

**SAFETY DATA SHEET****Dimethyl Sulfoxide (DMSO)**

Date of Preparation: July 21, 2016

Section 1: IDENTIFICATION

Product Name: Dimethyl Sulfoxide (DMSO)

Synonyms: Enviro S, dimethyl sulphoxide, methyl sulfoxide, sulfinylbis [methane].

Product Use: Solvent for manufacture of pharmaceuticals, fine chemicals and polymers.

Restrictions on Use: Not available.

Manufacturer/Supplier: Valhoma Corporation
1617 N. 93rd East Ave.
Tulsa, OK 74115
United States

Emergency Phone: CHEMTREC (USA): (800) 424-9300
Customer Service: Valhoma Corporation:
(918) 836-7135 (8:00am - 5:00pm CST)

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Section 2: HAZARD(S) IDENTIFICATION**GHS INFORMATION**

Classification: Flammable Liquids, Category 4

LABEL ELEMENTS

Hazard None.

Pictogram(s):

Signal Word: Warning

Hazard Combustible liquid.

Statements:

Precautionary Statements

Prevention: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Wear protective gloves, protective clothing and eye protection.

Response: In case of fire: Use dry chemical, CO₂, water spray or regular foam to extinguish.

Storage: Store in a well-ventilated place. Keep cool.

Disposal: Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: None.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).



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This material is considered hazardous by the Hazardous Products Regulations.

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Methane, 1,1'-sulfinylbis-	Dimethyl sulfoxide; DMSO	67-68-5	75 - 100

Impurities / Stabilizing additives: None known.

Section 4: FIRST-AID MEASURES

Inhalation: If inhaled: Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Exposure to high concentrations of Dimethyl sulfoxide could cause lowering of consciousness. Repeated exposure to DMSO vapors did not cause any irritation to the respiratory tract; however the exposure to high concentrations in the form of an aerosol induced an irritation of the upper airways after a repeated exposure.

Eye Contact: If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. DMSO is slightly irritating for the eye. In studies performed following the OECD 405 or the EEC method B.5, a slight to moderate conjunctival irritation, which cleared in 3 days, was observed in the eyes of rabbits. In humans, the instillation of solutions containing 50 to 100% DMSO has caused transient sensation of burning which was reversible within 24 hours.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Call a poison center or doctor if you feel unwell.

Acute and delayed symptoms and effects: May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching. Dimethyl sulfoxide may accelerate skin absorption of other materials. A skin irritation assay performed in rabbit (OECD 404) revealed no more than a very slight or well-defined erythema, which disappeared in 3 days.

Ingestion: If swallowed: Call a poison center or doctor if you feel unwell. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

Acute and delayed symptoms and effects: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.



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General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE-FIGHTING MEASURES

FLAMMABILITY AND EXPLOSION INFORMATION

Combustible liquid. Will be ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors will spread along ground and collect in low or confined areas (sewers, basements, tanks). Containers may explode when heated.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.

Sensitivity to Static Discharge: This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical, CO₂, water spray or regular foam.

Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Do not use straight streams.

Products of Combustion: Oxides of carbon. Oxides of sulphur.

Protection of Firefighters: Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. Runoff from fire control or dilution water may cause pollution. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8.

Environmental Precautions: Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment: Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:

Do not swallow. Avoid breathing mist, vapours, or spray. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Keep container tightly closed. Ground and bond container and receiving equipment. Use non-sparking tools. Take action to prevent static discharges. See Section 8 for information on Personal Protective Equipment.

Storage:

Store in a well-ventilated place. Keep cool. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. Keep out of the reach of children.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

Component

Dimethyl sulfoxide (DMSO) [CAS No. 67-68-5]

ACGIH: No TLV established.

OSHA: No PEL established.

PEL: Permissible Exposure Limit

TLV: Threshold Limit Value

Engineering Controls:

Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)



Eye/Face Protection:

Wear safety glasses with side shields. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection:

Wear protective gloves. Butyl or nitrile rubber gloves are recommended. Consult manufacturer specifications for further information.

