

Material Safety Data Sheet

MSDS No.
AP1595

DISULFIDE OIL (DSO)

HMIS	<p>IMPORTANT: Read this MSDS before handling and disposing of this product and pass this information on to employees, customers, and users of this product.</p> <p>This product is covered by the OSHA Hazard Communication Standard and this document has been prepared in accord with the MSDS requirements of the rule.</p>	Protective Equipment
Health Hazard *3		
Fire Hazard 4		
Reactivity 1		
* = Chronic Health Hazard		

SECTION 1: IDENTIFICATION

Trade Name	DISULFIDE OIL (DSO)	MSDS No.	AP1595
Product Number	E000010594	Revision Date	11/01/06
CAS Number	68955-96-4*		
Synonyms	Merox Disulfide Oil; Merox DS, MDSO, Merox Presulfiding Disulfide Oil, Disulfide Oil 253, LI-253, Cracking Inhibitor 150, CI-150 (former names); Mixed Dialkyl Disulfides From Sweetening Process.		
Generic Name	Dialkyl Disulfides From LPG/Naphtha Sweetening		
Chemical Family	Dithioalkanes and C5-C7 Hydrocarbons	Business Contact	Product Safety 800-700-0946
Manufacturer	Company Houston Refining One Houston Center, Suite 700 1221 McKinney St. P.O. Box 2583 Houston, Texas 77252-2583	24 Hour Emergency Contact	CHEMTREC 800-424-9300 CANUTEC-Canada 613-996-6666 LYONDELL 800-245-4532

SECTION 2: COMPOSITION

Component Name	CAS Number	Carcinogenic Listings	Concentration Wt%
DISULFIDES, DIALKYL AND DI-PH, NAPHTHA SWEETENING WHICH CONTAINS THE FOLLOWING SUBSTANCES	68955-96-4	Not applicable	AP 99 to 100
DIMETHYL DISULFIDE	624-92-0	Not applicable	AP 10 to 25
LIGHT SWEETENED NAPHTHA (PETROLEUM)	64741-87-3	Not applicable	AP 1
BENZENE	71-43-2	IARC,NTP,OSHA,ACGIH	AP 0.01 to 0.2

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Signal Word	DANGER!	Color	Pale yellow.
Physical State	Liquid.	Odor	Pungent and unpleasant similar to onions.
Physical and Health Hazards	<p>Extremely flammable liquid! Vapor may cause flash fire or explosion! High concentrations of vapor reduce oxygen available for breathing and may cause dizziness, drowsiness or suffocation! May cause mild skin irritation and inflammation! May be harmful if inhaled, ingested, or absorbed through the skin! Potential cancer and/or reproductive hazard! Spills may create a slipping hazard and/or odor nuisance!</p>		
Environmental Hazards	Ecological effects testing has not been conducted on this product. However, this product, its storage tank sludge, and any soil or water which it has contacted may be hazardous to plants, animals, and/or aquatic life		

POTENTIAL HEALTH EFFECTS

Routes of Exposure Inhalation, Skin contact, Skin absorption, Ingestion

Signs and Symptoms of Acute Exposure

- *Inhalation* Breathing mist or vapors may irritate the respiratory tract and cause central nervous system (CNS) depression. Symptoms may include headache, dizziness, slurred speech, excitation or giddiness, nausea, blurred vision, memory loss, drowsiness, fatigue, difficulty with breathing, confusion, vertigo, loss of consciousness, convulsions, and even death, depending upon the concentration and duration of exposure. Vapors can reduce oxygen content in air; therefore, oxygen deprivation is possible if working in confined spaces
- *Eye Contact* No eye irritation is expected upon short-term exposure. This is based upon animal test results for this product.
- *Skin Contact* Mild skin irritation may be expected from short-term exposure. Prolonged and/or repeated skin contact may produce mild to moderate irritation and inflammation; however, no dermal sensitization (allergic response) is expected following repeated exposures. This is based upon animal test results for this product. It may be absorbed through the skin and produce CNS depression (see symptoms related to "Inhalation").
- *Ingestion* Irritates mucous membranes and is readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, and CNS depression (see "Inhalation" above)

Due to the light viscosity of some of this product's components, there is a danger of aspiration into the lungs during vomiting, which will result in pulmonary edema (fluid in the alvioli) and chemical pneumonitis. Cardiovascular effects include swallow rapid pulse and pallor followed by flushing. Progressive CNS depression, respiratory insufficiency, and ventricular fibrillation may result in death.

