CARBON DISULPHIDE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
CARBON DISULFIDE

OTHER NAMES

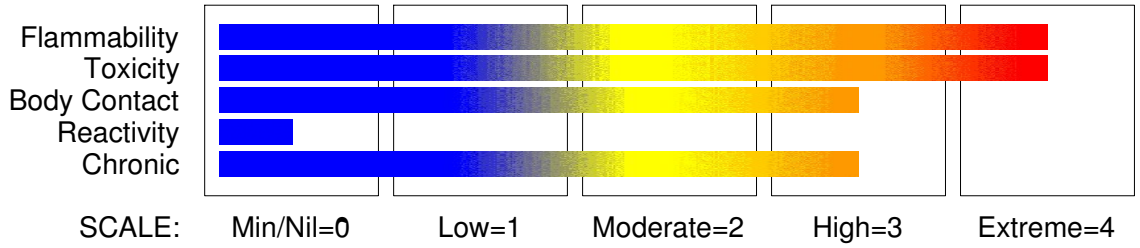
C-S2, S-C-S, S-C-S, "carbon bisulphide", "carbon bisulfide", "carbon sulphide", "carbon sulfide", "dithiocarbonic anhydride", "sulphocarbonic anhydride", "sulfocarbonic anhydride", "RCRA Waste Number PO22"

PROPER SHIPPING NAME
CARBON DISULPHIDE

PRODUCT USE
Used in manufacture of rayon, carbon tetrachloride, xanthogenates, soil disinfectants, electronic vacuum tubes; solvent for phosphorus, sulfur, selenium, bromine, iodine, fats, resins, rubbers.
Also used as solvent in gas chromatography.

SUPPLIER
Company: S D FINE- CHEM LIMITED
Address:
315- 317, T.V. INDUSTRIAL ESTATE,
248, WORLI,
MUMBAI- 400030.INDIA.
technical@sdfine.com
Telephone: 91- 22- 24959898
Telephone: 91- 22- 24959899
Fax: 91- 22- 24937232

HAZARD RATINGS



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Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity (Inhalation) Category 2
Acute Toxicity (Oral) Category 3
Eye Irritation Category 2A
Flammable Liquid Category 2
Organ Damage Category 1
Reproductive Toxicity Category 2
Skin Corrosion/Irritation Category 2
Skin Sensitizer Category 1

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H225 H330 H301 H315 H319 H317 H361 H361 H372
Highly flammable liquid and vapour
Fatal if inhaled
Toxic if swallowed
Causes skin irritation
Causes serious eye irritation
May cause allergic skin reaction
Suspected of damaging fertility
Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure by inhalation.

PRECAUTIONARY STATEMENTS

Prevention

Wash hands thoroughly after handling.
Do not eat, drink or smoke when using this product.
Ground/bond container and receiving equipment.
Wash thoroughly after handling.
Use only outdoors or in a well ventilated area.
Wear respiratory protection.
Do not breathe dust/fume/gas/mist/vapours/spray.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Contaminated clothing should not be allowed out of the workplace.
Use personal protective equipment as required.
Wear protective gloves and eye/face protection.
Do not handle until all safety precautions have been read and understood.
Keep container tightly closed.

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Obtain special instructions before use.
Use only non-sparking tools.
Keep away from heat/sparks/open flame - No smoking.
Use explosion-proof electrical/ventilating/lighting/equipment
Take precautionary measures against static discharge

Response

If exposed or concerned: Get medical attention advice.
Wear eye/face protection.
If skin irritation or rash occurs, seek medical advice/attention.
If eye irritation persists, get medical advice/attention.
Wash contaminated clothing before reuse.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
If skin irritation occurs, seek medical advice/attention.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
In case of fire, use dry agent for extinction.
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
In case of fire, use foam for extinction.
Get medical advice/attention if you feel unwell.
If on skin or hair: remove/take off immediately all contaminated clothing. Rinse with water/shower.
Specific treatment: refer to Label or MSDS.
IF ON SKIN: Gently wash with plenty of soap and water.
Immediately call a POISON CENTER or doctor/physician.
Wash/Decontaminate removed clothing before reuse.
Remove/Take off immediately all contaminated clothing

Storage

Store locked up.

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
carbon disulfide	75-15-0	>99

Section 4 - FIRST AID MEASURES

SWALLOWED

For advice, contact a Poisons Information Centre or a doctor.
· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
· For advice, contact a Poisons Information Centre or a doctor.
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 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.

