

## Chemical Safety Data Sheet MSDS / SDS

**4,4'-Methylenedianiline**

Revision Date:2025-02-01 Revision Number:1

**SECTION 1: Identification of the substance/mixture and of the company/undertaking****Product identifier**

Product name : 4,4'-Methylenedianiline  
CBnumber : CB7718182  
CAS : 101-77-9  
EINECS Number : 202-974-4  
Synonyms : MDA,4,4'-Methylenedianiline

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

Relevant identified uses : For R&D use only. Not for medicinal, household or other use.  
Uses advised against : none

**Company Identification**

Company : Chemicalbook  
Address : Building 1, Huihuang International, Shangdi 10th Street, Haidian District, Beijing  
Telephone : 010-86108875

**SECTION 2: Hazards identification****Classification of the substance or mixture**

Skin sensitization, Category 1  
Germ cell mutagenicity, Category 2  
Carcinogenicity, Category 1B  
Specific target organ toxicity – single exposure, Category 1  
Specific target organ toxicity – repeated exposure, Category 2  
Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 2

**Label elements****Pictogram(s)**

Signal word : Danger

**Hazard statement(s)**

H302 Harmful if swallowed  
H317 May cause an allergic skin reaction  
H341 Suspected of causing genetic defects

H350 May cause cancer

H370 Causes damage to organs

H373 May cause damage to organs through prolonged or repeated exposure

H401 Toxic to aquatic life

H411 Toxic to aquatic life with long lasting effects

#### **Precautionary statement(s)**

P201 Obtain special instructions before use.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P273 Avoid release to the environment.

P280 Wear protective gloves/protective clothing/eye protection/face protection.

P308+P313 IF exposed or concerned: Get medical advice/attention.

P405 Store locked up.

#### **Prevention**

P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

P272 Contaminated work clothing should not be allowed out of the workplace.

P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...

P203 Obtain, read and follow all safety instructions before use.

P260 Do not breathe dust/fume/gas/mist/vapours/spray.

P264 Wash ... thoroughly after handling.

P270 Do not eat, drink or smoke when using this product.

P273 Avoid release to the environment.

#### **Response**

P302+P352 IF ON SKIN: Wash with plenty of water/...

P333+P317 If skin irritation or rash occurs: Get medical help.

P321 Specific treatment (see ... on this label).

P362+P364 Take off contaminated clothing and wash it before reuse.

P318 IF exposed or concerned, get medical advice.

P308+P316 IF exposed or concerned: Get emergency medical help immediately.

P319 Get medical help if you feel unwell.

P391 Collect spillage.

#### **Storage**

P405 Store locked up.

#### **Disposal**

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

#### **Other hazards**

no data available

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## SECTION 3: Composition/information on ingredients

### **Substance**

Product name	: 4,4'-Methylenedianiline
Synonyms	: MDA,4,4'-Methylenedianiline
CAS	: 101-77-9
EC number	: 202-974-4
MF	: C13H14N2
MW	: 198.26

## SECTION 4: First aid measures

### Description of first aid measures

#### If inhaled

Fresh air, rest. Refer for medical attention.

#### Following skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer for medical attention .

#### Following eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

#### Following ingestion

Rinse mouth. Refer for medical attention .

### Most important symptoms and effects, both acute and delayed

Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]: TOXIC; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution. (ERG, 2016)

### Indication of any immediate medical attention and special treatment needed

Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. Nitrates, nitrites, and related compounds

## SECTION 5: Firefighting measures

### Extinguishing media

Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]: SMALL FIRE: Dry chemical, CO2 or water spray. LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. (ERG, 2016)

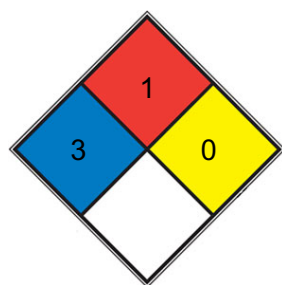
### Specific Hazards Arising from the Chemical

Excerpt from ERG Guide 153 [Substances - Toxic and/or Corrosive (Combustible)]: Combustible material: may burn but does not ignite readily. When heated, vapors may form explosive mixtures with air: indoors, outdoors and sewers explosion hazards. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. Runoff may pollute waterways. Substance may be transported in a molten form. (ERG, 2016)

### Advice for firefighters

Use water spray, powder, foam, carbon dioxide.

