

SAFETY DATA SHEETS

According to Globally Harmonized System of Classification and Labelling of Chemicals (GHS) - Sixth revised edition

Version: 1.0

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1. Identification

1.1 GHS Product identifier

Product name aniline

1.2 Other means of identification

Product number -

Other names Aniline

1.3 Recommended use of the chemical and restrictions on use

Identified uses For industry use only. Aniline is predominantly used as a chemical intermediate for the dye, agricultural, polymer, and rubber industries. It is also used as a solvent, and has been used as an antiknock compound for gasolines.

Uses advised against no data available

2. Hazard identification

2.1 Classification of the substance or mixture

Acute toxicity - Oral, Category 3

Acute toxicity - Dermal, Category 3

Serious eye damage, Category 1

Skin sensitization, Category 1

Acute toxicity - Inhalation, Category 3

Germ cell mutagenicity, Category 2

Carcinogenicity, Category 2

Specific target organ toxicity – repeated exposure, Category 1

Hazardous to the aquatic environment, short-term (Acute) - Category Acute 1

2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Danger

Hazard statement(s)

H301 Toxic if swallowed

H311 Toxic in contact with skin

H318 Causes serious eye damage

H317 May cause an allergic skin reaction

H331 Toxic if inhaled

H341 Suspected of causing genetic defects

H351 Suspected of causing cancer

H400 Very toxic to aquatic life

Precautionary statement(s)

Prevention

P264 Wash ... thoroughly after handling.

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

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

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

P272 Contaminated work clothing should not be

allowed out of the workplace.

P271 Use only outdoors or in a well-ventilated area.

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

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

P273 Avoid release to the environment.

Response

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

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

P330 Rinse mouth.

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

P312 Call a POISON CENTER/doctor/...if you feel unwell.

P361+P364 Take off immediately all contaminated clothing and wash it before reuse.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER/doctor/...

P333+P313 If skin irritation or rash occurs: Get medical advice/attention.

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

P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P311 Call a POISON CENTER/doctor/...

P308+P313 IF exposed or concerned: Get medical

advice/ attention.

P314 Get medical advice/attention if you feel unwell.

P391 Collect spillage.

Storage

P405 Store locked up.

P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Disposal

P501 Dispose of contents/container to ...

2.3 Other hazards which do not result in classification

none

3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
aniline	aniline	62-53-3	none	100%

4. First-aid measures

4.1 Description of necessary first-aid measures

General advice

Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled

Fresh air, rest. Administration of oxygen may be needed. Refer immediately for medical attention. See Notes.

In case of skin contact

Administration of oxygen may be needed. Remove contaminated clothes. Rinse and then wash skin with water and soap. Refer immediately for medical attention. See Notes.

In case of eye contact

First rinse with plenty of water for several minutes (remove contact lenses if

easily possible), then refer for medical attention.

If swallowed

Administration of oxygen may be needed. Rinse mouth. Do NOT induce vomiting. Rest. Refer immediately for medical attention. See Notes.

4.2 Most important symptoms/effects, acute and delayed

It is classified as very toxic. Probable oral lethal dose in humans is 50-500 mg/kg for a 150 lb. person. Aniline poisoning is characterized by methemoglobin formation in the blood and resulting cyanosis or blue skin. The formation of methemoglobin interferes with the oxygen-carrying capacity of the blood. The approximate minimum lethal dose for a 150 lb. human is 10 grams. Serious poisoning may result from ingestion of 0.25 mL. People at special risk include individuals with glucose-6-phosphate-dehydrogenase deficiency and those with liver and kidney disorders, blood diseases, or a history of alcoholism. (EPA, 1998)

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

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/

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

Use alcohol foam extinguishers. Vapors are heavier than air and will collect in low areas. Vapors may travel long distances to ignition sources and flashback. Vapors in confined areas may explode when exposed to fire. Storage containers and parts of containers may rocket great distances, in many directions. If material or contaminated runoff enters waterways, notify downstream users of potentially contaminated waters. Notify local health and fire officials and pollution control agencies. Fight fire from maximum distance. Dike fire control

water for later disposal and do not scatter material. If a leak or spill has not ignited, use water spray to control vapors. From a secure, explosion-proof location, use water spray to cool exposed containers. If cooling streams are ineffective (venting sound increases in volume and pitch, tank discolors or shows any signs of deforming), withdraw immediately to a secure position ... The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full facepieces and are operated in a pressure-demand or other positive-pressure mode.

