

DIMETHYL SULFOXIDE

Bio-Strategy Ltd.

Chemwatch Hazard Alert Code: 2

Chemwatch: 21934

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Safety Data Sheet according to the Health and Safety at Work (Hazardous Substances) Regulations 2017

S.GHS.NZL.EN.E

SECTION 1 Identification of the substance / mixture and of the company / undertaking

Product Identifier

Product name	DIMETHYL SULFOXIDE
Chemical Name	dimethyl sulfoxide
Synonyms	C2-H6-O-S; (CH3)2-S-O; methyl sulfoxide; methylsulfinylmethane; Deltan Gamasol 90 methyl sulfinyl methane; Demeso Durasorb sulfinyl bis(methane); Demasorb Hyadur sulphinyl bis(methane); Demavet Infiltrina dimethylsulfoxide; Demsodrox M176 Sigma D2650; dimethyl sulfoxide methane, sulfinylbis- Product Code 472301; Dimexide methyl sulfinyl methane; Dipartril-Tropico NSC-763; DMS-70 RIMSO-50; DMS-90 Somipront; Dolicur SQ 9453; Doligur SQ9453; Domoso sulfinyl bis(methane); Demeso Syntexan; DMSO Topsyms; Dromisol methane, sulphinylbis-; Sc-358801 dimethyl sulfoxide (DMSO)
Chemical formula	C2H6OS
Other means of identification	VWRC23500.260, VWRC23500.297, VWRC23500.322
CAS number	67-68-5

Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses	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. Dimethyl Sulfoxide is a highly polar organic liquid that is used widely as a chemical solvent and a free radical scavenger. It shows a range of pharmacological activity including analgesia and anti-inflammation. Because of its ability to penetrate biological membranes, it is used as a vehicle for topical application of pharmaceuticals. It is also used to protect cells and tissue during cryopreservation and has been used to treat extravasation damage caused by anthracycline-based chemotherapy. DMSO is a polar aprotic solvent used in chemical reactions, in polymerase chain reactions (PCR) and as a cryoprotectant vitrification agent for the preservation of cells, tissues and organs. DMSO is used in cell freezing media to protect cells from ice crystal induced mechanical injury. It is used for frozen storage of primary, sub-cultured, and recombinant heteroploid and hybridoma cell lines; embryonic stem cells (ESC), and hematopoietic stem cells. DMSO is frequently used in the combinations with BSA or fetal bovine serum (FBS)
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Details of the manufacturer or supplier of the safety data sheet

Registered company name	Bio-Strategy Ltd.
Address	1/33 Westpoint Drive, Hobsonville Auckland 0618 New Zealand
Telephone	09 9699150
Fax	09 9699151
Website	www.bio-strategy.com
Email	salesnz@bio-strategy.com

Emergency telephone number

Association / Organisation	Bio-Strategy Ltd.
Emergency telephone numbers	03 353 0199 (National Emergency Contact Centre)
Other emergency telephone numbers	0800 243 622 (Chemcall)

DIMETHYL SULFOXIDE

SECTION 2 Hazards identification

Classification of the substance or mixture

Considered a Hazardous Substance according to the criteria of the New Zealand Hazardous Substances New Organisms legislation. Not regulated for transport of Dangerous Goods.

Classification ^[2]	Flammable Liquids Category 4, Serious Eye Damage/Eye Irritation Category 2
Legend:	1. Classified by Chemwatch; 2. Classification drawn from CCID EPA NZ; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI
Gazetted by EPA New Zealand	3.1D, 6.4A

Label elements

Hazard pictogram(s)	
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Signal word	Warning
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Hazard statement(s)

H227	Combustible liquid.
H319	Causes serious eye irritation.

Supplementary statement(s)

Not Applicable

Precautionary statement(s) Prevention

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280	Wear protective gloves, protective clothing, eye protection and face protection.
P264	Wash all exposed external body areas thoroughly after handling.

Precautionary statement(s) Response

P370+P378	In case of fire: Use water spray/fog to extinguish.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313	If eye irritation persists: Get medical advice/attention.