Skin and Body Protection:

Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection:

Not required under normal use conditions. If ventilation is inadequate then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-11, with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.



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General Hygiene Considerations: Handle according to established industrial hygiene and safety practices. Consult a competent industrial hygienist to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear, colorless liquid.
Colour:	Colorless.
Odour:	Odorless.
Odour Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	18.5 °C (65.3 °F)
Initial Boiling Point:	189 °C (372.2 °F)
Boiling Range:	Not available.
Flash Point:	87 °C (188.6 °F) (Closed Cup)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	2.6 %
Upper Flammability Limit:	42 %
Vapor Pressure:	59.4 Pa at 20 °C (68 °F)
Vapor Density:	2.7 (Air = 1)
Relative Density:	1.1 (Water = 1)
Solubilities:	Miscible in water.
Partition Coefficient: n-Octanol/Water:	log Pow: -1.35 (calculated)
Auto-ignition Temperature:	215 °C (419 °F)
Decomposition Temperature:	Not available.
Viscosity:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
Density:	Not available.
Coefficient of Water/Oil Distribution:	Not available.



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Section 10: STABILITY AND REACTIVITY

Reactivity:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Chemical Stability:	Stable under normal storage conditions.
Possibility of Hazardous Reactions:	None known.
Conditions to Avoid:	Contact with incompatible materials. Sources of ignition. Exposure to heat.
Incompatible Materials:	Strong oxidizers. Perchlorates.
Hazardous Decomposition Products:	Not available.

Section 11: TOXICOLOGICAL INFORMATION**EFFECTS OF ACUTE EXPOSURE****Product Toxicity**

Oral:	14500 mg/kg (rat)
Dermal:	40000 mg/kg (rat)
Inhalation:	> 5330 mg/m ³ (rat); 4H

Component Toxicity

Component	CAS No.	LD₅₀ oral	LD₅₀ dermal	LC₅₀
Dimethyl sulfoxide	67-68-5	14500 mg/kg (rat)	40000 mg/kg (rat)	> 5330 mg/m ³ (rat); 4H

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system.

Symptoms (including delayed and immediate effects)

Inhalation:	May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Exposure to high concentrations of Dimethyl sulfoxide could cause lowering of consciousness. Repeated exposure to DMSO vapors did not cause any irritation to the respiratory tract; however the exposure to high concentrations in the form of an aerosol induced an irritation of the upper airways after a repeated exposure.
Eye:	May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. DMSO is slightly irritating for the eye. In studies performed following the OECD 405 or the EEC method B.5, a slight to moderate conjunctival irritation, which cleared in 3 days, was observed in the eyes of rabbits. In humans, the instillation of solutions containing 50 to 100% DMSO has caused transient sensation of burning which was reversible within 24 hours.
Skin:	May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching. Dimethyl sulfoxide may accelerate skin absorption of other materials. A skin irritation assay performed in rabbit (OECD 404) revealed no more than a very slight or well-defined erythema, which disappeared in 3 days.



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Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Sensitization tests performed in guinea pigs and mice were uniformly negative. A skin sensitization assay performed in humans was also negative.

Respiratory Sensitization: There is no reported case of respiratory sensitization in humans.

Medical Conditions Not available.

Aggravated By Exposure:

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system.

Chronic Effects: In humans, repeated application of DMSO solution to skin for up to several months can induce transient erythema, burning, stinging and itching, which returned to normal after discontinuation of treatment. A repeated instillation (100% DMSO, 3 times/day for 6 months) in the eyes of rabbits induced only a temporary lacrimation but did not show any changes in the iris, cornea, lens, retina, conjunctiva and lids.

