

Chemical Safety Data Sheet MSDS / SDS

3,3'-Dichlorobenzidine

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

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

Product name : 3,3'-Dichlorobenzidine
CBnumber : CB5178304
CAS : 91-94-1
EINECS Number : 202-109-0
Synonyms : 3,3'-Dichlorobenzidine,dichlorobenzidine

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 : 400-158-6606

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

Acute toxicity - Category 4, Dermal
Skin sensitization, Category 1
Carcinogenicity, Category 1B
Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1
Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 1

Label elements**Pictogram(s)**

GHS02

Signal word : Danger

Hazard statement(s)

H225 Highly Flammable liquid and vapour
H312 Harmful in contact with skin
H317 May cause an allergic skin reaction
H350 May cause cancer

H370 Causes damage to organs

H410 Very toxic to aquatic life with long lasting effects

H411 Toxic to aquatic life with long lasting effects

H412 Harmful to aquatic life with long lasting effects

Precautionary statement(s)

P201 Obtain special instructions before use.

P210 Keep away from heat/sparks/open flames/hot surfaces. — No smoking.

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.

P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

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

P501 Dispose of contents/container to.....

Prevention

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

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

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

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

P273 Avoid release to the environment.

Response

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

P317 Get medical help.

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

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

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

P318 IF exposed or concerned, get medical advice.

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

SECTION 3: Composition/information on ingredients

Substance

Product name	: 3,3'-Dichlorobenzidine
Synonyms	: 3,3'-Dichlorobenzidine,dichlorobenzidine
CAS	: 91-94-1

EC number : 202-109-0
MF : C12H10Cl2N2
MW : 253.13

SECTION 4: First aid measures

Description of first aid measures

If inhaled

Fresh air, rest. Seek medical attention if you feel unwell.

Following skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap. Seek medical attention if you feel unwell.

Following eye contact

Rinse with plenty of water (remove contact lenses if easily possible).

Following ingestion

Rinse mouth. Refer for medical attention .

Most important symptoms and effects, both acute and delayed

Exposure Routes: inhalation, skin absorption, ingestion, skin and/or eye contact Symptoms: Skin sensitization, dermatitis; headache, dizziness; caustic burns; frequent urination, dysuria; hematuria (blood in the urine); gastrointestinal upset; upper respiratory infection; [Potential occupational carcinogen] Target Organs: Bladder, liver, lung, skin, gastrointestinal tract Cancer Site [in animals: liver & bladder cancer] (NIOSH, 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. Aniline and related compounds

SECTION 5: Firefighting measures

Extinguishing media

Wear self contained breathing apparatus for fire fighting if necessary.

Specific Hazards Arising from the Chemical

Combustible. (NTP, 1992)

Advice for firefighters

Use fine water spray, dry powder, carbon dioxide.

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

Use of sodium hypochlorite bleach solution to decontaminate 3,3'-dichlorobenzidine was partially effective. An aqueous solution of 5% tetrapotassium pyrophosphate and 10% sodium ethyl hexyl sulfate when blended in a jet sprayer effectively removed 3,3'-dichlorobenzidine from a worker area (90-99% reduction). Once removed from the work site and collected in a central location, it was then determined that the diazotization reaction (the addition of sulfate, ice and sodium nitrate occurred to eliminate any detectable dichlorobenzine from the washings.

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

Provision to contain effluent from fire extinguishing. Separated from food and feedstuffs. Well closed. Store only in original container. Store in an area without drain or sewer access. Stable under recommended storage conditions.

SECTION 8: Exposure controls/personal protection

Control parameters

Occupational Exposure limit values

TLV: (skin); A3 (confirmed animal carcinogen with unknown relevance to humans). MAK: skin absorption (H); 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 face shield or eye protection in combination with breathing protection if powder.

Skin protection

Protective gloves. Protective clothing.

