Safety Data Sheet

Section 1 - Product and Company Identification

Product name：Dimethyl Sulfoxide (DMSO)
Other names：--
Product use： Solvent for polymerization & cyanide reactions; analytical reagent; in industrial cleaners, pesticides; preservation of cells at low temperatures; in plant pathology and nutrition.
Supplier's name：San Fu Chemical Co., Ltd.
Supplier's address：340 Hsiao Hsin Li, Shan-Hua District, Tainan City, Taiwan, R.O.C.
Supplier's phone：886-6-5837608 Emergency phone：886-6-5837608
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Section 2 - Hazards Identification

Classification：

1. Flammable liquids Category 4
2. Skin corrosion / irritation Category 3
3. Specific target organ system toxicity - single exposure Category 3
4. Serious eye Damage/eye irritation Category 2B

The Most Important Hazards and effect

Label element：

- Hazard symbol： Exclamation Mark

- Signal word：Warning

Hazard statement：

1. Flammable liquids and vapor
2. May cause moderate skin irritation
3. May cause respiratory tract irritation
4. May cause eye irritation

Precautionary statement：

1. Avoid contact with eyes.
2. Avoid contact with skin.
3. In case of contact with eyes, flush with plenty of water, call doctor immediately.
4. If swallowed, seek medical attention immediately and show this container or label

Others Hazard：/

Section 3 - Composition/Information On Ingredients

Chemical name：Dimethyl sulfoxide (DMSO)
Synonyms： Methyl sulfoxide; DMSO; Sulfinylbis(methane); Dimethyl sulfoxide; Sulfinylbismethane, C_2H_6OS
CAS No.：67-68-5

Ingredient contributing to the hazard(%)：100 %

Section 4 - First Aid Measures

The First-aid Information： ■ Inhalation：Move exposed person to fresh air. Keep person warm and at rest. If not breathing, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Call physician immediately. ■ Skin Contact：Use warm water to gently wash contaminated places for at least 20 minutes immediately. Remove contaminated clothes, shoes, and leather products. Thoroughly clean contaminated clothes before reuse. Do not reuse contained shoes and leather products. Get medical attention immediately. ■ Eye Contact：Immediately flush eyes with plenty of water for at least 30 minutes, lifting lower and upper eyelids occasionally. Try to not contaminate unaffected area. Get medical attention immediately. ■ Ingestion：Do not induce vomiting. Give large quantities of water. Never give anything by mouth to an unconscious person. Call a physician immediately. May cause irritation to skin, eyes, and respiratory tract.
Protection of First-aiders：Wear Class C protective gears and do first aid in a safe zone.
Notes to a Physician：--

Section 5 - Fire Fighting Measures

Extinguishing Media：Water spray, dry chemical powder, foam, or carbon dioxide. 1. Small fire: Use dry chemical powder, appropriate foam, or water spray. DO NO use water jet. 2. Large fire: Use water spray or appropriate foam.
Specific Hazards when Fire-fight： 1. Moderate fire hazard when expose to heat or flame. 2. Vapor can flow along surfaces to distant ignition source and flash back. 3. Above the flash point, vapor-air mixtures are explosive with flammable limits.
Specific Fire-fighting Procedure： 1. If safe to do so, move undamaged containers from the fire area. 2. Cool tanks or containers with flooding quantities of water until fire is out. 3. Stay away from the ends of tanks. 4. For fires in cargo or storage area, cool containers with water from unmanned hose holder or monitor nozzles until fire is out. If this is impossible then take the following precautions: keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. 5. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. 6. For tank, rail car, or tank truck: evacuation radius 800 meters (1/2 mile). 7. Let the fire burn unless leak can be stopped immediately. 8. Reduce vapors with water spray. Do not use high-pressure steam pressure on spills. 9. Fight fire from protected location or safe distance. 10. Do not inhale chemical or fumes. 11. Approach fire from upwind. Stay away from the low or confined areas.

Specific Protection of Firefighters：

1. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH and full protective gear
2. If necessary, may cover a spark-proof coat on the protective clothing.