Precautionary statement(s) Storage

P403	Store in a well-ventilated place.
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Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
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SECTION 3 Composition / information on ingredients

Substances

CAS No	%[weight]	Name
67-68-5	>97	<u>dimethyl sulfoxide</u>

Legend: 1. Classified by Chemwatch; 2. Classification drawn from CCID EPA NZ; 3. Classification drawn from Regulation (EU) No 1272/2008 - Annex VI; 4. Classification drawn from C&L; * EU IOELVs available

Mixtures

See section above for composition of Substances

SECTION 4 First aid measures

Description of first aid measures

Eye Contact	<p>If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> ▶ Wash out immediately with fresh 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. ▶ 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.
Skin Contact	<p>If skin contact occurs:</p> <ul style="list-style-type: none"> ▶ 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.
Inhalation	<ul style="list-style-type: none"> ▶ 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.
Ingestion	<ul style="list-style-type: none"> ▶ If swallowed do NOT induce vomiting. ▶ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▶ Observe the patient carefully. ▶ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▶ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▶ Seek medical advice. ▶ If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5 Firefighting measures

Extinguishing media

- ▶ Water spray or fog.
- ▶ Foam.
- ▶ Dry chemical powder.
- ▶ BCF (where regulations permit).
- ▶ Carbon dioxide.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
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Advice for firefighters

Fire Fighting	<ul style="list-style-type: none"> ▶ 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. ▶ 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.
Fire/Explosion Hazard	<p>Decomposition products include formaldehyde, methyl mercaptan, dimethyl sulfide, dimethyl disulfide, and bis (methylthio) methane</p> <ul style="list-style-type: none"> ▶ 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. <p>Combustion products include: carbon dioxide (CO₂) sulfur oxides (SO_x) other pyrolysis products typical of burning organic material.</p>

May emit poisonous fumes.
May emit corrosive fumes.

SECTION 6 Accidental release measures

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	<ul style="list-style-type: none"> ‣ Remove all ignition sources. ‣ Clean up all spills immediately. ‣ Avoid breathing vapours and contact with skin and eyes. ‣ Control personal contact with the substance, 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	<p>Moderate hazard.</p> <ul style="list-style-type: none"> ‣ 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. ‣ No smoking, naked lights or ignition sources. ‣ Increase ventilation. ‣ Stop leak if safe to do so. ‣ Contain spill with sand, earth or vermiculite. ‣ Collect recoverable product into labelled containers for recycling. ‣ Absorb remaining product with sand, earth or vermiculite. ‣ Collect solid residues and seal in labelled drums for disposal. ‣ Wash area and prevent runoff into drains. ‣ If contamination of drains or waterways occurs, advise emergency services.

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

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> ‣ DO NOT allow clothing wet with material to stay in contact with skin ‣ Avoid all personal contact, including inhalation. ‣ Wear protective clothing when risk of exposure occurs. ‣ 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 storage and handling recommendations contained within this SDS. ‣ Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
Other information	<ul style="list-style-type: none"> ‣ Store in original containers. ‣ Keep containers securely sealed. ‣ No smoking, naked lights or ignition sources. ‣ Store in a cool, dry, well-ventilated area. ‣ Store away from incompatible materials and foodstuff containers. ‣ Protect containers against physical damage and check regularly for leaks. ‣ Observe manufacturer's storage and handling recommendations contained within this SDS.

Conditions for safe storage, including any incompatibilities

Suitable container	<ul style="list-style-type: none"> ‣ Glass container is suitable for laboratory quantities ‣ Metal can or drum
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	<ul style="list-style-type: none"> ▶ Packaging as recommended by manufacturer. ▶ Check all containers are clearly labelled and free from leaks.
Storage incompatibility	<ul style="list-style-type: none"> ▶ Many aprotic (non-hydroxylic) solvents are not inert towards other reagents and care must be taken when using untried combinations of solvents and reagents for the first time. ▶ Some aprotic solvents have a dramatic effect on reaction rates <p>Dimethyl sulfoxide:</p> <ul style="list-style-type: none"> ▶ reacts violently or explosively with oxidisers, acyl halides, aryl halides and related compounds, non-metallic chlorides and other active halogen compounds, p-bromobenzoyl acetanilide, diborane, boron compounds, iodine pentafluoride, magnesium perchlorate, methyl bromide, perchloric acid, periodic acid, silver fluoride, sodium hydride, potassium permanganate ▶ forms powerfully explosive mixtures with metal salts of oxoacids <p>All blends containing DMSO must be buffered at pH 7-9 before distillation.</p> <p>Prolonged heating above 15 deg.C (302 deg. F) can cause rapid, exothermic decomposition</p> <ul style="list-style-type: none"> ▶ 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 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 reaction with oxidising agents

