



PALADIN®

1. PRODUCT AND COMPANY IDENTIFICATION

Company

Arkema Inc.
900 First Avenue
King of Prussia, Pennsylvania 19406

Thio and Fine Chemicals

Customer Service Telephone Number: (800) 628-4453
(Monday through Friday, 8:30 AM to 5:30 PM EST)

Emergency Information

Transportation: CHEMTREC: (800) 424-9300
(24 hrs., 7 days a week)
Medical: Rocky Mountain Poison Center: (866) 767-5089
(24 hrs., 7 days a week)

Product Information

Product name: PALADIN®
Synonyms: Not available
Molecular formula: C₂ H₆ S₂
Chemical family: Alkyl sulfide
Molecular weight: 94.20 g/mol
Environmental Protection Agency (EPA) registration number: 55050-4
Product use: Restricted Use Pesticide, Soil Fumigant for Agricultural / Pesticide Use Only, Do NOT use this MSDS for any other application.

2. HAZARDS IDENTIFICATION

Emergency Overview

Color: yellow
Physical state: liquid
Odor: garlic-like

WARNING!
KEEP OUT OF REACH OF CHILDREN
FLAMMABLE LIQUID AND VAPOR.
MAY BE HARMFUL IF SWALLOWED.
HARMFUL IF INHALED OR ABSORBED THROUGH SKIN.
CAUSES SLIGHT EYE IRRITATION.

Potential Health Effects

Primary routes of exposure:
Inhalation and skin contact.

Signs and symptoms of acute exposure:



Material Safety Data Sheet

PALADIN®

Liquid, vapor or mist: May cause eye irritation. May cause irritation of respiratory tract. Objectionable odor may cause nausea, headache or dizziness. Prolonged or repeated skin contact may cause: dermatitis, redness, rash, severe irritation, scabs, (severity of effects depends on extent of exposure).

Skin:

No more than slightly toxic. Slightly irritating. (based on components)

Inhalation:

Practically nontoxic. Slightly to moderately irritating. (based on components)

Eyes:

Slightly irritating. (based on components)

Ingestion:

Moderately toxic. (based on components)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS-No.	Wt/Wt	OSHA Hazardous
Disulfide, dimethyl	624-92-0	98.8 %	Y
Proprietary	Proprietary*	1.2 %	Y

The substance(s) marked with a "Y" in the Hazard column above, are those identified as hazardous chemicals under the criteria of the OSHA Hazard Communication Standard (29 CFR 1910.1200).

*The specific chemical identity is withheld because it is trade secret information of Arkema Inc.

This material is classified as hazardous under Federal OSHA regulation.

4. FIRST AID MEASURES

Inhalation:

Move to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

Skin:

If on skin, or clothing, take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Aerate all affected clothing thoroughly outdoors prior to washing. Discard any clothing or absorbent materials (e.g., leather) that have been drenched or heavily contaminated. Do not reuse them. Call a poison control center or doctor for treatment advice.

Eyes:

If in eyes, hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

Ingestion:

If swallowed, call a poison control center or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person.



5. FIRE-FIGHTING MEASURES

Flash point 65.3 °F (18.5 °C) (closed cup)

Auto-ignition temperature: 572 °F (300 °C)

Lower flammable limit (LFL): 1.1 %(V)

Upper flammable limit (UFL): 16 %(V)

Extinguishing media (suitable):

Water spray, Carbon dioxide (CO₂), Foam, Dry chemical

Protective equipment:

Fire fighters and others who may be exposed to products of combustion should wear full fire fighting turn out gear (full Bunker Gear) and self-contained breathing apparatus (pressure demand / NIOSH approved or equivalent).

Further firefighting advice:

Keep containers cool by spraying with water if exposed to fire.
Fire fighting equipment should be thoroughly decontaminated after use.
Do not allow run-off from fire fighting to enter drains or water courses.

Fire and explosion hazards:

When burned, the following hazardous products of combustion can occur:

Carbon oxides
sulfur oxides
hydrogen sulfide

6. ACCIDENTAL RELEASE MEASURES

In case of spill or leak:

Refer to the label's section "Personal Protective Equipment for Applicators and Other Handlers" for handling liquid spills and leaks. Cease all operations if any leak develops in the fumigation system. Evacuate everyone from the immediate areas of the spill or leak. Approach the area from the upwind side. Work upwind to repair leak(s), if possible. Only correctly trained and PPE-equipped handlers are permitted to enter. Do not permit entry into the spill or leak area by any other person until the garlic-like odor of this product is no longer detectable or sampling has verified that the DMDS concentration is below 55 ppb. Allow spilled fumigant to evaporate or to absorb onto vermiculite, dry sand, earth, or similar absorbent material. Such material should be disposed of on site or at an approved disposal facility.



