DIMETHYL SULPHOXIDE

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
DIMETHYL SULFOXIDE

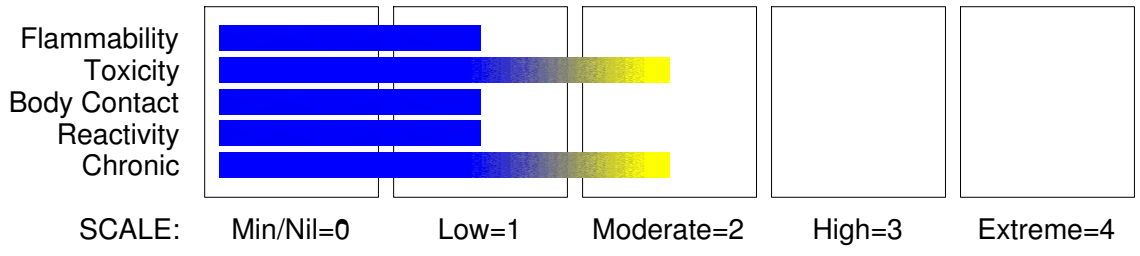
OTHER NAMES

C2-H6-O-S, C2-H6-O-S, (CH3)2-S-O, (CH3)2-S

PRODUCT USE
Used as solvent for acetylene, sulfur dioxide and other gases, as an anti-freeze or hydraulic fluid when mixed with water, as a paint or varnish remover and as a solvent for Orlon and other synthetic fibres.
Also used for polymerization and cyanide reactions and in industrial cleaners, pesticides, medicine (anti-inflammatory), veterinary medicine and pharmaceuticals.

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 (Oral) Category 3
Eye Irritation Category 2B
Flammable Liquid Category 4
Respiratory Sensitizer Category 1
Skin Corrosion/Irritation Category 3
Skin Sensitizer Category 1

EMERGENCY OVERVIEW

HAZARD

DANGER
Determined by using GHS criteria:
H227 H301 H316 H320 H334 H317
Combustible Liquid
Toxic if swallowed
Causes mild skin irritation
Causes eye irritation
May cause allergic or asthmatic symptoms or breathing difficulties if inhaled
May cause allergic skin reaction

PRECAUTIONARY STATEMENTS

Prevention

Wash hands thoroughly after handling.
Avoid breathing dust/fume/gas/mist/vapours/spray.
In case of inadequate ventilation wear respiratory protection.
Do not eat, drink or smoke when using this product.
Use explosion-proof electrical/ventilating/lighting/equipment
Keep away from flames and hot surfaces.
Contaminated clothing should not be allowed out of the workplace.

Response

If skin irritation or rash occurs, seek medical advice/attention.
If skin irritation occurs, seek medical advice/attention.
If eye irritation persists, get medical advice/attention.
If experiencing respiratory symptoms call a POISON CENTER or doctor/physician.
IF INHALED: If breathing is difficult, remove to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Specific treatment: refer to Label or MSDS.

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IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
Wash contaminated clothing before reuse.
IF ON SKIN: Gently wash with plenty of soap and water.

Storage

Store away from other materials
Store locked up.

Disposal

Dispose of contents and container in accordance with relevant legislation.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
dimethyl sulfoxide	67-68-5	>97

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.
· 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 or hair contact occurs:
· Immediately flush body and clothes with large amounts of water, using safety shower if available.

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· 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.

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.

NOTES TO PHYSICIAN

Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

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

FIRE FIGHTING

· Use water delivered as a fine spray to control fire and cool adjacent area.
· Do not approach containers suspected to be hot.
· Cool fire exposed containers with water spray from a protected location.
· If safe to do so, remove containers from path of fire.
· Equipment should be thoroughly decontaminated after use.

FIRE/EXPLOSION HAZARD

· Combustible.
· Slight fire hazard when exposed to heat or flame.
· Heating may cause expansion or decomposition leading to violent rupture of containers.
· On combustion, may emit toxic fumes of carbon monoxide (CO).
· May emit acrid smoke.
· Mists containing combustible materials may be explosive.

FIRE INCOMPATIBILITY

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

Personal Protective Equipment

Gas tight chemical resistant suit.
Limit exposure duration to 1 BA set 30 mins.

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Section 6 - ACCIDENTAL RELEASE MEASURES

EMERGENCY PROCEDURES

MINOR SPILLS
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb spill with sand, earth, inert material or vermiculite.
- Wipe up.
- Place in a suitable labelled container for waste disposal.

MAJOR SPILLS
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labelled containers for recycling.
- Neutralise/decontaminate residue.
- Collect solid residues and seal in labelled drums for disposal.
- Wash area and prevent runoff into drains.
- 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.