Section 6 - Accidental Release Measures

Personal Precautions：

1. Do not inhale vapor or mist.
2. Restrict access to area until completion of clean up.
3. Ensure clean up is inducted by trained personnel only.
4. Wear proper personal protective gears.

Environmental Precautions：

1. Well-ventilated the contaminated area.
2. Remove all sources of ignition.

Methods for Cleaning up：

1. Under a safe condition, try to stop or reduce the leakage.
2. Reduce vapor with water spray.
3. Small spills/leaks: Absorb spill with sand or other inert material, and then place in suitable containers for disposal. Remove all sources of ignition. Provide ventilation.
4. Large spills/leaks: Dike spills for disposal.

Section 7 - Handling and Storage

Handling：

1. Avoid contact with personnel.
2. Do not breathe vapor or mist.
3. Use an appropriate respirator if expose to hazard.
4. Store in a cool, well-ventilated area.
5. Do not enter confined area unless the air quality has been checked.
6. Avoid smoking, naked lights, or ignition sources.
7. Stay away from incompatible materials.
8. Never eat, drink, or smoke in work areas.
9. Keep containers tightly closed when not in use.
10. Protect containers against physical damage.
11. Wash thoroughly with soap and water after handling.
12. Launder contaminated clothing separate from other household laundry.
13. Practice good personal hygiene after using this material.
14. Check air quality regularly to ensure the safety in work environment.

Storage：

1. Make sure all containers are labeled clearly.
2. Store in glass, metal, or multi-layer lined containers.
3. Avoid contact with oxidizers and incompatible materials.
4. Store in original containers.
5. Keep containers tightly closed.
6. Avoid smoking, naked lights, heat, or ignitions sources in work area.
7. Store in a cool, dry, and well-ventilated area.
8. Stay away from incompatible materials and food area.

9. Protect containers against physical damage, check regularly for spill and leak.
10. Store protected from moisture.

Section 8 - Exposure Controls & Personal Protection

Engineering measures：

1. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.
2. Use adequate ventilation to keep airborne concentrations low.

Control parameters			
TWA	STEL	Ceiling	Biological standards
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■ Personal protective equipment：

1. Respiratory protection： The following respirators are recommended based on information found in the physical data, toxicity and health effects sections. They are ranked in order from minimum to maximum respiratory protection. The specific respirator selected must be based on contamination levels found in the work place, must be based on the specific operation, must not exceed the working limits of the respirator and must be jointly approved by the National Institute for Occupational Safety and Health and the Mine Safety and Health Administration (NIOSH-MSHA).
2. Any type 'C' supplied-air respirator with a full face-piece operated in pressure-demand or other positive pressure mode or with a full face-piece, helmet or hood operated in continuous-flow mode.
3. Any self-contained breathing apparatus with a full face-piece operated in pressure-demand or other positive pressure mode.

■ Hand Protection：Wear appropriate chemical protective gloves.

■ Eye Protection：Wear splash-proof safety goggles. An emergency eye wash station should be provided whenever the possibility exists for eye exposure to this substance.

■ Skin and Body Protection：Wear proper protective clothing and equipments.

Hygiene measures：

1. Change contaminated clothing. Dispose or reuse after cleaning thoroughly. Must advise the danger to the laundry worker.
2. Eating or smoking is prohibited.
3. Wash hands thoroughly after working with the substance.
1. Maintain the cleanness of the workplace.

Section 9 - Physical & Chemical Properties

Appearance：liquid	Odor：distinctive garlic or oyster-like odor
Colour：colorless	Melting Point: 18.45℃
pH value：--	Boiling point/boiling range：189℃
Flammability: --	Flash point：89℃
Decomposition temp：＞189℃	Test method：close
Autoignition temp：215℃	Explosion properties：2.6% ～ 42%
Vapor pressure：0.4 mmHg@20℃	Vapor density：2.71 (air = 1)

Density：1.1014 (water = 1)	Solubility：Soluble in cold water, ethanol, acetone, ether, benzene, chloroform
log Kow：--	Evaporation Rate：4.3 (Carbon Tetrachloride = 1)