Respiratory protection

Avoid inhalation of dust. Use local exhaust or breathing protection.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties

Information on basic physicochemical properties

Physical state	neat
Colour	Needles from alcohol or benzene
Odour	no data available
Melting point/freezing point	133°C
Boiling point or initial boiling point and boiling range	368°C
Flammability	Combustible. Gives off irritating or toxic fumes (or gases) in a fire.
Lower and upper explosion limit/flammability limit	no data available
Flash point	10°C
Auto-ignition temperature	350°C
Decomposition temperature	no data available
pH	Weak base
Kinematic viscosity	no data available
Solubility	Soluble in ethanol, benzene, and glacial acetic acid (Windholz et al., 1983)
Partition coefficient n-octanol/water	log Kow = 3.51
Vapour pressure	4.2×10^{-7} at 25 °C (estimated, Howard, 1989)
Density and/or relative density	1.381g/cm ³
Relative vapour density	no data available
Particle characteristics	no data available

SECTION 10: Stability and reactivity

Reactivity

NIOSH considers 3,3'-dichlorobenzidine (and its salts) to be a potential occupational carcinogens.

Decomposes on burning. This produces toxic and corrosive fumes including nitrogen oxides and hydrogen chloride.

Chemical stability

no data available

Possibility of hazardous reactions

A halide- and amine-substituted aromatic compound. Amines are chemical bases. They neutralize acids to form salts plus water. These acid-

base reactions are exothermic. The amount of heat that is evolved per mole of amine in a neutralization is largely independent of the strength of the amine as a base. Amines may be incompatible with isocyanates, halogenated organics, peroxides, phenols (acidic), epoxides, anhydrides, and acid halides. Flammable gaseous hydrogen is generated by amines in combination with strong reducing agents, such as hydrides.

Conditions to avoid

no data available

Incompatible materials

Strong oxidizing agents

Hazardous decomposition products

When heated to decomposition it emits very high toxic fumes of hydrogen chloride and nitrogen oxides.

SECTION 11: Toxicological information

Acute toxicity

- Oral: LD50 Mouse (female) oral 352 mg/kg/day (7 consecutive days)
- Inhalation: no data available
- Dermal: no data available

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

NTP: Reasonably anticipated to be a human carcinogen

Reproductive toxicity

No information is available on the reproductive or developmental effects of 3,3'-dichlorobenzidine in humans. Animal studies have reported abnormal growth in the kidneys of the fetuses of pregnant mice treated subcutaneously with 3,3'-dichlorobenzidine. No data were reported on maternal effects.

STOT-single exposure

The substance is irritating to the respiratory tract.

STOT-repeated exposure

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

Aspiration hazard

Evaporation at 20°C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.

SECTION 12: Ecological information

Toxicity

Toxicity to fish: LC50; Species: *Pimephales promelas* (Fathead Minnow) age 30 days, length 20 mm, weight 0.103 g; Conditions: freshwater, flow through, 22 (21.7-22.5) deg C, pH 7.24 (6.76-7.54), hardness 51.6 (50.9-51.9) mg/L CaCO₃, alkalinity 43 (36-46) mg/L CaCO₃, dissolved oxygen 83.1% (73.7-88.5%); Concentration: 2080 ug/L for 96 hr /98% purity

Toxicity to daphnia and other aquatic invertebrates: LC50; Species: *Daphnia magna* (Water Flea) age <24 hr neonate; Conditions: freshwater, renewal, 22.3. (22-22.6 deg C), pH 8.43 (8.33-8.61), hardness 170 (163-183) mg/L CaCO₃, alkalinity 108 (88-131) mg/L CaCO₃, dissolved oxygen 98.4% (94.8-100.8%); Concentration: 1050 ug/L for 48 hr (95% confidence interval: 810-1360 ug/L) /98% purity

