroxyl radical reaction, or an oxygen atom reaction but not by dissociation. Based on the estimates of a lifetime in the troposphere for CS₂ of the order of weeks and the troposphere to stratosphere turnover time of the order of years, very little tropospheric CS₂ is expected to be transported to the stratosphere.

Ecotoxicity:

Carbon disulfide has moderate acute toxicity to aquatic organisms; acute toxicity values range between >1 mg/l and 100 mg/l.

Fish LC₅₀ (96 h): *Poecilia reticulata* (guppy) 3-5.8 mg/l; *Alburnus* 45.0-94.0 mg/l; *Gambusia affinis* (mosquitofish) 135 mg/l *Daphnia magna* (water flea) LC₅₀ (48 h): 1.9-2.2 mg/l.

Algae EC₅₀ (96 h): *Chlorella pyrenoidosa* 21.0 mg/l (growth).

POTASSIUM ETHYL XANTHATE:

Marine Pollutant

Yes

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

Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

Xanthates react readily with water. In neutral or mildly alkaline solutions they form carbon disulfide, the carbonate, trithiocarbonate and the corresponding alkyl alcohol. In strongly alkaline solutions, hydrogen sulfide is produced whilst in acidic solutions, carbon disulfide, an alkyl alcohol and a hydroxide are formed.

If discharged in water ways, xanthates may persist for several days, hydrolysing slowly in the neutral environment. Bioaccumulation is unlikely.

Xanthates are unstable compounds, and the apparent toxicity may reflect the action of impurities or degradation products. It may be noted that hydrogen sulfide is extremely toxic to fathead minnows exposed in flow through bioassays, with 96-hour end points varying between 7 ppb and 550 ppb over the temperature range 6–24°C

Predicted LC₅₀'s for aquatic fauna are above 2 ppm, and chronic endpoints above 0.2 ppm. Effects on algal growth are predicted at concentrations below 1 ppm. Sodium ethyl xanthate must be regarded as highly toxic to

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Section 12 - ECOLOGICAL INFORMATION

aquatic fauna, but the variability in aquatic toxicity data merits comment. Static testing, which would simulate a spill situation, indicates moderate toxicity to invertebrates and slight toxicity to fish, based on nominal concentrations. Flow-through tests, which more closely reflect continuous input via effluent discharge rather than spills, indicate high toxicity to fish. Static test results reported by Canada indicate sodium ethyl xanthate to be very highly toxic to fish and invertebrates, based on measured concentrations, in contrast to the nominal data. Other xanthates range from practically non-toxic to fish to very highly toxic. Xanthates may form complexes with heavy metals increasingly the potential for uptake. Antimicrobial activity is evident from the median inhibitory limit on ammonia oxidation in *Nitrosomonas* of 12 ppm. Potassium ethyl xanthate is a nitrification inhibitor that has also been observed to inhibit soil denitrification at concentrations around 50 ppm, but only in soils previously amended with mannitol to stimulate denitrifying activity.

CARBON DISULFIDE:

Hazardous Air Pollutant:	Yes
Fish LC50 (96hr.) (mg/l):	135
BCF<100:	7.9
log Kow (Sangster 1997):	1.94
log Pow (Verschuereen 1983):	1.84/2.16

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
carbon disulfide	HIGH	No Data Available	LOW	HIGH

Section 13 - DISPOSAL CONSIDERATIONS

- Containers may still present a chemical hazard/ danger when empty.
 - Return to supplier for reuse/ recycling if possible.
- Otherwise:
- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
 - Where possible retain label warnings and MSDS and observe all notices pertaining to the product.
- Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
- A Hierarchy of Controls seems to be common - the user should investigate:
- Reduction
 - Reuse
 - Recycling
 - Disposal (if all else fails)
- This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. In most instances the supplier of the material should be consulted.
- DO NOT allow wash water from cleaning or process equipment to enter drains.
 - It may be necessary to collect all wash water for treatment before disposal.
 - In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
 - Where in doubt contact the responsible authority.
 - Recycle wherever possible or consult manufacturer for recycling options.
 - Consult State Land Waste Authority for disposal.

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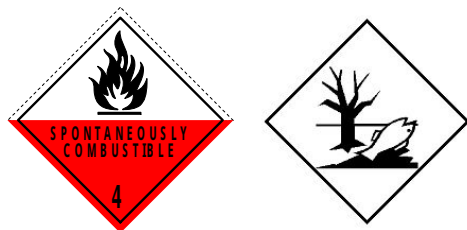
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Section 13 - DISPOSAL CONSIDERATIONS

- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: SPONTANEOUSLY COMBUSTIBLE

HAZCHEM:

1Y

Land Transport UNDG:

Class or division: 4.2
UN No.: 3342
Shipping Name: XANTHATES

Subsidiary risk: None
UN packing group: II

Air Transport IATA:

ICAO/IATA Class: 4.2
UN/ID Number: 3342
Special provisions: A3
Cargo Only
Packing Instructions: 470
Passenger and Cargo
Packing Instructions: 467
Passenger and Cargo
Limited Quantity
Shipping name: XANTHATES

ICAO/IATA Subrisk: None
Packing Group: II

Maximum Qty/Pack: 50 kg
Passenger and Cargo
Maximum Qty/Pack: 15 kg
Passenger and Cargo
Limited Quantity

Maritime Transport IMDG:

IMDG Class: 4.2
UN Number: 3342
EMS Number: F- A, S- J
Limited Quantities: 0
Shipping name: XANTHATES

IMDG Subrisk: None
Packing Group: II
Special provisions: None
Marine Pollutant: Yes

continued...

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Section 15 - REGULATORY INFORMATION

REGULATIONS

Regulations for ingredients

carbon disulfide (CAS: 75-15-0) is found on the following regulatory lists;

"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 Council of Chemical Associations (ICCA) - High Production Volume List", "OECD List of High Production Volume (HPV) Chemicals", "United Nations Consolidated List of Products Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments"

No data for potassium ethyl xanthate (CAS: , 140-89-6)

Section 16 - OTHER INFORMATION

Denmark Advisory list for selfclassification of dangerous substances

Substance	CAS	Suggested codes
potassium ethyl xanthate	140- 89- 6	Xn; R22
carbon disulfide	75- 15- 0	Xn; R22

REPRODUCTIVE HEALTH GUIDELINES

■ Established occupational exposure limits frequently do not take into consideration reproductive end points that are clearly below the thresholds for other toxic effects. Occupational reproductive guidelines (ORGs) have been suggested as an additional standard. These have been established after a literature search for reproductive no-observed-adverse effect-level (NOAEL) and the lowest-observed-adverse-effect-level (LOAEL). In addition the US EPA's procedures for risk assessment for hazard identification and dose-response assessment as applied by NIOSH were used in the creation of such limits. Uncertainty factors (UFs) have also been incorporated.

Ingredient	ORG	UF	Endpoint	CR	Adeq TLV
carbon disulfide	8.4 mg/m3	100	D	NA	-

■ These exposure guidelines have been derived from a screening level of risk assessment and should not be construed as unequivocally safe limits. ORGS represent an 8-hour time-weighted average unless specified otherwise.

CR = Cancer Risk/10000; UF = Uncertainty factor:

TLV believed to be adequate to protect reproductive health:

LOD: Limit of detection

Toxic endpoints have also been identified as:

D = Developmental; R = Reproductive; TC = Transplacental carcinogen

Jankovic J., Drake F.: A Screening Method for Occupational Reproductive

American Industrial Hygiene Association Journal 57: 641-649 (1996).

■ 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

continued...

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Section 16 - OTHER INFORMATION

by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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