Section 10 - Stability & Reactivity Data

Stability：Stable under normal temperature and pressure

Possible hazardous reactions under specific conditions：

1. Acid Anhydrides - Possible explosive reaction.
2. Acid Halides - Possible explosive reaction.
3. Acyl Halides - Violent or explosive reaction.
4. Aryl Halides - Violent decomposition reaction.
5. Boron Hydrides - May form explosive mixture.
6. Boron Hydroborates - May form explosive mixture.
7. 4(4'-Bromobenzoyl)acetanilide - May explode at elevated temperatures.
8. Carbonyl Diisothiocyanate - Explosive reaction.
9. Dinitrogen Tetraoxide - Violent or explosive reaction.
10. Iodine Pentafluoride - Possible explosive reaction.
11. Metal Nitrates - Forms an extremely explosive mixture.
12. Metal Perchlorates - Forms an extremely explosive mixture.
13. Nitric Acid - Possible explosion hazard.
14. Oxidizers (strong) - Fire and explosion hazard.
15. Perchloric Acid - Explodes on contact.
16. Periodic Acid - Possible explosive reaction.
17. Phosphorous (III) Oxide - Violent reaction.
18. Potassium - Violent reaction.
19. Potassium Permanganate - Ignition on contact.
20. Silver Difluoride - Violent reaction.
21. Sodium Hydride - Possible fire and explosion at elevated temperatures.
22. Sulfur Trioxide - Exothermic reaction.

Conditions to avoid：air, heat, sparks, open flame, other sources of ignition.

1. Avoid contact with heat, sparks, flames, or other sources of ignition. Vapors may be explosive.
2. Avoid overheating of containers; containers may violently rupture in heat of fire.
3. Avoid contamination of water sources.

Materials to avoid：alkali metal、peroxide、nitrate、halogens or halide、perchloric acid、chlorate、nonmetallic oxyhalides、NOx、SOx、Strong oxidant.

Hazardous decomposition products：Thermal decomposition products may include formaldehyde, methyl mercaptan, and sulfur dioxide vapors.

Section 11 - Toxicological Information

Route of exposure：Eye、Skin、Ingestion、Inhalation

Symptoms：coughing, nausea, vomiting, chills, cramps, headache, lethargy, diarrhea, drowsiness, blurred vision, or dilatation of blood vessels in the conjunctiva.

Immediate Toxicity：

- Skin:

1. May cause irritation with erythema, itching, scaling, a transient burning sensation, and possibly blistering.
2. May initiate the immediate release of histamine with urticarial wheal and flare formation.
3. Absorption is rapid and may cause a garlic-like taste and odor to the breath and skin.
4. Large amounts may cause nausea, vomiting, cramps, diarrhea, anesthesia, lethargy, drowsiness, headache, chills, chest pains, burning and aching eyes, and transient disturbances of color vision and photophobia.
5. Transient hemolysis with hemoglobinuria has also been reported.
6. Enhanced irritation, epidermal vesiculation, histological evidence of dermal death, and perivascular dermal infiltrates were noted after occluded path testing.
7. Occasional hypersensitivity reactions including anaphylaxis have been reported.
8. Due to its solvent properties, DMSO facilitates the absorption of substances present on the skin which may result in toxic effects.

■ Eyes:

1. Direct contact may cause irritation with redness, pain, and blurred vision.
2. Aqueous solutions containing 75-90% DMSO may cause irritation with temporary stinging and burning. 50% solutions have caused a transient burning sensation.
3. Lower concentrations have been tolerated well without injury to the eye.
4. Application full strength into rabbit eyes caused pain, moderate discharge, corneal epithelium injury, and dilation of conjunctiva blood vessels but no hemorrhaging. The eyes returned to normal in 2 day.

■ Inhalation:

1. Vapors may cause moderate irritation of the respiratory tract without coughing.
2. Exposure to very high concentrations may cause symptoms of intoxication, for example, nausea, vomiting, chill, spasm, headache, dizziness, and lethargy.
3. Allergic respiratory reactions may also occur.