### NFPA 704



**HEALTH 3** Short exposure could cause serious temporary or moderate residual injury (e.g. [liquid hydrogen](#), [sulfuric acid](#), [calcium hypochlorite](#), hexafluorosilicic acid)

**FIRE 1** Materials that require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. Includes some finely divided suspended solids that do not require heating before ignition can occur. Flash point at or above 93.3 °C (200 °F). (e.g. [mineral oil](#), ammonia)

**REACT 0** Normally stable, even under fire exposure conditions, and is not reactive with water (e.g. helium, [N2](#))

☐ SPEC.

☐ HAZ.

## SECTION 6: Accidental release measures

### Personal precautions, protective equipment and emergency procedures

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

### Environmental precautions

Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into sealable containers. If appropriate, moisten first to prevent dusting. Carefully collect remainder. Then store and dispose of according to local regulations.

### Methods and materials for containment and cleaning up

Facility and process are discussed for removal of methylenedianiline.

## SECTION 7: Handling and storage

## Precautions for safe handling

NO open flames. Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

## Conditions for safe storage, including any incompatibilities

Separated from strong oxidants and food and feedstuffs. Well closed. Store in an area without drain or sewer access. Provision to contain effluent from fire extinguishing. MATERIALS WHICH ARE TOXIC AS STORED OR WHICH CAN DECOMPOSE INTO TOXIC COMPONENTS...SHOULD BE STORED IN A COOL WELL VENTILATED PLACE, OUT OF THE DIRECT RAYS OF THE SUN, AWAY FROM AREAS OF HIGH FIRE HAZARD, & SHOULD BE PERIODICALLY INSPECTED. INCOMPATIBLE MATERIALS SHOULD BE ISOLATED...

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# SECTION 8: Exposure controls/personal protection

## Control parameters

### Occupational Exposure limit values

TLV: 0.1 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: skin absorption (H); sensitization of skin (SH); carcinogen category: 2

### Biological limit values

no data available

## Exposure controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

## Individual protection measures

### Eye/face protection

Wear safety spectacles or face shield.

### Skin protection

Protective gloves. Protective clothing.

### Respiratory protection

Use ventilation (not if powder), local exhaust or breathing protection.

### Thermal hazards

no data available

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# SECTION 9: Physical and chemical properties

## Information on basic physicochemical properties

Physical state	neat
Colour	Cream.
Odour	Faint, amine-like odor
Melting point/freezing point	Ca. 90 °C.
Boiling point or initial boiling point and	Ca. 393 - 403 °C.

boiling range	
Flammability	Combustible Solid
Lower and upper explosion	no data available
limit/flammability limit	
Flash point	228 °C. Atm. press.:749 mm Hg.
Auto-ignition temperature	515 °C. Atm. press.:733 - 737 mm Hg.
Decomposition temperature	no data available
pH	Remarks:Alkaline.
Kinematic viscosity	8.3 cP at 100 deg C
Solubility	water: soluble
Partition coefficient n-octanol/water	log Pow = 1.55. Temperature:25 °C.
Vapour pressure	Ca. 0 Pa. Temperature:25 °C. Remarks:To take account of uncertainty due to experiment and extrapolation, an overall uncertainty of $\pm 0.00005$ Pa was allowed.
Density and/or relative density	1.15. Temperature:20 °C.;1 150 kg/m <sup>3</sup> . Temperature:20 °C.
Relative vapour density	6.8 (NTP, 1992) (Relative to Air)
Particle characteristics	no data available

## SECTION 10: Stability and reactivity

### Reactivity

NIOSH considers 4,4'-methylenedianiline be a potential occupational carcinogen.

The substance is a weak base. Reacts violently with strong oxidants.

### Chemical stability

Oxidizes in air; pale yellow crystals turn dark color when exposed to air.