In repeated dose toxicity studies performed by different routes of administration and with several mammalian species, DMSO produced only slight systemic toxicity. With the exception of a decrease of the body weight gain and some hematological effects (which could be secondary to an increased diuresis) at very high dose levels, the most common finding observed in these studies is changes of the refractive power of the lens. Species in which such lens alterations readily develop include the rat, rabbit, dog and pig, while primates are not sensitive. Clinical signs of systemic toxicity and the alterations of the lens have never been observed or reported in clinical and epidemiological studies performed in humans, even after exposure to high dose level (1000 mg/kg/d for 3 months) or for a long period of time (up to 19 months). The NOAELs by oral and dermal routes in primates are 2970 and 8910 mg/kg bw/d, respectively.

Carcinogenicity: This product does not contain any carcinogens or potential carcinogens as listed by ACGIH, IARC, OSHA, or NTP. There are no standard carcinogenicity studies conducted with DMSO, but considering the lack of genotoxic potential, the absence of target organs (excepted the eye lens in some sensitive species) in many repeated dose toxicity studies performed with divers animal species, routes of administration and exposure durations up to 2 years and the results of some initiation/promotion studies, it is not scientifically justified to perform a carcinogenicity study.

Mutagenicity: No genotoxic activity was observed for DMSO in gene mutations assays in *Salmonella typhimurium*, an in vitro cytogenetics assay in CHO cells and an in vivo micronucleus assay in rats. With few exceptions, a large battery of additional in vitro and in vivo non-guideline studies confirmed the lack of genotoxic potential.

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Reproductive Effects:

In a Reproduction/Developmental Toxicity Screening Test performed following OECD 421, the NOAEL for parental toxicity, reproductive performance (mating and fertility) and toxic effects on the progeny was considered to be 1000 mg/kg/day.

Developmental Effects**Teratogenicity:**

The developmental toxicity of DMSO has been investigated in OECD guideline studies using rats and rabbits. In developmental toxicity studies, oral administration of DMSO to pregnant female rats or rabbits during the period of organogenesis was not teratogenic. The NOAELs for maternal toxicity and embryo/foetotoxicity were 1000 mg/kg/day in both species.

Embryotoxicity: Not available.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION**Ecotoxicity:**

Danio rerio: LC50 > 25 g/L, 24-hr, freshwater, static;
Danio rerio: LC50 > 25 g/L, 48-hr, freshwater, static;
Danio rerio: LC50 > 25 g/L, 72-hr, freshwater, static;
Danio rerio: LC50 > 25 g/L, 96-hr, freshwater, static;
Oncorhynchus mykiss: LC50 = 33 - 37 g/L, 96-hr, freshwater, static;
Lepomis macrochirus: LC50 > 40 g/L, 96-hr, freshwater, static;
Oncorhynchus mykiss: LC50 = 38 g/L, 96-hr, freshwater;
Pimephales promelas: LC50 = 34 g/L, 96-hr, freshwater, flow-through;
Oryzias latipes: LC50 = 33 g/L, 96-hr, freshwater, static;
Daphnia magna: EC50 = 24.6 g/L, 48-hr, freshwater, static;
Daphnia magna: EC50 = 58.2 g/L, 24-hr;
Artemia salina: EC50 = 68.6 g/L, 24-hr;
Culex pipiens molestus: EC50 = 23.2 g/L, 24-hr;
Daphnia pulex: EC50 = 22300 - 27100 mg/L, 18-hr;
Culex restuans: EC50 = 25.9 - 30.7 g/L, 18-hr;
Hyalella azteca: EC50 = 31900 - 58000 mg/L, 18-hr;
Palaemonetes kadiakensis: EC50 = 22100 - 45000 mg/L, 18-hr;
Daphnia magna: EC50 = 19.25 g/L, 24-hr;
Daphnia sp.: EC50 = 7000 mg/L, 24-hr;
Pseudokirchnerella subcapitata: EC50 = 17 g/L, 72-hr, freshwater, static;
Pseudokirchnerella subcapitata: EC50 = 12 g/L, 72-hr, freshwater, static;
Chlamydomonas eugametos: EC63 = 25 g/L, 48-hr;
Green algae: EC50 = 27448.309 mg/L, 96-hr;
Green algae: ChV = 426.87 mg/L, 96-hr.