Chronic Health Effects Summary

Prolonged and/or repeated contact may cause skin defatting, redness, dryness, blistering, lesions, and/or scaly dermatitis. Based upon animal toxicity studies, overexposure may cause spleen damage and/or thyroid dysfunction. Altered mental state, drowsiness, menstrual problems, peripheral motor neuropathy, irreversible brain damage (so-called Petrol Sniffers Encephalopathy), delirium, seizures, and sudden death have been common results for gasoline and light naphtha abusers

Overexposures to alkyl disulfide compounds have caused hemolytic anemia. Repeated and prolonged exposures to benzene can cause toxicity to blood and blood forming tissues. Symptoms may include decreases in blood cell counts, aplastic anemia, or acute myelogenous leukemia (AML). The benzene and toluene contaminants present in this product may also cause a weak cardiac sensitization to epinephrine (adrenaline)-like drugs.

Conditions Aggravated by Exposure

Personnel with pre-existing central, and possibly peripheral, nervous system disease, psychological conditions, skin disorders, impaired liver or kidney function, blood disorders, or chronic respiratory diseases should avoid exposure.

Target Organs

Skin, mucous membranes, lungs, central nervous system, kidneys, liver, spleen, thyroid gland, blood and blood-forming tissues (hematopoietic system), heart, brain, and possibly the peripheral nervous system and/or reproductive organs.

Carcinogenic Potential

Please refer to Sections 2 and/or 11 for the identification of components, if any, which have been identified as having carcinogenic potential in animals and/or humans.

SECTION 4: FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to the Emergency Overview in Section 3 and Exposure Controls in Section 8 of this MSDS.

Inhalation	Move the exposed person to fresh air at once. If breathing has stopped, initiate artificial respiration; if the heart has stopped, initiate CPR. When breathing is difficult, properly trained personnel may administer 100% oxygen. Keep the affected person warm and at rest. Get medical attention as soon as possible.
Eye Contact	Check for and remove contact lenses. Immediately wash the eyes with large amounts of clean low-pressure water, occasionally lifting the upper and lower lids. If irritation persists, promptly seek medical attention.
Skin Contact	Immediately remove excess chemical and contaminated clothing; wash the contaminated area with mild soap and water. If irritation persists after washing, seek medical attention. Thoroughly clean contaminated clothing before reuse; discard contaminated leather goods.
Ingestion	Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If conscious and alert, have victim drink 8 to 10 ounces of water. If vomiting does occur, have victim lean forward to reduce risk of aspiration into lungs. Repeat administration of water. Get medical attention as soon as possible.
Notes to Physician	If ingested, this material presents a significant aspiration/chemical pneumonitis hazard. As a result, do not induce vomiting! Administer an aqueous slurry of activated charcoal followed by a cathartic such as magnesium citrate or sorbitol. Treatment may also involve careful gastric lavage if performed soon after ingestion or in patients who are comatose or at risk of convulsing. Vigorous anti-inflammatory/steroid treatment may be required at first evidence of upper airway or pulmonary edema. Administer 100 percent humidified supplemental oxygen with assisted ventilation, as required. Protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position. Obtain chest X-ray and liver function tests. Monitor cardiac function and arterial blood gases in severe exposure cases.

SECTION 5: FIRE FIGHTING MEASURES**FLAMMABLE PROPERTIES**

Flammability Classification	Extremely Flammable! OSHA/NFPA Class-IB or IC Flammable Liquid
Flash Point/Method	AP 70°F (21°C) by ASTM D-93.
Flammable Limits %	LEL: AP 0.9% in air. UEL: AP 7.1% in air. (Based upon NFPA "NAPHTHA" and "BENZENE".)
Auto-Ignition Temperature	AP 450°F (232°C) by ASTM E-659. (Based upon NFPA "NAPHTHA".)
Hazardous Combustion Products	Burning or excessive heating may produce smoke, carbon monoxide, carbon dioxide, aldehydes, and other harmful gases/vapors including oxides and/or other compounds of sulfur, possibly hydrogen sulfide and alkyl mercaptans.
Special Properties	Highly flammable; will be easily ignited by heat, sparks or flames and may form explosive mixtures with air. Vapors are heavier than air and will spread along the ground and may travel to a source of ignition and flash back. Vapors may collect in low or confined areas. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Product will float on water.