7. HANDLING AND STORAGE

Handling

General information on handling:

Keep away from heat, sparks and flames.

Do not taste or swallow.

Do not breath vapor or mist.

Avoid contact with the skin, eyes and clothing.

Wash thoroughly after handling.

Keep container tightly closed.

Use only with adequate ventilation.

Ensure all containers are bonded and grounded during filling, transferring or emptying operations.

Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark.

Do not contaminate water, food, or feed by storage or disposal.

Refillable container. Refill this container with pesticide only. Do not reuse this container for any other purpose.

Cleaning before refilling is the responsibility of the refiller.

Cleaning the container before final disposal is the responsibility of the person disposing of the container.

Container hazardous when empty.

Emptied container retains product residue.

Follow label warnings even after container is emptied.

RESIDUAL VAPORS MAY EXPLODE ON IGNITION.

DO NOT CUT, DRILL, GRIND, OR WELD ON OR NEAR THIS CONTAINER.

Improper disposal or reuse of this container may be dangerous and/or illegal.

Storage

General information on storage conditions:

Store in well ventilated area away from heat and sources of ignition such as flame, sparks and static electricity.

Ensure that all storage and handling equipment is properly grounded and installed to satisfy electrical classification requirements. Do not store near or with oxidizers. Store only in areas that are authorized for flammable material storage. Static electricity may accumulate when transferring material. Cylinder storage must be in an area as designated by local and State requirements. Make certain cylinder tops are closed and cylinder remains in an upright position. Store only in original containers. Observe all federal, state and local regulations and National Fire Protection Association (NFPA) Codes which pertain to the specific local conditions of storage and use, including OSHA 29 CFR 1910.106 and NFPA 30, 70, 77, and 497.

Storage incompatibility – General:

Store separate from: Alkali metals

Acids (concentrated solutions)

Strong oxidizing agents

Reactive materials

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Airborne Exposure Guidelines:

Disulfide, dimethyl (624-92-0)



US. ACGIH Threshold Limit Values

Time Weighted Average (TWA):	0.5 ppm
Skin designation	
Remarks:	Can be absorbed through the skin.

Only those components with exposure limits are printed in this section. Limits with skin contact designation above have skin contact effect. Air sampling alone is insufficient to accurately quantitate exposure. Measures to prevent significant cutaneous absorption may be required. Limits with a sensitizer designation above mean that exposure to this material may cause allergic reactions.

Engineering controls:

Investigate engineering techniques to reduce exposures below airborne exposure limits or to otherwise reduce exposures. Provide ventilation if necessary to minimize exposures or to control exposure levels to below airborne exposure limits (if applicable see above). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

Consult ACGIH ventilation manual or NFPA Standard 91 for design of exhaust systems.

Respiratory protection:

If any handler detects the garlic-like odor of this product, then a half face or full face air-purifying respirator with a pesticide-approved organic vapor cartridge filter or equivalent (NIOSH approved number prefix TC-23C) must be worn. Any handlers not wearing respirators must cease operations and leave the application block and surrounding buffer zone. Handlers wearing respirators can remove them or handlers not wearing respirators can resume operations if two consecutive samples taken at least 15 minutes apart show that the levels of DMDS do not exceed 50 ppb. Samples must be taken where the odor was first detected. If sampling is not done, after one hour and at hourly intervals thereafter, handlers can remove their air-purifying respirators momentarily to determine if the garlic-like odor is still detectable. If detectable, the respirator must be put back on. Respiratory protection programs must comply with 29 CFR § 1910.134.

Skin protection:

When handling this material, gloves of the following type(s) should be worn:

butyl-rubber

nitrile

Wear face shield and chemical resistant clothing such as a rubber apron when splashing may occur. Remove clothing and personal protective equipment (PPE) immediately if pesticide gets inside. Rinse immediately if skin is contaminated. Wash contaminated clothing and clean protective equipment before reuse. Aerate all affected clothing thoroughly outdoors prior to washing. Thoroughly rinse the outside of gloves and protective clothing with water prior to removal. Wash thoroughly after handling.

Eye protection:

Where there is potential for eye contact, a full face shield or safety glasses with brow, temple and side protection is required. Do not wear goggles.

General safety and hygiene measures:

The personal protective equipment (PPE) recommendations above are for use as a Soil Fumigant.