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:
dimethyl sulfoxide 500 mg/m³

irreversible or other serious effects or symptoms which could impair an individual's ability to take protective action is:
dimethyl sulfoxide 500 mg/m³

other than mild, transient adverse effects without perceiving a clearly defined odour is:
dimethyl sulfoxide 100 mg/m³

The threshold concentration below which most people will experience no appreciable risk of health effects:
dimethyl sulfoxide 35 mg/m³

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

\+ + + + + +

+: 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

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- 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.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

SUITABLE CONTAINER

Packaging as recommended by manufacturer.
· Check that containers are clearly labelled.
Glass container.
Metal can.
Polylined drum.
Metal drum.

STORAGE INCOMPATIBILITY

Avoid reaction with oxidising agents.
· Sulfoxide ion may react violently or explosively with acyl halides, non-metal halides, benzenesulfonyl halides, cyanuric halides, oxalyl phosphorus trihalides, phosphorus oxyhalides, sulfuryl halides and thionyl halides.
These violent reactions may occur as a result of exothermic polymerisation of formaldehyde produced by the interaction of the sulfoxide with reactive halides, and acidic or basic reagents.
· Alkyl halides may produce a delayed, vigorous and strongly exothermic reaction.
· Strong bases may produce violent ignition.
· Mixtures of metal salts of oxoacids and sulfoxides may produce powerful explosives; the

continued...

water in hydrated oxo-salts (aluminium perchlorate, iron(III) perchlorate, iron(III) nitrate) may be replaced by dimethyl or other sulfoxides to give solvated salts which are potentially explosive.
· Metal nitrates and perchlorates, solvated with alkyl sulfoxides, are potentially powerful explosives, and under certain conditions may produce violent reactions which are easily triggered.
· Excessive sulfoxide may react explosively with sodium hydride.
This may again be explained in terms of exothermic polymerisation of formaldehyde produced by reaction with the hydride base.
· Interaction with potassium may be violent.
· Interaction of sulfoxide with some acid anhydrides or halides may be explosive.
· Lower members of the salts formed between organic sulfoxides and perchloric acid are unstable and explosive when dry.
· Sulfoxides alone may decompose violently at elevated temperatures e.g. dimethyl sulfoxide 270-355 deg. C., cyclohexyl methyl sulfoxide 181-255 deg. C., methyl phenyl sulfoxide, 233-286 deg. C.
Avoid contact with non-metallic chlorides, other active halogen compounds, diborane and sodium hydride.

STORAGE REQUIREMENTS

Observe manufacturer's storing and handling recommendations.
Store in original containers.
Keep containers securely sealed.
No smoking, naked lights, heat or ignition sources.
Store in a cool, dry place.
Store in a well-ventilated area.
Store away from incompatible materials.
Protect containers against physical damage.
Check regularly for spills and leaks.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

The following materials had no OELs on our records

• dimethyl sulfoxide: CAS:67- 68- 5 CAS:164071- 41- 4 CAS:705301- 21- 9 CAS:8070- 53- 9

MATERIAL DATA

No exposure limits set by NOHSC or ACGIH.
Designated H in List of MAK values: Danger of cutaneous absorption.
Absorption of such substances through the skin can pose an incomparably larger danger of toxicity than their inhalation. To avoid health risks when handling such substances, meticulous cleaning of the skin, hair and clothing is imperative.
MAK values, and categories and groups are those recommended within the Federal Republic of Germany.

PERSONAL PROTECTION

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EYE
· Safety glasses.
· 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].

OTHER
· Barrier cream.
· 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: dimethyl sulfoxide

Protective Material CPI *.

BUTYL	A
HYPALON	A
NEOPRENE	A
NEOPRENE/NATURAL	A
PE/EVAL/PE	A
NITRILE+PVC	B
PVC	C
NATURAL RUBBER	C
NITRILE	C
NATURAL+NEOPRENE	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,

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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 ppm (volume)	Maximum Protection Factor	Half- face Respirator	Full- Face Respirator
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

General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in specific circumstances. If risk of overexposure exists, wear approved respirator. Correct fit is essential to obtain adequate protection. Provide adequate ventilation in warehouse or closed storage areas. 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	1: Disturbing room air currents

continued...

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

capture
2: Contaminants of low toxicity or of nuisance value only.
3: Intermittent, low production.
4: Large hood or large air mass in motion

2: Contaminants of high toxicity
3: High production, heavy use
4: Small hood- local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 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, very hygroscopic liquid, practically no odour or slight garlic odour, slightly bitter taste with sweet after-taste.
Miscible in water, alcohol, ether, benzene, chloroform and acetone.
Viscosity (27 C): 1.1 cps. Evaporation rate (n-butyl acetate=1): 1.4
Upper explosive limit in air has been reported as high as 63%.
Dimethyl sulfoxide has been shipped as UN 2810 Poisonous Liquid, N.O.S.