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· 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.

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.
· Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
· Transport to hospital or doctor without delay.
· Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

SKIN

If skin contact occurs:
· Immediately remove all contaminated clothing, including footwear.
· Flush skin and hair with running water (and soap if available).
· Seek medical attention in event of irritation.

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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NOTE: Preplacement and periodic medical examinations should be concerned especially with skin, eyes, central and peripheral nervous system, cardio-vascular disease, as well as liver and kidney function. Electrocardiograms should be taken.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
· Dry chemical powder.
· BCF (where regulations permit).
· Carbon dioxide.

FIRE FIGHTING
Alert Fire Brigade and tell them location and nature of hazard.
· May be violently or explosively reactive.
· 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).
If safe to do so, switch off electrical equipment until vapour fire hazard is removed.
Cool fire exposed containers with water spray from a protected location.
DO NOT approach containers suspected to be hot.
Avoid spraying water onto liquid pools.
If safe to do so, remove containers from path of fire.

FIRE/EXPLOSION HAZARD
· Liquid and vapour are highly flammable.
· Severe fire hazard when exposed to heat, flame and/or oxidisers.
· Vapour forms an explosive mixture with air.
· Severe explosion hazard, in the form of vapour, when exposed to flame or spark.
· Vapour may travel a considerable distance to source of ignition.
· Heating may cause expansion / decomposition with violent rupture of containers.
· On combustion, may emit toxic fumes of carbon monoxide (CO).
Other combustion products include:.
sulfur oxides (SOx).

FIRE INCOMPATIBILITY
WARNING: May decompose violently or explosively on contact with other substances.

· This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.
· The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.
· Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.
BRETHERICK L.: Handbook of Reactive Chemical Hazards.

Personal Protective Equipment
Breathing apparatus.
Gas tight chemical resistant suit.

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Limit exposure duration to 1 BA set 30 mins.

Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS
Environmental hazard - contain spillage.
Clean up all spills immediately.
Avoid breathing vapours and contact with skin and eyes.
Control personal contact by using protective equipment.
Shut off all possible sources of ignition and increase ventilation.
Wipe up and absorb small quantities with vermiculite or other absorbent material.
Allow absorbed spillage to evaporate in an open top container, away from habitation.

MAJOR SPILLS
Clear area of personnel and move upwind.
Alert Fire Brigade and tell them location and nature of hazard.
· May be violently or explosively reactive.
· Wear full body protective clothing with breathing apparatus.
· Prevent, by any means available, spillage from entering drains and water course.
· Consider evacuation (or protect in place).
Shut off all possible sources of ignition and increase ventilation.
No smoking or naked lights within area.
Stop leak if safe to do so.
Use extreme caution to avoid a violent reaction.
Any electric cleaning equipment must be explosion proof.
Absorb or cover spill with sand, earth, inert material or vermiculite.
Water spray or fog may be used to disperse vapour.
Collect recoverable product into labelled containers for recycling.
Collect, using a spark-free shovel, and seal in labelled drums for disposal.
If contamination of drains or waterways occurs, advise emergency services.
After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.

EMERGENCY RESPONSE PLANNING GUIDELINES (ERPG)

The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour WITHOUT experiencing or developing

life-threatening health effects is:
carbon disulfide 500 ppm

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
carbon disulfide 50 ppm

other than mild, transient adverse effects without perceiving a clearly defined odour is:
carbon disulfide 10 ppm

The threshold concentration below which most people will experience no appreciable risk of health effects:
carbon disulfide 10 ppm

continued...

American Industrial Hygiene Association (AIHA)

Ingredients considered according to the following cutoffs

Very Toxic (T+)	>= 0.1%	Toxic (T)	>= 3.0%
R50	>= 0.25%	Corrosive (C)	>= 5.0%
R51	>= 2.5%		
else	>= 10%		

where percentage is percentage of ingredient found in the mixture

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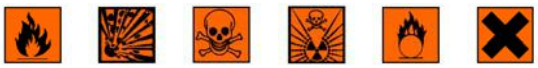
SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X	X	X	X	X	+

+: May be stored together
O: May be stored together with specific preventions
X: Must not be stored together

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

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
Use good occupational work practice.
Avoid breathing vapours and contact with skin and eyes.
Wear protective clothing when risk of exposure occurs.
Avoid smoking, naked lights or ignition sources.
Avoid generation of static electricity.
Avoid thermal shock (wait for surfaces to cool).
Vapour may travel a considerable distance to source of ignition.