EXTINGUISHING MEDIA

SMALL FIRE. Use dry chemicals, carbon dioxide (CO₂), foam, water fog, or inert gas (Halon® or nitrogen). **LARGE FIRE:** Use foam, water fog, or waterspray. Water fog and spray are effective but might cause frothing and/or may not achieve extinguishment. A water jet may be used to cool the vessel's external walls to prevent pressure build-up, autoignition, or explosion. NEVER use a water jet directly on the fire because it may spread the fire to a larger area.

FIRE FIGHTING

Protective Equipment/Clothing. Wear a NIOSH-approved positive pressure self-contained breathing apparatus and firefighter's turnout gear.

Instructions: Evacuate area and fight from a maximum distance or use unmanned hose holders or monitor nozzles. Disperse vapors with water spray; cover pooling liquid with foam. Containers can build up pressure if exposed to heat, cool with flooding quantities of water until well after the fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of vessel.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview in Section 3 and Exposure Controls in Section 8 of this MSDS

Eliminate all ignition sources. All equipment used when handling this product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, or confined areas. A vapor suppressing foam may be used to reduce vapors. Neutralize the spill's odor by using liquid bleach or a 5% aqueous solution of calcium or sodium hypochlorite. DO NOT use concentrated or powdered bleach because of the potential fire hazard. Absorb with pads or cover with dry earth, sand, or other non-combustible material and transfer to disposal containers. Use clean non-sparking tools to collect absorbed material.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Positive pressure self-contained breathing apparatus (SCBA) and structural firefighters' protective clothing will provide limited protection. Dike far ahead of liquid spill for later disposal. Water spray may reduce vapor, but may not reduce the odor or prevent ignition in closed spaces.

SECTION 7: HANDLING and STORAGE

Handling

Keep containers tightly closed and do not handle near heat or ignition sources. Remove spillage immediately from hard, smooth walking areas. Use only with adequate ventilation/personal protection. Do not breathe vapor. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Do not take internally. Prevent contact with food, chewing, or smoking materials.

All electrical equipment in areas where product is handled/stored should be installed in accordance with applicable requirements of the N.F.P.A.'s National Electrical Code (NEC). Empty containers retain some liquid and vapor residues, so all hazard precautions must be observed when handling empty containers.

Storage

Keep away from heat, sparks and other sources of ignition; segregate from incompatible materials. Store original container tightly closed in a cool, dry, well-ventilated place, plainly labeled, and out of closed vehicles. Containers should be able to withstand pressures expected from cooling or warming during storage. Ground all containers and transfer vessels.

SECTION 8: EXPOSURE CONTROLS and PERSONAL PROTECTION

ENGINEERING CONTROLS

Engineering controls are normally required when handling this material. Use process enclosures, local exhaust ventilation, or other controls to maintain airborne levels below recommended exposure limits. Engineering controls should meet applicable requirements of the National Electrical Code. Storage or handling facilities should be equipped with an emergency eyewash station and safety shower

PERSONAL PROTECTIVE EQUIPMENT

• *Protective Equipment*



• *Eye Protection*

Safety glasses with side shields are recommended as a minimum protection. During transfer operations or when there is a likelihood of misting, splashing or spraying, chemical goggles should be worn. Suitable eye wash water should be readily available. Hard contact lenses MUST NOT be worn.

• *Skin Protection*

- *Hands*

Disposable PVC, nitrile, neoprene, or PVC/NBR gloves are recommended. Avoid prolonged and/or repeated contact.

- *Body*

Avoid skin contact. If splashing or spraying is expected, chemical-resistant protective clothing (Tyvek® or neoprene) should be worn. This might include apron, slicker suit, boots, and additional facial protection.

• *Respiratory Protection*

For unknown vapor concentrations use a positive-pressure pressure-demand self-contained breathing apparatus (SCBA). For known vapor concentrations above the exposure guidelines, use a NIOSH respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirator use should follow OSHA requirements 29 CFR 1910.134 or equivalent (e.g. ANSI Z88.2)

• *General Comments*

Odor is not an adequate warning of potentially hazardous air concentrations!