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Not Available

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
dimethyl sulfoxide	150 ppm	290 ppm	1,800 ppm

Ingredient	Original IDLH	Revised IDLH
dimethyl sulfoxide	Not Available	Not Available

Occupational Exposure Banding

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
dimethyl sulfoxide	E	≤ 0.1 ppm

Notes:

Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

Exposure controls

Appropriate engineering controls	<p>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.</p> <p>The basic types of engineering controls are:</p> <p>Process controls which involve changing the way a job activity or process is done to reduce the risk.</p> <p>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.</p> <p>Employers may need to use multiple types of controls to prevent employee overexposure.</p>
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General exhaust is adequate under normal operating conditions. Local exhaust ventilation may be required in special circumstances. If risk of overexposure exists, wear approved respirator. Supplied-air type respirator may be required in special circumstances. Correct fit is essential to ensure adequate protection. Provide adequate ventilation in warehouses and enclosed 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 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

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.

Individual protection measures, such as personal protective equipment



Eye and face protection

- ▶ Safety glasses with side shields.
- ▶ Chemical goggles. [AS/NZS 1337.1, EN166 or national equivalent]
- ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses 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].

Skin protection

See Hand protection below

Hands/feet protection

- ▶ Wear chemical protective gloves, e.g. PVC.
- ▶ Wear safety footwear or safety gumboots, e.g. Rubber

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 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.

Personal hygiene is a key element of effective hand care. 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.

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
- dexterity

Select 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.

	<ul style="list-style-type: none"> Some glove polymer types are less affected by movement and this should be taken into account when considering gloves for long-term use. Contaminated gloves should be replaced. <p>As defined in ASTM F-739-96 in any application, gloves are rated as:</p> <ul style="list-style-type: none"> Excellent when breakthrough time > 480 min Good when breakthrough time > 20 min Fair when breakthrough time < 20 min Poor when glove material degrades <p>For general applications, gloves with a thickness typically greater than 0.35 mm, are recommended.</p> <p>It should be emphasised that glove thickness is not necessarily a good predictor of glove resistance to a specific chemical, as the permeation efficiency of the glove will be dependent on the exact composition of the glove material. Therefore, glove selection should also be based on consideration of the task requirements and knowledge of breakthrough times.</p> <p>Glove thickness may also vary depending on the glove manufacturer, the glove type and the glove model. Therefore, the manufacturers technical data should always be taken into account to ensure selection of the most appropriate glove for the task.</p> <p>Note: Depending on the activity being conducted, gloves of varying thickness may be required for specific tasks. For example:</p> <ul style="list-style-type: none"> Thinner gloves (down to 0.1 mm or less) may be required where a high degree of manual dexterity is needed. However, these gloves are only likely to give short duration protection and would normally be just for single use applications, then disposed of. Thicker gloves (up to 3 mm or more) may be required where there is a mechanical (as well as a chemical) risk i.e. where there is abrasion or puncture potential <p>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.</p> <ul style="list-style-type: none"> ▶ Aprotic solvents may greatly promote the toxic properties of solutes because of their unique ability to penetrate synthetic rubber protective gloves and the skin (butyl rubber gloves are reported to be more satisfactory than others ▶ Neoprene gloves
Body protection	See Other protection below
Other protection	<ul style="list-style-type: none"> ▶ Overalls. ▶ P.V.C apron. ▶ Barrier cream. ▶ Skin cleansing cream. ▶ Eye wash unit.

Recommended material(s)

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

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

* CPI - Chemwatch Performance Index

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.

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

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.