### Possibility of hazardous reactions

Combustable when exposed to heat or flame. 4,4'-DIAMINODIPHENYLMETHANE polymerizes if heated above 257° F. Incompatible with strong oxidizing agents. It is also incompatible with acids. Catalyzes isocyanate-alcohol and epoxide reactions. Flammable gaseous hydrogen may be generated in combination with strong reducing agents, such as hydrides.

### Conditions to avoid

no data available

### Incompatible materials

Strong oxidizers.

### Hazardous decomposition products

When heated to decomposition it emits highly toxic fumes of aniline and NO<sub>x</sub>.

## SECTION 11: Toxicological information

### Acute toxicity

- Oral: LD50 - rat (male/female) - 444 mg/kg bw.
- Inhalation: LC50 - rat (male/female) - > 0.46 mg/L air.
- Dermal: LD50 - rat (male/female) - 2 080 mg/kg bw.

#### **Skin corrosion/irritation**

no data available

#### **Serious eye damage/irritation**

no data available

#### **Respiratory or skin sensitization**

no data available

#### **Germ cell mutagenicity**

no data available

#### **Carcinogenicity**

No data are available in humans. Sufficient evidence of carcinogenicity in animals. OVERALL EVALUATION: Group 2B: The agent is possibly carcinogenic to humans.

#### **Reproductive toxicity**

No adequate information is available on the reproductive or developmental effects of MDA in humans or animals.

#### **STOT-single exposure**

The substance may cause effects on the liver. This may result in liver impairment.

#### **STOT-repeated exposure**

Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the liver. This substance is possibly carcinogenic to humans.

#### **Aspiration hazard**

A harmful concentration of airborne particles can be reached quickly when dispersed.

## **SECTION 12: Ecological information**

#### **Toxicity**

Toxicity to fish: LC50 - *Oryzias latipes* - 20.6 mg/L - 96 h.

Toxicity to daphnia and other aquatic invertebrates: EC50 - *Daphnia magna* - 0.35 mg/L - 48 h.

Toxicity to algae: EC50 - *Pseudokirchneriella subcapitata* (previous names: *Raphidocelis subcapitata*, *Selenastrum capricornutum*) - 5.34 mg/L - 72 h.

Toxicity to microorganisms: EC50 - activated sludge - > 100 mg/L - 3 h.

#### **Persistence and degradability**

AEROBIC: 4,4'-Diaminodiphenylmethane, present at 100 mg/L, reached 0% of its theoretical BOD in 4 weeks using an activated sludge

inoculum at 30 mg/L in the Japanese MITI test(1). Aerobic biodegradation of 4,4'-diaminodiphenylmethane in a silt loam soil (measured as the fraction of CO<sub>2</sub> recovered) was 2, 10, 11.2, and 11.6% after 3, 14, 28, and 56 days, respectively(2). Apparent biodegradation after 365 days in the silt loam soil was reported as 40.1%(2).

### **Bioaccumulative potential**

BCF values ranging from 3.0 to 14 were measured for 4,4'-diaminodiphenylmethane (200 ug/L) in carp (4.5% lipid content) after a 6 week period(1). According to a classification scheme(2), these BCF values suggest the bioconcentration in aquatic organisms is low(SRC).

### **Mobility in soil**

After an 8 hour sorption period, Koc values of 5681 and 3825 were measured for 4,4'-diaminodiphenylmethane in sandy loam under aerobic and anaerobic conditions, respectively(1). Koc values of 4015 and 3831 were measured in silt loam under aerobic and anaerobic conditions, respectively(1). According to a classification scheme(2), these measured Koc values suggest that 4,4'-diaminodiphenylmethane is expected to have slight to no mobility in soil. The reaction of 4,4'-diaminodiphenylmethane with soil humics was studied by allowing the substance to remain in contact with soil for 7 days and then measuring desorption in 1 day. The results suggested that 4,4'-diaminodiphenylmethane sorbed onto soil may be in a relatively facile equilibrium with the surrounding solution as shown by the similarity of distribution ratios (sorbed compound (in ug/g of soil)/concentrated in solution (in ug/mL)) for both sorption and desorption with R<sub>desorb</sub>/R<sub>sorb</sub> ranging from 1.1 to 1.4(1). In this study the average ratio of aerobic/anaerobic soil sorption coefficients for 4,4'-diaminodiphenylmethane was 1.27, suggesting little difference between the behavior of 4,4'-diaminodiphenylmethane with soil under oxidizing and reducing conditions(1). Aromatic amines have been observed to undergo rapid and reversible covalent bonding with humic materials in aqueous solution; the initial bonding reaction is followed by a slower and much less reversible reaction believed to represent the addition of the amine to quinoidal structures followed by oxidation of the product to give an amino-substituted quinone; these processes represent pathways by which aromatic amines may be converted to latent forms in the biosphere(3).