9. PHYSICAL AND CHEMICAL PROPERTIES

Color: yellow

Physical state: liquid



Odor:	garlic-like
Odor threshold:	approx. 8 - 10 ppb
pH:	no data available
Density:	not determined
Specific Gravity (Relative density):	1.062 (68 °F(20 °C))
Vapor pressure:	22.5 mmHg (68 °F (20 °C))
Vapor density:	3.25 kg/m3
Boiling point/boiling range:	228 - 230 °F (109 - 110 °C)
Freezing point:	-120.5 °F (-84.7 °C)
Melting point/range:	not applicable
Solubility in water:	1 - 10 g/l 68 °F (20 °C)
Solubility in other solvents: [qualitative and quantative]	Soluble in: Alcohols Hydrocarbons
Refractive index:	1.526 68 °F (20 °C)
Viscosity, dynamic:	0.62 mPa.s 68 °F (20 °C)
% Volatiles:	100 %
Molecular weight:	94.20 g/mol

10. STABILITY AND REACTIVITY

Stability:

This material is chemically stable under normal and anticipated storage, handling and processing conditions.

Materials to avoid:

Alkali metals
Acids (concentrated solutions)
Strong oxidizing agents
Reactive materials

Conditions / hazards to avoid:

To avoid thermal decomposition, do not overheat. Contact with combustible materials may enhance the risk of fire. Alkali metals, acids, solid bleach (strong oxidizer) may cause violent reaction and fire.

Hazardous decomposition products:

Thermal decomposition giving flammable and toxic products
hydrogen sulfide
Methylmercaptan
Dimethylsulphide

11. TOXICOLOGICAL INFORMATION

Data on this material and/or its components are summarized below.

Data for Proprietary (Proprietary)**Acute toxicity****Oral:**

Practically nontoxic. (rat) LD50 > 10,000 mg/kg.

Dermal:

Practically nontoxic. (rabbit) LD50 > 20,000 mg/kg.

Inhalation:

Slightly toxic. (rat) LC50 = 1.5 mg/l.

Skin Irritation:

Moderately irritating. (rabbit) Irritation Index: 3.5/8.0.

Eye Irritation:

Practically non-irritating. (rabbit)

Repeated dose toxicity

Prolonged oral administration to rat / affected organ(s): liver, kidney

Developmental toxicity

Exposure during pregnancy. oral (rat) / No birth defects were observed.

Reproductive effects

Repeated administration. oral (rat) / No toxicity to reproduction

Human experience**Skin contact:**

Skin: No skin allergy was observed. (repeated or prolonged exposure)

Data for Disulfide, dimethyl (624-92-0)**Acute toxicity****Oral:**

Moderately toxic. (rat) LD50 = 290 - 500 mg/kg.

Dermal:

No more than slightly toxic. (rabbit) LD50 > 2,000 mg/kg.

Inhalation:

Practically nontoxic. (rat) 4 h LC50 = 5.24 mg/l (1310 ppm).

Signs/effects reported after acute exposure. (rat) 24 h EC = 0.07 mg/l (18 ppm). signs: Degeneration of nasal epithelium

(rat) 24 h NOAEL = 0.05 mg/l (12 ppm).

Skin Irritation:

Slightly irritating. (rabbit) Irritation Index: 1.5 - 2.5 / 8.0. (4 h)

Eye Irritation:

Slightly to moderately irritating. (rabbit) Irritation Index: 7 - 20 /110.

Skin Sensitization:

Not a skin sensitizer. Buehler Test. (guinea pig) No skin allergy was observed

Repeated dose toxicity

Repeated dermal administration to rabbit / affected organ(s): skin, central nervous system / signs: severe irritation, lethargy / Local irritation (applied undiluted, occluded exposure)

Inhalation administration to rat / affected organ(s): upper respiratory tract / signs: Atrophy of nasal epithelium

Genotoxicity**Assessment in Vitro:**

No genetic changes were observed in laboratory tests using: bacteria, animal cells, human cells

Genotoxicity**Assessment in Vivo:**

No genetic changes were observed in laboratory tests using: rats

Developmental toxicity

Exposure during pregnancy. inhalation (rat and rabbit) / No birth defects were observed. (delays in development, at doses that produce effects in mothers)

Reproductive effects

Two generation reproduction study. inhalation (rat) / No toxicity to reproduction

12. ECOLOGICAL INFORMATION**Chemical Fate and Pathway**

Data on this material and/or its components are summarized below.

Data for Disulfide, dimethyl (624-92-0)**Biodegradation:**

Not readily biodegradable. (28 d) < 10 % / Closed Bottle test

Octanol Water Partition Coefficient:

log Pow = 1.77 - 1.91 (measured)

**Ecotoxicology**

Data on this material and/or its components are summarized below.