Required minimum protection factor	Maximum gas/vapour concentration present in air p.p.m. (by volume)	Half-face Respirator	Full-Face Respirator
up to 10	1000	A-AUS / Class1	-
up to 50	1000	-	A-AUS / Class 1
up to 50	5000	Airline *	-
up to 100	5000	-	A-2
up to 100	10000	-	A-3
100+			Airline**

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

A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO₂), G = Agricultural chemicals, K = Ammonia(NH₃), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- ▶ Cartridge respirators should never be used for emergency ingress or in areas of unknown vapour concentrations or oxygen content.
- ▶ The wearer must be warned to leave the contaminated area immediately on detecting any odours through the respirator. The odour may indicate that the mask is not functioning properly, that the vapour concentration is too high, or that the mask is not properly fitted. Because of these limitations, only restricted use of cartridge respirators is considered appropriate.
- ▶ Cartridge performance is affected by humidity. Cartridges should be

changed after 2 hr of continuous use unless it is determined that the humidity is less than 75%, in which case, cartridges can be used for 4 hr. Used cartridges should be discarded daily, regardless of the length of time used

SECTION 9 Physical and chemical properties

Information on basic 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 Toxic Liquid, N.O.S. Supercools easily and remelts slowly at room temperature. Solidified product can be re-liquified by warming to room temperature without detriment to the product. Material is hygroscopic, absorbs moisture from surrounding air.		
Physical state	Liquid	Relative density (Water = 1)	1.10
Odour	Not Available	Partition coefficient n-octanol / water	-2.03
Odour threshold	Not Available	Auto-ignition temperature (°C)	300-302
pH (as supplied)	Not Applicable	Decomposition temperature (°C)	100 approx.
Melting point / freezing point (°C)	18.4	Viscosity (cSt)	1.1
Initial boiling point and boiling range (°C)	189	Molecular weight (g/mol)	78.13
Flash point (°C)	89-95	Taste	Not Available
Evaporation rate	1.4 BuAc=1	Explosive properties	Not Available
Flammability	Combustible.	Oxidising properties	Not Available
Upper Explosive Limit (%)	29-63	Surface Tension (dyn/cm or mN/m)	Not Available
Lower Explosive Limit (%)	2.6-3.5	Volatile Component (%vol)	100 approx.
Vapour pressure (kPa)	0.053	Gas group	Not Available
Solubility in water	Miscible	pH as a solution (1%)	Not Applicable
Vapour density (Air = 1)	2.7	VOC g/L	1100

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	<ul style="list-style-type: none"> ▶ Unstable in the presence of incompatible materials. ▶ Product is considered stable. ▶ Hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 Toxicological information

Information on toxicological effects

Inhaled	The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage. Inhalation hazard is increased at higher temperatures. Inhalation of vapours of DMSO may cause cough or a burning sensation. High concentrations may cause nausea, vomiting, chills, cramps, headache, dizziness, tiredness, and allergic reactions. Very high doses may be lethal. Repeated exposure may cause liver damage and inflammation of the airway and lung.
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Ingestion	<p>Accidental ingestion of the material may be damaging to the health of the individual.</p> <p>DMSO has very few toxic symptoms in humans. The most common are nausea, skin rashes and an unusual garlic-onion-oyster smell on the body and breath. Swallowing large quantities of DMSO may cause vomiting, diarrhoea, cramps, chills and drowsiness.</p>									
Skin Contact	<p>The material may cause mild but significant inflammation of the skin either following direct contact or after a delay of some time. Repeated exposure can cause contact dermatitis which is characterised by redness, swelling and blistering.</p> <p>Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.</p> <p>Topical exposure to DMSO results in stinging sensation, skin burns, redness, itching, scaly rashes and blisters. There may be garlic breath, transient disturbances of colour vision, headache, aversion to light, diarrhoea, numbness, tiredness, chills, chest pains, aching eyes, dark urine from rapid breakdown of the blood, drowsiness and shock. DMSO is commonly used as a carrier for topical preparations of many chemicals including drugs. Contact with DMSO solutions containing toxic material or materials with unknown toxicology should be avoided, as DMSO easily penetrates the skin and may enhance the rate of skin absorption of other skin-permeable substances.</p> <p>Open cuts, abraded or irritated skin should not be exposed to this material</p> <p>Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.</p>									
Eye	<p>Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals. Prolonged eye contact may cause inflammation characterised by a temporary redness of the conjunctiva (similar to windburn).</p> <p>Direct contact with high concentrations of DMSO produces irritation with temporary stinging and burning. Lower concentrations do not appear to cause injury and are tolerated well. Application of its full strength to the eye may cause pain, moderate discharge, corneal injury and dilation of the conjunctival blood vessels with bleeding. These effects are reversed within 2 days.</p>									
Chronic	<p>Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems.</p> <p>Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.</p> <p>There is some evidence that inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population.</p> <p>There is limited evidence that, skin contact with this product is more likely to cause a sensitisation reaction in some persons compared to the general population.</p> <p>Topical application for 6 months resulted in bad breath, transient reddening of skin, burning and stinging with moderate inflammation. These reversed with continuation of treatment. Continuous applications under an occluding membrane produced hardening of the skin within a month. There could be eye changes, leading to visual impairment; lung inflammation, liver enlargement, and kidney damage may occur. Reproductive effects have been reported in animals.</p>									
dimethyl sulfoxide	<table border="1"> <thead> <tr> <th data-bbox="375 1153 928 1189">TOXICITY</th> <th data-bbox="928 1153 1489 1189">IRRITATION</th> </tr> </thead> <tbody> <tr> <td data-bbox="375 1189 928 1234">dermal (rat) LD50: ~40000 mg/kg^[1]</td> <td data-bbox="928 1189 1489 1234">Not Available</td> </tr> <tr> <td data-bbox="375 1234 928 1279">Inhalation(Rat) LC50: >1.6 mg/L4h^[2]</td> <td data-bbox="928 1234 1489 1279"></td> </tr> <tr> <td data-bbox="375 1279 928 1323">Oral (Mouse) LD50; 7920 mg/kg^[2]</td> <td data-bbox="928 1279 1489 1323"></td> </tr> </tbody> </table>	TOXICITY	IRRITATION	dermal (rat) LD50: ~40000 mg/kg ^[1]	Not Available	Inhalation(Rat) LC50: >1.6 mg/L4h ^[2]		Oral (Mouse) LD50; 7920 mg/kg ^[2]		
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Legend:	<p>1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2. Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances</p>									