SUITABLE CONTAINER

· Check that containers are clearly labelled.
Packaging as recommended by manufacturer.
Glass container.
Steel drum.
Metal can.
Store in metal drums or safety cans.
Plastic containers may only be used if approved for flammable liquids.

STORAGE INCOMPATIBILITY

WARNING: May decompose violently or explosively on contact with other substances.

· This substance is one of the relatively few compounds which are described as "endothermic" i.e. heat is absorbed into the compound, rather than released from it, during its formation.
· The majority of endothermic compounds are thermodynamically unstable and may decompose explosively under various circumstances of initiation.

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· Many but not all endothermic compounds have been involved in decompositions, reactions and explosions and, in general, compounds with significantly positive values of standard heats of formation, may be considered suspect on stability grounds.
BRETHERICK L.: Handbook of Reactive Chemical Hazards.
Avoid reaction with oxidising agents.
Segregate from, azides, organic amines, imines, halogens, nitrogen oxides, permanganates, sulphuric acid and chemically active metals.

STORAGE REQUIREMENTS

· 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.
· 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.
· Observe manufacturer's storing and handling recommendations.
Store below 20 deg. C.
Store away from sunlight.
Keep storage area free of debris, waste and combustibles.
In larger containers, voids above CS2 must be filled with water or nitrogen as the tank is emptied.
Limit quantity of material in storage. Keep locked up.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records
• carbon disulfide: CAS:75- 15- 0 CAS:355120- 85- 3

EMERGENCY EXPOSURE LIMITS

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

ODOUR SAFETY FACTOR (OSF)

OSF=45 (CARBON DISULFIDE)
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

continued...

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

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MATERIAL DATA

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 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.

PERSONAL PROTECTION



EYE

· Chemical goggles.
· Full face shield.
DO NOT wear contact lenses.
· 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

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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].

HANDS/FEET
Impervious, gauntlet length gloves.
Viton gloves.
PVA gloves.
PVC boots.
Safety footwear.

OTHER
· Overalls.
· PVC Apron.
· PVC protective suit may be required if exposure severe.
· Eyewash unit.
· Ensure there is ready access to a safety shower.

GLOVE SELECTION INDEX
Glove selection is based on a modified presentation of the:
" Forsberg Clothing Performance Index" .
The effect(s) of the following substance(s) are taken into account in the computer- generated selection: carbon disulfide

PE/EVAL/PE	A
PVA	A
VITON/CHLOROBUTYL	A
VITON	A
TEFLON- FEP	A
NITRILE	C
CPE	C
NEOPRENE	C
BUTYL	C

A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

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

Breathing Zone Level	Maximum Protection	Half- face Respirator	Full- Face Respirator

continued...

ppm (volume)	Factor		
1000	10	A- AUS	-
1000	50	-	A- AUS
5000	50	Airline *	-
5000	100	-	A- 2
10000	100	-	A- 3
	100+		Airline**

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

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

ENGINEERING CONTROLS

Local exhaust ventilation usually required. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection.
An approved self contained breathing apparatus (SCBA) may be required in some situations.
Provide adequate ventilation in warehouse or closed storage area. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, degreasing etc., evaporating from tank (in still air).	0.25- 0.5 m/s (50- 100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5- 1 m/s (100- 200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1- 2.5 m/s (200- 500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5- 10 m/s (500- 2000 f/min.)

Within each range the appropriate value depends on:

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

continued...

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Clear, colourless to yellow, mobile liquid with a strong disagreeable odour; nearly odourless when pure. Miscible with anhydrous methanol, ethanol, ether, benzene, chloroform, carbon tetrachloride, oils.
Immiscible in water.
Odour threshold: 0.02 ppm (detection); 0.06 to 0.6 ppm (recognition).
Odour detection not reliable as olfactory fatigue may occur.

PHYSICAL PROPERTIES

Liquid.
Does not mix with water.
Sinks in water.