■ Ingestion: Ingestion of large amounts may cause nausea, vomiting, diarrhea, abdominal pain, lethargy, and drowsiness.

- LD_{50}：14500 mg/kg (Oral, Rat)
- LC_{50}：--
- 500 mg/24H (Rabbit, skin) irritation
- 500 mg/24H (Rabbit, eye) irritation

Specific effects：

1. Animals showed liver damage and bronchopneumonia on being subjected to spray for 5 minutes, 10 times over 15 days, but no evidence of toxicity on exposure to heated vapor for 30 minutes under similar conditions.
2. Rabbits exposed to 25-50 ml/hour of mist for 5 months developed chemical pneumonia, cloudy swelling of the liver, and signs of renal toxicity.
3. 9ml of 90% DMSO was applied to the entire trunk of 20 men once daily for 26 weeks. The effects noted were bad breath, transient erythema, burning, and stinging. The dermatitis, accompanied by only moderate inflammation, regressed as treatment continued.
4. Crystalline lens alterations, resembling juvenile nuclear sclerosis, have been produced in some animal species, but not in humans. No lens abnormalities were found in 25 patients treated daily with up to 30ml applied topically for 19 months.
5. Repeated or prolonged contact with irritants may cause conjunctivitis.
6. In animal studies, repeated doses of 1-5 gm/kg resulted in liver necrosis and renal lesions.

Reproductive effects have been reported in animals.

Section 12 - Ecological Information

Ecotoxicology： ■ LC_{50}(fish)：400μg/L/96 weeks (Brachydanio rerio) ■ EC_{50}(Aquatic Invertebrates)：-- ■ Bioconcentration factor (BCF)：＜1 (esetimated)
Persistence and degradability： 1. Dimethyl sulfoxide is expected to slowly volatilize fro dry soil surfaces based upon a vapor pressure 0.61 mm Hg. 2. If released into water, dimethyl sulfoxide is not expected to adsorb to suspended solids and sediment based upon the esetimated Koc. 3. Volatilization from water and moist soil surfaces is not expected to be an important fate process. 4. Vapor-phase dimethyl sulfoxide will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 6.2-6.6 hours. ■ Half-Life (Air)：6.2-6.6 hours ■ Half-Life (Water surface)：-- ■ Half-Life (Groundwater)：-- ■ Half-Life (Soil)：--
Bioaccumulative potential：A low experimental BCF of ＜1 suggests that bioconcentration in aquatic organisms is low.
Mobility in soil：If released to soil, dimethyl sulfoxide is expected to have very high mobility based upon an estimated Koc of 4.
Other adverse effects：DMSO will react with photochemically-produced hydroxyl radicals with a half-life of about 7 hours. DMSO is very difficult to biodegrade.

Section 13 - Disposal Considerations

Methods of disposal： The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations.

Section 14 - SDS Transport Information

UN classification number：1993
Proper D.O.T Shipping Name：Dimethyl Sulfoxide
Hazard Class：--
Packing Group：--
Marine pollution：--

Specific precautionary transport measures and conditions：--

Section 15 - Regulatory Information

Regulations： 1. Occupational Safety and Health Act 2. Regulations for the Labelling and Hazard Communication of Hazardous Chemicals 3. Road Traffic Safety Regulations 4. Industrial Waste Storage and Disposal Regulations 5. Assessment and Classification Administration of Hazardous Chemicals 6. Permissible Exposure Limits of Hazardous Substances in the Work Environment 7. Public Hazardous Materials and Flammable Pressurized Gases Establishment Standards and Safety Control Regulations.

Section 16 - Other Information

Literature references	1. RTECS Database, TOMES CPS CD-ROM, Vol. 71, 2007 2. ChemWatch Database, 2007-1 3. OHS MSDS Database, 2007 4. HSDB Database, TOMES CPS CD-ROM, Vol. 71, 2007	
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Remarks	Symbols Explanations: "--" No information is available at this time. "/" Not applicable to this substance.	

■ This information above has consulted national or international papers and manufacturer or supplier's provided information. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Users should make their own determination of the suitability of the information for their particular purposes.