DIMETHYL SULFOXIDE	<p>Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. 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. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases. The disorder is characterized by difficulty breathing, cough and mucus production.</p> <p>DMSO (dimethyl sulfoxide) is absorbed following inhalation, through the skin and after oral intake. Topical application causes mild redness, burning, stinging and itching, which disappear after discontinuation. It is mildly irritating to the eye and may induce tear formation with a brief burning sensation. Long term exposure may cause poor weight gain and changes in the blood and eye. There is no adverse effect on reproduction.</p> <p>Extensive monitoring of humans has shown that DMSO does not affect human kidney function. Although it causes an increase in urine production, no sign of kidney damage or cancer has been found. Repeated skin application can cause occasional skin irritation, garlicky breath and body odour. It is metabolised in the body and excreted in the urine, faeces, through the breath and skin. When taken orally, it takes about 120 hours to be completely excreted. No residual accumulation in the body has been reported. Based on their widespread natural occurrence and ready degradation and/or excretion, the production of these metabolites is not expected to pose any toxicological concern. However, very high doses may be harmful.</p> <p>The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.</p> <p>The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.</p>
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DIMETHYL SULFOXIDE

Acute Toxicity	✗	Carcinogenicity	✗
Skin Irritation/Corrosion	✗	Reproductivity	✗
Serious Eye Damage/Irritation	✓	STOT - Single Exposure	✗
Respiratory or Skin sensitisation	✗	STOT - Repeated Exposure	✗
Mutagenicity	✗	Aspiration Hazard	✗

Legend: ✗ – Data either not available or does not fill the criteria for classification
✓ – Data available to make classification

SECTION 12 Ecological information

Toxicity

dimethyl sulfoxide	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	12000mg/L	2
	EC50	48h	Crustacea	24600mg/L	2
	EC50	96h	Algae or other aquatic plants	17.75mg/l	2
	LC50	96h	Fish	>25000mg/L	2
	NOEC(ECx)	96h	Fish	0.003mg/L	4

Legend: *Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*

For Dimethyl Sulfoxide (DMSO): Half-life (hr): 7; Melting Point: 18.5 C; Boiling Point: 189 C (at 1,013 hPa); log Kow: -1.35; Vapor Pressure: 0.81 hPa @ 25 C; Henry Law's Constant: 1.17 10+5 mol.kg-1.atm-1.

Environmental Fate: DMSO is a colorless liquid which, in some cases, has a light, characteristic sulfur odor due to traces of the raw material dimethyl sulfide. The main compartments will be soil (60.4%) and water (39.5%) with the remainder partitioning between air (0.0334%) and sediment (0.0723%).

