

Chemical Safety Data Sheet MSDS / SDS

Benzidine

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

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

Product identifier

Product name : Benzidine
CBnumber : CB5152058
CAS : 92-87-5
EINECS Number : 202-199-1
Synonyms : Benzidine,4,4'-diaminobiphenyl

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, Oral
Carcinogenicity, Category 1A
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)

Signal word : Danger

Hazard statement(s)

H225 Highly Flammable liquid and vapour
H302 Harmful if swallowed
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

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.

P391 Collect spillage. Hazardous to the aquatic environment

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

P370+P378 In case of fire: Use ... for extinction.

P501 Dispose of contents/container to....

Prevention

P264 Wash ... thoroughly after handling.

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

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

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

P273 Avoid release to the environment.

Response

P301+P317 IF SWALLOWED: Get medical help.

P330 Rinse mouth.

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	: Benzidine
Synonyms	: Benzidine,4,4'-diaminobiphenyl
CAS	: 92-87-5
EC number	: 202-199-1
MF	: C ₁₂ H ₁₂ N ₂
MW	: 184.24

SECTION 4: First aid measures

Description of first aid measures

If inhaled

Fresh air, rest.

Following skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap. Wear protective gloves when administering first aid.

Following eye contact

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

Following ingestion

Rinse mouth.

Most important symptoms and effects, both acute and delayed

Poisonous if inhaled, swallowed or absorbed through skin. May cause contact dermatitis, irritation or sensitization. Ingestion may cause nausea and vomiting. (USCG, 1999)

Indication of any immediate medical attention and special treatment needed

Basic treatment: Establish a patent airway. Suction if necessary. Watch for signs of respiratory insufficiency and assist ventilations if necessary. Administer oxygen by nonrebreather mask at 10 to 15 L/min. Monitor for shock and treat if necessary . Anticipate seizures and treat if necessary . For eye contamination, flush eyes immediately with water. Irrigate each eye continuously with normal saline during transport . Do not use emetics. For ingestion, rinse mouth and administer 5 ml/kg up to 200 ml of water for dilution if the patient can swallow, has a strong gag reflex, and does not drool. Administer activated charcoal . Aniline and related compounds

SECTION 5: Firefighting measures

Extinguishing media

If material on fire or involved in fire: Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Use foam, dry chemical, or carbon dioxide.

Specific Hazards Arising from the Chemical

Special Hazards of Combustion Products: Contain highly toxic NO_x fumes. Behavior in Fire: Produces highly toxic fumes. (USCG, 1999)

Advice for firefighters

Use water spray, foam, powder, carbon dioxide.

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures

Personal protection: chemical protection suit 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: chemical protection suit 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

Cover the spill with a 9:1 mixture of sand and soda ash.

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 strong oxidants and food and feedstuffs. Keep in the dark. Well closed. Store in an area without drain or sewer access. KEEP WELL CLOSED & PROTECTED FROM LIGHT.

SECTION 8: Exposure controls/personal protection

Control parameters

Occupational Exposure limit values

TLV: A1 (confirmed human carcinogen); (skin). MAK: carcinogen category: 1. MAK skin absorption (H)

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

Use closed system and ventilation.

Thermal hazards

no data available

SECTION 9: Physical and chemical properties

Information on basic physicochemical properties

Physical state	neat
Colour	Grayish-yellow, crystalline powder; white or slightly reddish crystals, powder
Odour	no data available
Melting point/freezing point	120 °C
Boiling point or initial boiling point and boiling range	401 °C
Flammability	Combustible Solid, but difficult to burn.
Lower and upper explosion limit/flammability limit	no data available
Flash point	11°C
Auto-ignition temperature	no data available
Decomposition temperature	no data available
pH	no data available
Kinematic viscosity	no data available
Solubility	Soluble in ethanol (U.S. EPA, 1985) and ether (1 g/50 mL) (Windholz et al., 1983)
Partition coefficient n-octanol/water	log Kow= 1.34
Vapour pressure	Based on the specific vapor density value of 6.36 (Sims et al., 1988), the vapor pressure was calculated to be 0.83 at 20 °C.
Density and/or relative density	1.3
Relative vapour density	6.36 (NTP, 1992) (Relative to Air)
Particle characteristics	no data available

SECTION 10: Stability and reactivity

Reactivity

NIOSH considers benzidine to be a potential occupational carcinogen.

Decomposes on heating and on burning. This produces toxic fumes including nitrogen oxides. Reacts violently with strong oxidants, especially nitric acid.