Data for Disulfide, dimethyl (624-92-0)**Aquatic toxicity data:**

Moderately toxic. Danio rerio (zebra fish) 96 h LC50 = 5 mg/l

Highly toxic. Trout 96 h LC50 = 0.97 mg/l

Moderately toxic. Cyprinodon variegatus (sheepshead minnow) 96 h LC50 = 5.6 mg/l

Aquatic invertebrates:

Moderately toxic. Daphnia 48 h EC50 = 1.8 mg/l

Moderately toxic. Mysid shrimp 96 h LC50 = 5 mg/l

Slightly toxic. Oysters 96 h LC50 = 14 mg/l

Algae:

Slightly toxic. Pseudokirchneriella subcapitata 72 h EC50 = 11 - 35 mg/l

Slightly toxic. Common duckweed 7 d EC50 36 - 75 mg/l

Terrestrial non-mammal:

Colinus virginianus (Bobwhite quail) 4 h LC50 (Acute inhalation toxicity) = 478 ppm

Colinus virginianus (Bobwhite quail) LD50 (Acute oral toxicity) = 342 mg/kg

13. DISPOSAL CONSIDERATIONS**Waste disposal:**

Pesticide wastes are acutely hazardous. Do not contaminate water when cleaning equipment or disposing of equipment, washwaters, or rinsate. Improper disposal of excess pesticide, spray mix or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental control agency, or hazardous waste representative at the nearest EPA regional office for guidance.

14. TRANSPORT INFORMATION**US Department of Transportation (DOT)**

UN Number : 2381
Proper shipping name : Dimethyl disulfide
Class : 3
Subsidiary hazard class : (6.1)
Packaging group : II
Marine pollutant : no

International Maritime Dangerous Goods Code (IMDG)

UN Number : 2381
Proper shipping name : DIMETHYL DISULPHIDE
Class : 3
Packaging group : II
Marine pollutant : yes
Flash point : 65.3 °F (18.5 °C) closed cup

**15. REGULATORY INFORMATION****Chemical Inventory Status**

EU. EINECS	EINECS	Conforms to
US. Toxic Substances Control Act	TSCA	The components of this product are all on the TSCA Inventory.
Australia. Industrial Chemical (Notification and Assessment) Act	AICS	Conforms to
Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL). (Can. Gaz. Part II, Vol. 144)	DSL	All components of this product are on the Canadian DSL list.
Japan. Kashin-Hou Law List	ENCS (JP)	Conforms to
Korea. Existing Chemicals Inventory (KECI)	KECI (KR)	Conforms to
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act	PICCS (PH)	Conforms to
China. Inventory of Existing Chemical Substances	IECSC (CN)	Conforms to
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand	NZIOC	Conforms to

United States – Federal Regulations**SARA Title III – Section 302 Extremely Hazardous Chemicals:**

The components in this product are either not SARA Section 302 regulated or regulated but present in negligible concentrations.

SARA Title III - Section 311/312 Hazard Categories:

Acute Health Hazard, Fire Hazard

SARA Title III – Section 313 Toxic Chemicals:

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - Reportable Quantity (RQ):

The components in this product are either not CERCLA regulated, regulated but present in negligible concentrations, or regulated with no assigned reportable quantity.



OSHA Regulated Carcinogens (NTP, IARC, OSHA Listed):

NTP:

No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

IARC:

No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

OSHA:

No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

United States – State Regulations

New Jersey Right to Know

<u>Chemical Name</u>	<u>CAS-No.</u>
Disulfide, dimethyl	624-92-0

New Jersey Right to Know – Special Health Hazard Substance(s)

<u>Chemical Name</u>	<u>CAS-No.</u>
Disulfide, dimethyl	624-92-0

Pennsylvania Right to Know

<u>Chemical Name</u>	<u>CAS-No.</u>
Disulfide, dimethyl	624-92-0

Pennsylvania Right to Know – Environmentally Hazardous Substance(s)

<u>Chemical Name</u>	<u>CAS-No.</u>
Disulfide, dimethyl	624-92-0

California Prop. 65

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

16. OTHER INFORMATION

Miscellaneous:

Use restrictions:	Soil Fumigant for Agricultural / Pesticide Use Only
Use restrictions:	Do NOT use this MSDS for any other application.
Other information:	Refer to National Fire Protection Association (NFPA) Codes 30, 70, 77, and 497 and OSHA 29 CFR 1910.106, for safe handling.

Latest Revision(s):



Material Safety Data Sheet

PALADIN®

Revised Section(s):	Updated Corporate Address Change and Rocky Mountain Poison Center Phone Number
Reference number:	000000053720
Date of Revision:	07/11/2011
Date Printed:	07/11/2011

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