Parts and equipment using or containing this product must be steam-cleaned prior to all maintenance procedures. All material sampling should be conducted in a manner which avoids vapor inhalation or skin contact.

Use good personal hygiene practices. Wash hands and other exposed skin areas with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities, or leaving work. DO NOT use gasoline, kerosene, solvents, or harsh abrasive skin cleaners.

EXPOSURE GUIDELINES

Substance	Source	Date	Type	Value	Time
BENZENE	OSHA	1987	AL	0.5 ppm	8 hours
BENZENE	OSHA	1987	PEL	1 ppm	8 hours
BENZENE	OSHA	1987	STEL	5 ppm	15 minutes
BENZENE ("A2" CARCINOGEN)	ACGIH	1996	TLV	10 ppm	8 hours
BENZENE - SKIN ("A1" CARCINOGEN) (Proposed for 1997)	ACGIH	1996	TLV	0.5 ppm	8 hours
BENZENE - SKIN ("A1" CARCINOGEN) (Proposed for 1997)	ACGIH	1996	STEL	2.5 ppm	15 minutes
PETROLEUM DISTILLATES (NAPHTHA)	OSHA	1989	PEL	400 ppm	8 hours
VM & P NAPHTHA ("A3" CARCINOGEN)	ACGIH	1996	TLV	300 ppm	8 hours

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid.		
Color	Pale yellow.		
Odor	Pungent and unpleasant similar to onions		
pH	Not applicable.		
Vapor Pressure	AP 1.2 Reid- <i>psia</i> at 100°F (38°C)	Viscosity	AP 2 cSt at 40°C (ASTM D-445)
Vapor Specific Gravity	AP 5.0 when air = 1.0 at 70°F	Melting/Freezing Pt.	AP -30°F (-34°C) (ASTM D-97)
Volatile Characteristics	Appreciable	Solubility in Water	Negligible
Boiling Point/Range	AP 82° to 392°F (-28° to 200°C) (ASTM D-2887)	Specific Gravity	AP 0.97 to 1.00 (ASTM D-1250)
Additional Properties	Odor is not an adequate warning of potentially hazardous air concentrations! Odor problems can be reduced by replacing rubber pump seals with polyethylene or polypropylene seals. Dialkyl disulfides will dissolve Viton® O-rings and seals.		
	Average Calculated Density = AP 8.300 lbs./gal.;		
	Alkane and Isoparaffin Hydrocarbons Content = LT 0.5 Wt.% (ASTM D-3257),		
	C6-C7 Aromatic Hydrocarbons Content = LT 0.5 Wt.% (ASTM D-2267);		
	Sulfur Content = AP 45 to 50 Wt.% (ASTM D-2622 or D-1266)		

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability	Stable.
Conditions to Avoid	Heat, sparks, and open flame
Incompatibility with Other Materials	Strong acids, alkalis, and oxidizers such as liquid chlorine, concentrated oxygen, and sodium or calcium hypochlorite. Some types of plastic may be dissolved by dialkyl disulfides.
Hazardous Decomposition Products	No degradation data available.
Hazardous Polymerization	Not expected to occur.

SECTION 11: TOXICOLOGICAL INFORMATION**DISULFIDE OIL (DIALKYL DISULFIDES):**

GAS (LC50):	Acute: GT 4,840 mg/L (Rat screen level) (4 hours).
ORAL (LD100):	Acute: 5,000 mg/kg (Rat screen level) - All died, spleen damage, and thyroid gland dysfunction.
ORAL (LD50):	Acute: 1,700 mg/kg (Rat males).
ORAL (LD50):	Acute: 1,590 mg/kg (Rat females)
DERMAL (LD50):	Acute: 1,800 mg/kg (Rabbit).
DRAIZE EYE:	Acute: Non-irritating (Rabbit).
DRAIZE DERMAL:	Acute: Mild skin irritant (Rabbit).
BUEHLER DERMAL:	Acute: Non-sensitizing (Guinea Pig).