**Persistence /
Degradability:**

DMSO is not considered as persistent in environment.

Stability in air:

DMSO does not absorb light at wavelengths >290 nm and therefore is not expected to be susceptible to direct photolysis by sunlight.



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Stability in water:

DMSO is expected to be stable in water in the environmental conditions. DMSO is not expected to volatilize according to its Henry's law constant. DMSO is readily reduced to dimethyl sulfide by reducing agents such as Sn(II), iodine, Ti(III), Cr(II) that may be present in the environment.

Stability in soils:

Metabolism of DMSO in soil by microorganisms results in the formation of sulfur and dimethyl sulfide. Reduction was significantly correlated with the organic C and N content of the mineral soils, anaerobically-mineralized N, microbial biomass C and aerobically mineralized SO₄S.

**Bioaccumulation /
Accumulation:**

Based on its log Kow value (-1.35) DMSO has a low potential for bioaccumulation.

**Mobility in
Environment:**

Adsorption/desorption

DMSO Log Koc is estimated as 0.64, using a log Kow of -1.35 and a regression-derived equation. This estimated Koc value suggests that DMSO is expected to have very high mobility in soil. Nevertheless, DMSO could adsorb chemically or physically on minerals contained in clay. It can be assumed that this weak adsorption would be due to DMSO polarity.

Koc = 0.15 is the value retained for PNEC calculations when equilibrium partitioning method is required. This Koc is obtained from Gerstl' equation (1990) as recommended by the technical guidance document for deriving PNECs.

Volatilization from soil

The Henry's Law constant for DMSO indicates that DMSO is expected to be essentially non-volatile from moist soil. DMSO is expected to slowly volatilize from dry soil surfaces based upon a vapor pressure 0.56 hPa.

Volatilization from water

DMSO is not expected to volatilize from water. Its concentration would increase in time as water evaporates. The rate of volatilization will be controlled by the chemical's slow diffusion through air. The observation that the concentration of DMSO in marine air is about a hundredth that of dimethyl sulfide suggests that little or no DMSO is volatilizing from the sea surface.

Other Adverse Effects: Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORT INFORMATION**U.S. Department of Transportation (DOT)****Less than 119 gallons single container:** Non regulated.**Greater than 119 gallons single container:****Proper Shipping Name:** NA1993, COMBUSTIBLE LIQUIDS, N.O.S. (Dimethyl sulfoxide),
Combustible liquid, PG III**Class:** Combustible liquid**UN Number:** NA1993**Packing Group:** III**Label Code:****Canada Transportation of Dangerous Goods (TDG)****Proper Shipping Name:** Not regulated.**Class:** Not applicable.**UN Number:** Not applicable.**Packing Group:** Not applicable.**Label Code:** Not applicable.**IMDG Transport Information****Proper Shipping Name:** Not regulated.**Class:** Not applicable.**UN Number:** Not applicable.**Packing Group:** Not applicable.**Label Code:** Not applicable.**ICAO/IATA Transport Information****Proper Shipping Name:** Not regulated.**Class:** Not applicable.**UN Number:** Not applicable.**Packing Group:** Not applicable.**Label Code:** Not applicable.**Section 15: REGULATORY INFORMATION****Chemical Inventories****US (TSCA)**

The components of this product are in compliance with the chemical notification requirements of TSCA.



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Canada (DSL)

The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations

United States

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

No components are listed.

State Regulations

Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

No components are listed.

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Dimethyl sulfoxide (DMSO)	67-68-5	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

No components are listed.

California

California Prop 65: This product does not contain chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Section 16: OTHER INFORMATION

Disclaimer:

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

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Version: 1.0

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