Chemical stability

Darkens on exposure to air & light

Possibility of hazardous reactions

Benzidine itself does not burn or burns with difficulty. BENZIDINE forms insoluble salts with sulfuric acid. Can be diazotized, acetylated and alkylated. Is hypergolic with red fuming nitric acid (NTP, 1992). Neutralizes acids in exothermic reactions to form salts plus water. May be incompatible with isocyanates, halogenated organics, peroxides, phenols (acidic), epoxides, anhydrides, and acid halides. Flammable gaseous hydrogen may be generated in combination with strong reducing agents, such as hydrides.

Conditions to avoid

no data available

Incompatible materials

Benzidine is hypergolic (will ignite spontaneously) with red fuming nitric acid.

Hazardous decomposition products

When heated to decomp it emits highly toxic fumes of /nitrogen oxides/.

SECTION 11: Toxicological information

Acute toxicity

- Oral: LD50 Rat oral 309 mg/kg
- 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: Known to be a human carcinogen

Reproductive toxicity

No information is available on the reproductive or developmental effects of benzidine in humans and animals.

STOT-single exposure

no data available

STOT-repeated exposure

This substance is 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: *Pimephales promelas* (fathead minnow) > 20,000 ug/l/96 hr /Conditions of bioassay not specified

Toxicity to daphnia and other aquatic invertebrates: no data available

Toxicity to algae: no data available

Toxicity to microorganisms: no data available

Persistence and degradability

At concentrations of 60 to 120 mg/l, benzidine inhibited the oxygen uptake of sludge that had been acclimated to aniline; at concentrations of 40 to 80 mg/l, the oxygen uptake of unacclimated sludge was also inhibited. At ug/l concentrations, however, benzidine was partially degraded.

Bioaccumulative potential

In a 42 day experiment in a flow-through tank in which bluegills were exposed to ¹⁴C-benzidine, the BCF was 40 in the edible portion of the fish(1). The depuration half-life of the ¹⁴C-residues was about 7 days(1). After 3 days in a model ecosystem, the BCF for fish, mosquitos, snail and algae were 55, 457, 646 and 1,585(2). Based on a classification scheme(3), the BCF values of benzidine in fish suggests bioconcentration in aquatic organisms is moderate(SRC).

Mobility in soil

Benzidine exists as a neutral molecule, and as a singly and doubly ionized cation under acidic conditions (acid dissociation constants pKa1 and pKa2 are 4.3 and 3.3, respectively)(1,9) and adsorption to soil is sensitive to the soil pH. In a study of the adsorption of benzidine to 14 soils and sediments, it was found that the Freundlich adsorption constant was not correlated with any soil property such as % organic carbon but rather with pH(1). The pH controls the amount of benzidine in the ionized form and sorption increases as the pH decreases, that is, as a greater fraction of the total benzidine occurs in the ionic form. The Freundlich adsorption constant for the 14 soils and sediments ranged from 50 to 3,940 on a molar basis. The adsorption curve is highly non-linear with the average value of 1/n in the Freundlich adsorption equation being 0.5(1). In another study with 4 soils, the Freundlich adsorption constants ranged from 7,600 to 21,000 and the mean 1/n was 0.768(6). Even though the adsorption curves were not linear, Koc values were estimated to range from 227,000 to 882,000(6). Koc values for benzidine adsorbed to 3 estuarine sediments containing 0.93, 1.36, and 3.01% organic carbon were 4,899, 462, and 3,307, respectively(4). For adsorption to Chesapeake Bay sediment, the Freundlich adsorption constant was 6,025 and 1/n was 0.75 at pH 7.9(5). Adsorption increased as pH decreased, indicating that the protonated form of benzidine is more strongly bound to colloids than the neutral form(5). A sequential extraction procedure was used to show that benzidine binds to soil in two phases(7). Initially a reversible equilibrium is established followed by covalent bonding to soil organic matter, primarily humic acids(7). The benzidine concentration in soil solution decreases rapidly over the first 6 hours and then more slowly(8). After 48 hrs the level of benzidine in soil solution remains constant, 6-22 ppb for soil application rates of 30-50 ppm(8). Benzidine adsorbs to clay minerals forming a blue-colored species, the adsorption increasing with decreasing pH(2). Aromatic amines like benzidine are known to form covalent bonds with humic materials, adding to quinone-like structures followed by a slow oxidation(3,9). According to a classification scheme(10), the Koc values from sediment and soil(4,6) suggest that benzidine is expected to have very low or no mobility in soil(SRC).

Toxics Screening Level

The Initial Risk Screening Level (IRSL) for benzidine (CAS# 92-87-5) is 0.00002 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: UN1885 (For reference only, please check.)

IMDG: UN1885 (For reference only, please check.)

IATA: UN1885 (For reference only, please check.)

UN Proper Shipping Name

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

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

IATA: BENZIDINE (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: II (For reference only, please check.)

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

IATA: II (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)

Not 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

Do NOT take working clothes home. 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.