Molecular Weight: 76.14
Melting Range (°C): - 111.6
Solubility in water (g/L): Immiscible
pH (1% solution): Not applicable.
Volatile Component (%vol): 100
Relative Vapour Density (air=1): 2.67
Lower Explosive Limit (%): 1.3
Autoignition Temp (°C): 90
State: Liquid

Boiling Range (°C): 46.3
Specific Gravity (water=1): 1.26 @ 20 C
pH (as supplied): Not applicable
Vapour Pressure (kPa): 40 @ 20 C
Evaporation Rate: 22.6 BuAc=1
Flash Point (°C): - 30 (CC)
Upper Explosive Limit (%): 50.0
Decomposition Temp (°C): Not available.
Viscosity: Not available

log Kow (Sangster 1997): 1.94
log Kow: 1.70-4.16

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

Presence of incompatible materials.
Long term storage.
Presence of heat source and ignition source.
Stable under normal storage conditions.
Presence of elevated temperatures.
Hazardous polymerisation will not occur.

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Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
Accidental ingestion of the material may be severely damaging to the health of the individual; animal experiments indicate that ingestion of less than 5 gram may be fatal.

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.
The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

SKIN
Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
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.
Toxic effects may result from skin absorption.
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.

INHALED
Inhalation may produce severe health damage*.
The material is not thought to produce respiratory irritation (as classified by EC Directives using animal models). Nevertheless inhalation, of the material, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.
The material may accentuate any pre-existing skin condition.
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.

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CHRONIC HEALTH EFFECTS

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 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.
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 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).

TOXICITY AND IRRITATION

TOXICITY	IRRITATION
Oral (human) LDLo: 14 mg/kg	Nil Reported
Oral (human) TCLo: 40 mg/m^3	
Oral (rat) LD50: 3188 mg/kg	
Inhalation (human) LCLo: 4000 ppm/30 min	
Inhalation (human) LCLo: 2000 ppm/5 min	
Inhalation (rat) LC50: 25000 mg/m^3/2 h	

Fatty liver degeneration, paternal effects, effects on fertility,

continued...

foetotoxicity, effects on newborn recorded.
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).

Section 12 - ECOLOGICAL INFORMATION

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

log Kow: 1.70-4.16
Koc: 63
Henry's atm m^3 /mol: 0.0014
BCF: 7-9
Toxicity Fish: LC50(96)135mg/L
Bioaccumulation: not sig
Nitrif. inhib.: 75% inhib at 35mg/L

Section 13 - DISPOSAL CONSIDERATIONS

Recycle wherever possible.
Consult manufacturer for recycling options.
Consult State Land Waste Management Authority for disposal.
Evaporate or incinerate residue at an approved site.
Recycle containers if possible, or dispose of in an authorised landfill.
Ensure damaged or non-returnable drums are gas-free before disposal.

WASTE DISPOSAL PROCEDURES
• Collect and package recoverable quantities of carbon disulfide into labelled containers for recycling or disposal. Wear protective clothing, Viton rubber gloves and eye protection to control personal contact. Work in a well ventilated
area and place 670mL of sodium hypochlorite or a mixture of 55g of 65% calcium hypochlorite in 220mL of water for each 0.05 mol of carbon disulfide. Dropwise add the carbon disulfide, maintaining the reaction temperature between 20- 30 degrees Celsius. Continue to stir for 2 hours or until clear. Empty the reaction
mixture into the drain. Large quantities of carbon disulfide may be recovered by
distillation and reused [Armour 1996].

SPILLAGE DISPOSAL
• Shut off all possible ignition sources. Clear area of personnel. Wear protective clothing, breathing apparatus, eye protection and Viton rubber gloves
to control personal contact. Cover and contain the spill with a 1:1:1 mixture by
weight of sodium carbonate or calcium carbonate, calcium bentonite and sand.

continued...

Place the absorbed mixture on a evaporating dish, in a well ventilated area.
Thoroughly ventilate the area of the spill, to dispel vapours [Armour 1996].

Section 14 - TRANSPORTATION INFORMATION

Labels Required: FLAMMABLE LIQUID,TOXIC
HAZCHEM: 3WE

UNDG:

Dangerous Goods Class:	3	Subrisk:	6.1
UN Number:	1131	Packing Group:	I

Shipping Name:CARBON DISULPHIDE

Maritime Transport IMDG:

IMDG Class:	3	IMDG Subrisk:	6.1
UN Number:	1131	Packing Group:	I
EMS Number:	F- E, S- D		

Shipping name:CARBON DISULPHIDE

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS:IATA

Section 15 - REGULATORY INFORMATION

REGULATIONS

carbon disulfide (CAS: 75-15-0) is found on the following regulatory lists;
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 Representative List of High Production Volume (HPV) Chemicals

No data available for carbon disulfide as CAS: 355120-85-3.

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
carbon disulfide	75- 15- 0, 355120- 85- 3

continued...

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).

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