PHYSICAL PROPERTIES

Liquid.
Mixes with water.

Molecular Weight: 78.13
Melting Range (°C): 18.4
Solubility in water (g/L): Miscible
pH (1% solution): Not applicable.
Volatile Component (%vol): 100 approx.
Relative Vapour Density (air=1): 2.7
Lower Explosive Limit (%): 2.6
Autoignition Temp (°C): 215 (300)
State: Liquid

Boiling Range (°C): 189
Specific Gravity (water=1): 1.10
pH (as supplied): Not applicable
Vapour Pressure (kPa): 0.053
Evaporation Rate: 1.4 BuAc=1
Flash Point (°C): 89- 95
Upper Explosive Limit (%): 29
Decomposition Temp (°C): 100 approx.
Viscosity: Not available

log Kow (Sangster 1997): - 1.35
log Kow : 1.35-2.03

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

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Section 11 - TOXICOLOGICAL INFORMATION

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
Although ingestion is not thought to produce harmful effects (as classified under EC Directives), the material may still be damaging to the health of the individual, following ingestion, especially where pre-existing organ (e.g liver, kidney) damage is evident. Present definitions of harmful or toxic substances are generally based on doses producing mortality rather than those producing morbidity (disease, ill-health).
Gastrointestinal tract discomfort may produce nausea and vomiting. In an occupational setting however, ingestion of insignificant quantities is not thought to be cause for concern.
Considered an unlikely route of entry in commercial/industrial environments.

EYE
Limited evidence exists, or practical experience suggests, that the material may cause eye irritation in a substantial number of individuals and/or is expected to 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 material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

SKIN
Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.
Limited 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.
Open cuts, abraded or irritated skin should not be exposed to this material.
Toxic effects may result from skin absorption.
The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterised by skin redness (erythema) and swelling epidermis. Histologically there may be intercellular oedema of the spongy layer (spongiosis) and intracellular oedema of the epidermis.

INHALED
The material is not thought to produce adverse health effects or irritation of the respiratory tract (as classified by EC Directives using animal models). Nevertheless,

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good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.
Inhalation hazard is increased at higher temperatures.
Respiratory sensitisation may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.

CHRONIC HEALTH EFFECTS
Limited evidence shows that inhalation of the material is capable of inducing a sensitisation reaction in a significant number of individuals at a greater frequency than would be expected from the response of a normal population.
Pulmonary sensitisation, resulting in hyperactive airway dysfunction and pulmonary allergy may be accompanied by fatigue, malaise and aching. Significant symptoms of exposure may persist for extended periods, even after exposure ceases. Symptoms can be activated by a variety of nonspecific environmental stimuli such as automobile exhaust, perfumes and passive smoking.
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.
Principal routes of exposure are by accidental skin and eye contact and by inhalation of vapours especially at higher temperatures.
The material may accumulate in the human body and progressively cause tissue damage.
When 90 ml of 90% DMSO were applied to the entire trunk of 20 men daily for 6 months, bad breath, transient erythema, burning and stinging were apparent. Dermatitis, accompanied by moderate inflammation, regressed as treatment continued. Continuous applications under an occluding membrane produced hardening of the skin within a month.
Crystalline lens alterations, resembling juvenile nuclear sclerosis, has been produced in test animals, but not in man, following chronic dermal exposure.
Rabbits exposed to DMSO mists for 5 months developed chemical pneumonia, cloudy swelling of the liver and signs of renal toxicity.
Reproductive effects have been reported in animals.

TOXICITY AND IRRITATION

TOXICITY	IRRITATION
Oral (rat) LD50: 14500 mg/kg	Skin (rabbit):10 mg/24h open- Mild
	Skin (rabbit): 500 mg/24h - Mild
	Eye (rabbit): 100 mg
	Eye (rabbit): 500 mg/24h - Mild

Section 12 - ECOLOGICAL INFORMATION

log Kow (Sangster 1997): - 1.35
log Pow (Verschueren 1983): - 2.03

log Kow : 1.35-2.03
Half-life (hr) air: 7

continued...

Section 13 - DISPOSAL CONSIDERATIONS

- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

Section 14 - TRANSPORTATION INFORMATION

HAZCHEM: None

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

Section 15 - REGULATORY INFORMATION

REGULATIONS

dimethyl sulfoxide (CAS: 67-68-5) is found on the following regulatory lists;
International Council of Chemical Associations (ICCA) - High Production Volume List
OECD Representative List of High Production Volume (HPV) Chemicals

No data available for dimethyl sulfoxide as CAS: 164071-41-4, CAS: 705301-21-9, CAS: 8070 -53-9.

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name	CAS
dimethyl sulfoxide	67- 68- 5, 164071- 41- 4, 705301- 21- 9, 8070- 53- 9

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

Issue Date: 26-Aug-2017