



SAFETY DATA SHEETS

According to the UN GHS revision 9

Version: 1.0
Creation Date: July 15, 2019
Revision Date: July 15, 2019

SECTION 1: Identification

1.1 GHS Product identifier

Product name Benzidine

1.2 Other means of identification

Product number -

Other names BENZIDINE; [1,1'-Biphenyl]-4,4'-diamine; 4,4'-Bianiline

1.3 Recommended use of the chemical and restrictions on use

Identified uses Industrial and scientific research use.

Uses advised against no data available

1.4 Supplier's details

Company Shanghai Yien Chemical Technology Co., Ltd
Address Building 6, 28 Yingong Road, Fengxian District, Shanghai
Chemical Industry Zone, Shanghai, 201400, China
Telephone +86-400-133-2688

1.5 Emergency phone number

Emergency phone number +86-400-133-2688

Service hours Monday to Friday, 9am-5pm (Standard time zone: UTC/GMT +8 hours).

SECTION 2: Hazard identification

2.1 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

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Danger

Hazard statement(s)

H302 Harmful if swallowed

H350 May cause cancer

H410 Very toxic to aquatic life with long lasting effects

Precautionary statement(s)**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.

2.3 Other hazards which do not result in classification

no data available

SECTION 3: Composition/information on ingredients**3.1 Substances**

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Benzidine	Benzidine	92-87-5	202-199-1	100%

SECTION 4: First-aid measures**4.1 Description of necessary 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.

4.2 Most important symptoms/effects, 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)

4.3 Indication of immediate medical attention and special treatment needed, if necessary

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: Fire-fighting measures**5.1 Suitable 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.

5.2 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)

5.3 Special protective actions for fire-fighters

Use water spray, foam, powder, carbon dioxide.

SECTION 6: Accidental release measures

6.1 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.

6.2 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.

6.3 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

7.1 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.

7.2 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

8.1 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

8.2 Appropriate engineering controls

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

8.3 Individual protection measures, such as personal protective equipment (PPE)

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 and safety characteristics

Physical state	Benzidine is a grayish-yellow to grayish-red, crystalline solid. Toxic by ingestion, inhalation, and skin absorption. Combustion produces toxic oxides of nitrogen. Used to make other chemicals and in chemical and biological analysis.
Colour	White or slightly-reddish, crystalline 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	Partially miscible with water
Partition coefficient n-octanol/water	log Kow= 1.34
Vapour pressure	Low (NIOSH, 2016)
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**10.1 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.

10.2 Chemical stability

Darkens on exposure to air & light

10.3 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.

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

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

10.6 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

12.1 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

12.2 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.

12.3 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).

12.4 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).

12.5 Other adverse effects

no data available

SECTION 13: Disposal considerations

13.1 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

14.1 UN Number

ADR/RID: UN1885 (For reference only, please check.)

IMDG: UN1885 (For reference only, please

IATA: UN1885 (For reference only, please

check.)

check.)

14.2 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.)

14.3 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.)

14.4 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.)

14.5 Environmental hazards

ADR/RID: Yes
IMDG: Yes
IATA: Yes

14.6 Special precautions for user

no data available

14.7 Transport in bulk according to IMO instruments

no data available

SECTION 15: Regulatory information

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

Chemical name	Common names and synonyms	CAS number	EC number
Benzidine	Benzidine	92-87-5	202-199-1
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.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Listed.
Korea Existing Chemicals List (KECL)			Not Listed.

SECTION 16: Other information

Information on revision

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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?pageID=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.

Any questions regarding this SDS, Please send your inquiry to sds@xixisys.com

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