Aquatic Fate: DMSO is able to mix in all proportion with water and with most of the common organic solvents such as alcohols, esters, ketones, ethers, chlorinated solvents and aromatics. DMSO is stable in water and is not expected to volatilize. DMSO is not expected to bioaccumulate in the aquatic environment. Effluents containing DMSO can easily be treated in biological waste water treatment facilities. DMSO is found in many natural waters but, concentrations are dependent on DMSO producing algae and other natural variables. Terrestrial Fate: Soil - DMSO is mobile in soil and is not expected to adsorb to suspended solids, sediments and soils. Any DMSO over sprayed to the soil from applications to crops would be rapidly metabolized by a wide variety of microorganisms diminishing ground or surface water exposure to DMSO. Plants - DMSO is absorbed by plant roots. Metabolism of DMSO primarily occurs in the foliage and does not accumulate in plant tissues. The amount of residue is dependent on the time since application.

Ecotoxicity: It is expected that DMSO will be readily biodegradable with better expectations for it to be neither biodegradable nor bioaccumulative. Biodegradability is 94% after 27 days. Aerobic biodegradation produces nonpolluting sulfates and CO2. When applied to food crops, dietary exposure to DMSO can be estimated from naturally-occurring DMSO levels in various food and feedstuffs in combination with those from crops harvested 24 hours after DMSO application. Since DMSO is naturally-occurring in most fruits, vegetables and grains, it is readily metabolized and eliminated and has low toxicity. Plant-eating animals, including humans, ingest endogenous DMSO on a daily basis throughout their life as part of the normal diet without adverse effect. DMSO is not acutely toxic to fish, Daphnia sp. water fleas, bacteria or algae.

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
dimethyl sulfoxide	HIGH	HIGH

Bioaccumulative potential

Ingredient	Bioaccumulation
dimethyl sulfoxide	LOW (BCF = 0.4)

Mobility in soil

Ingredient	Mobility
dimethyl sulfoxide	LOW (KOC = 4.411)

SECTION 13 Disposal considerations

Waste treatment methods

DIMETHYL SULFOXIDE

Product / Packaging disposal

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

- **DO NOT allow wash water from cleaning 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.

In the absence of dissolved oxygen and in the presence of bacteria, a small amount of DMSO can be reduced to DMS (dimethyl sulfide), which produces a nauseating odour at very small concentrations.

These specific conditions occur mainly with DMSO effluents in poorly aerated, non sterile storage tanks or in biological waste treatment plant.

- With spot quantity of DMSO effluents in drums or storage tank, odour can be prevented or eliminated with 0,3% concentration of castor oil based formulation.
- In biological water treatment plant, DMS formation can be inhibited with less than 5 ppm of nitrates such as KNO₃. NB: nitrate concentration are permitted by European standards up to 50 ppm in both waste water and drinking water.
- If hydrogen peroxide is already used, with a molar recommended ratio H₂O₂/DMSO of 2, oxidation of DMSO leads to stable DMSO₂ (dimethyl sulfone).
- 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.

Ensure that the hazardous substance is disposed in accordance with the Hazardous Substances (Disposal) Notice 2017

Disposal Requirements

Packages that have been in direct contact with the hazardous substance must be only disposed if the hazardous substance was appropriately removed and cleaned out from the package. The package must be disposed according to the manufacturer's directions taking into account the material it is made of. Packages which hazardous content have been appropriately treated and removed may be recycled.

The hazardous substance must only be disposed if it has been treated by a method that changed the characteristics or composition of the substance and it is no longer hazardous.

DO NOT deposit the hazardous substance into or onto a landfill or a sewage facility.

Burning the hazardous substance must happen under controlled conditions with no person or place exposed to

(1) a blast overpressure of more than 9 kPa; or

(2) an unsafe level of heat radiation.

The disposed hazardous substance must not come into contact with class 1 or 5 substances.

SECTION 14 Transport information

Labels Required

Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (UN): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Air transport (ICAO-IATA / DGR): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Sea transport (IMDG-Code / GGVSee): NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

Transport in bulk according to Annex II of MARPOL and the IBC code

Not Applicable

Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
dimethyl sulfoxide	Not Available

Transport in bulk in accordance with the IGC Code

Product name	Ship Type

Continued...