Toxicity to algae: no data available

Toxicity to microorganisms: no data available

Persistence and degradability

3,3-Dichlorobenzidine, present at 3 mg/L dissolved organic carbon, was 9-43% 0-91%, 34-93% and 18-99% biodegraded in 4 weeks using an activated sludge inoculum, amended with a yeast extract nutrient broth of 50, 100, 200 and 400 mg/L, respectively, in the Modified AFNOR test. No biodegradation was observed in tests not amended with the yeast extract(1). When incubated with natural aquatic communities from eutrophic and mesotrophic lakes, 25% of the 3,3'-dichlorobenzidine degraded in a month(2). When incubated in soil under aerobic conditions, only 2% mineralization occurred in 32 weeks and no degradation intermediates were detected(3). Under anaerobic conditions no mineralization occurred in a year(3). 3,3'-Dichlorobenzidine, present at 100 mg/L, achieved 1% of its theoretical BOD in 4 weeks using an activated sludge inoculum at 30 mg/L and the Japanese MITI test which classified the compound as not readily biodegradable(4). The half-life of 3,3'-dichlorobenzidine in a lake water and sediment slurry obtained from Lake Macatawa, MI was approximately 150 days(5). 3,3'-Dichlorobenzidine dihydrochloride was not readily biodegradable by microorganisms obtained from freshwater lakes and incubated for 28 and 30 days or in an activated sludge study(6,7). These data suggest that biodegradation of 3,3'-dichlorobenzidine will occur slowly in the environment(SRC). Half-lives of 4-26 weeks and 16-101 weeks have been estimated for the biodegradation of 3,3'-dichlorobenzidine in surface water and anaerobic groundwater, respectively(8).

Bioaccumulative potential

The equilibrium bioconcentration factors using (14)-C-3,3'-dichlorobenzidine in whole bluegill sunfish (*Lepomis macrochirus*) was reported as 495-507, the BCF was 114-175 in the edible portion and 814-856 in non-edible parts(1). The BCF values measured in Golden ide fish (*Leuciscus idus*) and in algae were 610 and 940, respectively(2). A BCF range of 43-213 was measured in fish for 3,3'-dichlorobenzidine(SRC), using carp (*Cyprinus carpio*) which were exposed over an 8-week period(3). According to a classification scheme(4), these BCF data suggest the potential for bioconcentration in aquatic organisms is moderate to high(SRC).

Mobility in soil

Based upon measured Freundlich adsorption coefficients in a Brookston clay loam soil and a Rubicon sandy soil(1), the K_{oc} of 3,3'-dichlorobenzidine can be determined to be 33,720 and 15,885 in the respective soils(SRC). Batch isotherm studies using five sandy to silty-

clay sediment samples collected from Lake Macatawa (Holland, MI), measured Koc values ranging from 721 to 3,965(2); the majority of adsorption was determined to occur through covalent bonding(2). According to a classification scheme(3), these Koc values suggest that 3,3'-dichlorobenzidine is expected to have low to no mobility in soil. 3,3'-Dichlorobenzidine is a weak base with pKa values of 3.2 and 1.6(4), indicating that this compound will exist primarily in the neutral form. Aromatic amines like benzidine, 3,3'-dichlorobenzidine and substituted anilines are known to bind to soils containing a large organic carbon content due to the ability of the aromatic amino group to form covalent bonds with humic and fulvic material in soils(5). These complexes are often irreversibly bound and immobile(5).

Toxics Screening Level

The Initial Risk Screening Level (IRSL) for dichlorobenzidine is 0.002 µg/m³ based on an annual averaging time.

Other adverse effects

no data available

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.

SECTION 14: Transport information

UN Number

ADR/RID: UN3077 (For reference only, please check.)

IMDG: UN3077 (For reference only, please check.)

IATA: UN3077 (For reference only, please check.)

UN Proper Shipping Name

ADR/RID: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (For reference only, please check.)

IMDG: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (For reference only, please check.)

IATA: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (For reference only, please check.)

Transport hazard class(es)

ADR/RID: 9 (For reference only, please check.)

IMDG: 9 (For reference only, please check.)

IATA: 9 (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

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.

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

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

The substance is combustible but no flash point is available in literature. TLV Note: Exposure by all routes should be carefully controlled to levels as low as possible.

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.