SWEETENED NAPHTHA

GAS (LC50):	Acute: GT 5,000 mg/L (Rat screen level) (4 hours).
ORAL (LD50):	Acute: GT 5,000 mg/kg (Rat) - Hypermotility and diarrhea.
DERMAL (LD50):	Acute: GT 2,000 mg/kg (Rabbit screen level).
DRAIZE EYE:	Acute: Non-irritating (Rabbit).
DRAIZE DERMAL:	Acute: Mild skin irritant (Rabbit).

DIMETHYL DISULFIDE (DMDS)

For humans, DMDS poisoning may cause hemolytic anemia with potential for development of kidney failure from red blood cell breakdown products excreted in the urine. In experimental animals, DMDS overexposures produced hepatic encephalopathy with coma and convulsions. Rats exposed to concentrations of 7 to 26 mg/L for 30 to 35 minutes had pulmonary irritation with lung ecchymoses and convulsions. But, at 805 ppm of DMDS for 4 hours, rats had no mortality and only slight liver and spleen damage. Inhalation of 2 ppm for 3 months caused microscopic liver damage. In chickens and other domestic fowl, hemolytic Heinz body anemia was produced by oral administration

Repeated and prolonged overexposure to benzene vapors may cause toxicity to blood-forming tissues. Symptoms include decreased blood cell counts, aplastic anemia, or acute myelogenous leukemia (AML). Studies in both experimental animals and humans indicate that benzene causes chromosomal aberrations, damages bone marrow, reduces blood cell counts, and is a leukemogen. The National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC) list benzene as a "Human Carcinogen."

SECTION 12: ECOLOGICAL INFORMATION

Toxic aromatic hydrocarbon components of this product (benzene and toluene) are volatile; and therefore, they may be released to the atmosphere and react with photochemically-produced hydroxyl radicals to create smog

Volatilization and photodegradation are the major fate process for dimethyl disulfide. The atmospheric half-life is approximately four hours, while the aquatic half-life ranges from four to forty-four hours. Soil is capable of adsorbing dimethyl disulfide from the gas phase and act as an environmental sink.

If spilled, this product, its storage tank water bottoms and sludge, and any contaminated soil or water may be hazardous to human, animal, and aquatic life.

SECTION 13: DISPOSAL CONSIDERATIONS

Maximize product recovery for reuse or recycling. When disposing of this product, its storage tank water bottoms, sludge, and any contaminated soil or water, one must assume the waste material to be an EPA "Ignitable Hazardous Waste" (D001), unless proven otherwise by thorough analytical testing. Use approved treatment, transporters, and disposal sites in compliance with all applicable regulations. Recommended disposal method is incineration.

SECTION 14: TRANSPORT INFORMATION

DOT Status	A U.S. Department of Transportation regulated material.		
Proper Shipping Name	Flammable liquids, n.o.s. (Dimethyl disulfide, Naphtha)		
Hazard Class	3		
UN/NA ID	UN1993	Packing Group(s)	PG II
Reportable Quantity	RQ Substances: BENZENE, TOLUENE (METHYLBENZENE), and n-HEXANE.		

Placards



Emergency Response Guide Number	130
HAZMAT STCC Number	Not applicable.
MARPOL III Status	"Marine Pollutant" due to the presence of DIMETHYL DISULFIDE.

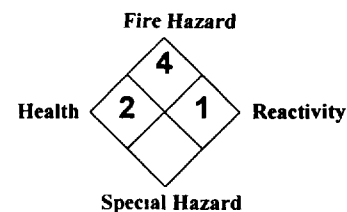
SECTION 16: OTHER INFORMATION

HMIS (U.S.A.)

Health Hazard	*3
Fire Hazard	4
Reactivity	1

* = Chronic Health Hazard

National Fire Protection Association (U.S.A.)



REVISION INFORMATION

Version Number 06
Revision Date 11/01/06
Latest Revision Logo and Manufacturer name change.

ABBREVIATIONS

AP = Approximately EQ = Equal GT = Greater Than LT = Less Than NA = Not Applicable ND = No Data
ACGIH = American Conference of Governmental Industrial Hygienists
IARC = International Agency for Research on Cancer NTP = National Toxicology Program
NIOSH = National Institute of Occupational Safety and Health OSHA = Occupational Safety and Health Administration

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