Product name	Ship Type
dimethyl sulfoxide	Not Available

SECTION 15 Regulatory information

Safety, health and environmental regulations / legislation specific for the substance or mixture

This substance can be managed under the controls specified in the Transfer Notice or alternatively it may be managed using the conditions specified in an applicable Group Standard.

HSR Number	Group Standard
HSR002649(Proposed)	Solvents (Combustible) Group Standard 2020

Please refer to Section 8 of the SDS for any applicable tolerable exposure limit or Section 12 for environmental exposure limit.

dimethyl sulfoxide is found on the following regulatory lists

FEI Equine Prohibited Substances List - Controlled Medication

FEI Equine Prohibited Substances List (EPSL)

New Zealand Hazardous Substances and New Organisms (HSNO) Act - Classification of Chemicals

New Zealand Hazardous Substances and New Organisms (HSNO) Act - Classification of Chemicals - Classification Data

New Zealand Inventory of Chemicals (NZIoC)

Hazardous Substance Location

Subject to the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Hazard Class	Quantities
Not Applicable	Not Applicable

Certified Handler

Subject to Part 4 of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Class of substance	Quantities
Not Applicable	Not Applicable

Refer Group Standards for further information

Maximum quantities of certain hazardous substances permitted on passenger service vehicles

Subject to Regulation 13.14 of the Health and Safety at Work (Hazardous Substances) Regulations 2017.

Hazard Class	Gas (aggregate water capacity in mL)	Liquid (L)	Solid (kg)	Maximum quantity per package for each classification
3.1C or 3.1D				10 L

Tracking Requirements

Not Applicable

National Inventory Status

National Inventory	Status
Australia - AIC / Australia Non-Industrial Use	Yes
Canada - DSL	Yes
Canada - NDSL	No (dimethyl sulfoxide)
China - IECSC	Yes
Europe - EINEC / ELINCS / NLP	Yes
Japan - ENCS	Yes
Korea - KECI	Yes
New Zealand - NZIoC	Yes
Philippines - PICCS	Yes
USA - TSCA	Yes
Taiwan - TCSI	Yes

National Inventory	Status
Mexico - INSQ	Yes
Vietnam - NCI	Yes
Russia - FBEPH	Yes
Legend:	Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.

SECTION 16 Other information

Revision Date	17/06/2022
Initial Date	26/08/2006

SDS Version Summary

Version	Date of Update	Sections Updated
4.1	27/06/2017	Hazards identification - Classification
5.1	17/06/2022	Toxicological information - Acute Health (swallowed), First Aid measures - Advice to Doctor, Physical and chemical properties - Appearance, CAS Number, Hazards identification - Classification, Identification of the substance / mixture and of the company / undertaking - Synonyms, Identification of the substance / mixture and of the company / undertaking - Use

Other information

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC - TWA: Permissible Concentration-Time Weighted Average
 PC - STEL: Permissible Concentration-Short Term Exposure Limit
 IARC: International Agency for Research on Cancer
 ACGIH: American Conference of Governmental Industrial Hygienists
 STEL: Short Term Exposure Limit
 TEEL: Temporary Emergency Exposure Limit
 IDLH: Immediately Dangerous to Life or Health Concentrations
 ES: Exposure Standard
 OSF: Odour Safety Factor
 NOAEL :No Observed Adverse Effect Level
 LOAEL: Lowest Observed Adverse Effect Level
 TLV: Threshold Limit Value
 LOD: Limit Of Detection
 OTV: Odour Threshold Value
 BCF: BioConcentration Factors
 BEI: Biological Exposure Index
 AIIC: Australian Inventory of Industrial Chemicals
 DSL: Domestic Substances List
 NDSL: Non-Domestic Substances List
 IECSC: Inventory of Existing Chemical Substance in China
 EINECS: European INventory of Existing Commercial chemical Substances
 ELINCS: European List of Notified Chemical Substances
 NLP: No-Longer Polymers
 ENCS: Existing and New Chemical Substances Inventory
 KECI: Korea Existing Chemicals Inventory
 NZIoC: New Zealand Inventory of Chemicals
 PICCS: Philippine Inventory of Chemicals and Chemical Substances
 TSCA: Toxic Substances Control Act
 TCSI: Taiwan Chemical Substance Inventory
 INSQ: Inventario Nacional de Sustancias Químicas
 NCI: National Chemical Inventory
 FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

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