### **Toxics Screening Level**

The initial risk screening level (IRSL) for 4,4'-methylenedianiline (CAS # 101-77-9) is 0.022 µg/m<sup>3</sup> annual averaging time and the secondary risk screening level (SRSL) is 0.22 µg/m<sup>3</sup> annual averaging time.

### **Other adverse effects**

no data available

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## **SECTION 13: Disposal considerations**

### **Disposal methods**

#### **Product**

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

#### **Contaminated packaging**

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

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## **SECTION 14: Transport information**



## UN Number

ADR/RID: UN2651 (For reference only, please check.)

IMDG: UN2651 (For reference only, please check.)

IATA: UN2651 (For reference only, please check.)

## UN Proper Shipping Name

ADR/RID: 4,4'-DIAMINODIPHENYL- METHANE (For reference only, please check.)

IMDG: 4,4'-DIAMINODIPHENYL- METHANE (For reference only, please check.)

IATA: 4,4'-DIAMINODIPHENYL- METHANE (For reference only, please check.)

## Transport hazard class(es)

ADR/RID: 6.1 (For reference only, please check.)

IMDG: 6.1 (For reference only, please check.)

IATA: 6.1 (For reference only, please check.)

## Packing group, if applicable

ADR/RID: III (For reference only, please check.)

IMDG: III (For reference only, please check.)

IATA: III (For reference only, please check.)

## Environmental hazards

ADR/RID: Yes

IMDG: Yes

IATA: Yes

## Special precautions for user

no data available

## Transport in bulk according to IMO instruments

no data available

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## SECTION 15: Regulatory information

### Safety, health and environmental regulations specific for the product in question

#### European Inventory of Existing Commercial Chemical Substances (EINECS)

Listed.

#### EC Inventory

Listed.

#### United States Toxic Substances Control Act (TSCA) Inventory

Listed.

#### China Catalog of Hazardous chemicals 2015

Listed.

#### New Zealand Inventory of Chemicals (NZIoC)

Listed.

#### **PICCS**

Listed.

#### **Vietnam National Chemical Inventory**

Listed.

#### **IECSC**

Listed.

#### **Korea Existing Chemicals List (KECL)**

Listed.

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## **SECTION 16: Other information**

### **Abbreviations and acronyms**

CAS: Chemical Abstracts Service

ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road

RID: Regulation concerning the International Carriage of Dangerous Goods by Rail

IMDG: International Maritime Dangerous Goods

IATA: International Air Transportation Association

TWA: Time Weighted Average

STEL: Short term exposure limit

LC50: Lethal Concentration 50%

LD50: Lethal Dose 50%

EC50: Effective Concentration 50%

### **References**

IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>

HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>

IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>

eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: [http://www.echemportal.org/echemportal/index?pagelD=0&request\\_locale=en](http://www.echemportal.org/echemportal/index?pagelD=0&request_locale=en)

CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>

ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>

ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>

Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>

ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

### **Other Information**

Do NOT take working clothes home. Depending on the degree of exposure, periodic medical examination is suggested.

#### **Disclaimer:**

The information in this MSDS is only applicable to the specified product, unless otherwise specified, it is not applicable to the mixture of this product and other substances. This MSDS only provides information on the safety of the product for those who have received the appropriate professional training for the user of the product. Users of this MSDS must make independent judgments on the applicability of this SDS. The authors of this MSDS will not be held responsible for any harm caused by the use of this MSDS.