5.2 Specific hazards arising from the chemical

Combustion can produce toxic fumes including nitrogen oxides and carbon monoxide. Aniline vapor forms explosive mixtures with air. It is incompatible with strong oxidizers and strong acids and a number of other materials. Avoid heating. Hazardous polymerization may occur. Polymerizes to a resinous mass. (EPA, 1998)

5.3 Special protective actions for fire-fighters

Wear self-contained breathing apparatus for firefighting if necessary.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

6.2 Environmental precautions

Evacuate danger area! Consult an expert! Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent. Then store and dispose of according to local regulations.

6.3 Methods and materials for containment and cleaning up

Wear breathing apparatus, eye protection, laboratory coat, and butyl rubber gloves. Cover the spill with a 1:1:1 mixture by weight of sodium carbonate or calcium carbonate, clay cat litter (bentonite), and sand. When the aniline has been absorbed, scoop the mixture into a plastic pail and add enough water to

dissolve the sodium carbonate. Allow the solids to settle and decant the liquid to another container. Discard the solids with the normal refuse. To the liquid, slowly (frothing will occur) add 6 M sulfuric acid to pH 2. Stir into the acidified solution sufficient solid potassium permanganate so that the liquid is purple (a drop of the liquid on filter paper will show a purple ring). Allow the mixture to stand at room temperature for 48 hours, and then neutralize with solid sodium carbonate (frothing will occur), or with a 10% aqueous solution of sodium hydroxide. Add solid sodium bisulfite until the solution is colorless. Decant the clear liquid into the drain and discard any brown solid with normal refuse.

7. Handling and storage

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Avoid exposure - obtain special instructions before use. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Separated from strong oxidants, strong acids and food and feedstuffs. Well closed. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access. Aniline is slightly corrosive to some types of metal. So all amphoteric materials such as aluminum, copper, tin, zinc, and alloys containing one of these metals (brass, bronze) are not suitable for the handling of aniline, as they are corroded by it. For normal applications carbon steel or cast iron are appropriate materials for the aniline handling or storage. Only if discoloration must be kept to minimum, aniline should be stored and transported in stainless steel equipment with proper nitrogen blanketing.

8. Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

NIOSH considers aniline to be a potential occupational carcinogen.

NIOSH usually recommends that occupational exposures to carcinogens be limited to the lowest feasible concentration.

Biological limit values

no data available

8.2 Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

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

Eye/face protection

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection

Wear impervious clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.

Respiratory protection

Wear dust mask when handling large quantities.

Thermal hazards

no data available

9. Physical and chemical properties

Physical state	colourless liquid
Colour	Oily liquid; colorless when freshly distilled, darkens in exposure to air and light.
Odour	Hedonic tone; pungent
Melting point/ freezing point	-6°C(lit.)
Boiling point or initial boiling point and boiling range	184°C(lit.)
Flammability	Class IIIA Combustible Liquid: Fl.P. at or above 60°C and

	below 93.33°C. Combustible. Gives off irritating or toxic fumes (or gases) in a fire.
Lower and upper explosion limit / flammability limit	Lower flammable limit: 1.3% by volume; Upper flammable limit: 11% by volume
Flash point	70°C
Auto-ignition temperature	615°C
Decomposition temperature	no data available
pH	8.1 (0.2 molar aq soln)
Kinematic viscosity	4.35 cP at 20°C; 1.62 cP at 60°C
Solubility	In water: 36 g/L (20 °C)
Partition coefficient n-octanol/water (log value)	no data available
Vapour pressure	0.7 mm Hg (25 °C)
Density and/or relative density	1.022g/mL at 25°C (lit.)
Relative vapour density	3.22 (185 °C, vs air)
Particle characteristics	no data available

10. Stability and reactivity

10.1 Reactivity

no data available

10.2 Chemical stability

Darkens on exposure to air and light and polymerizes to a resinous mass.

10.3 Possibility of hazardous reactions

A combustible liquid when exposed to heat or flame. ANILINE is a heat sensitive base. Combines with acids to form salts. Dissolves alkali metals or alkaline earth metals with evolution of hydrogen. Incompatible with albumin, solutions of iron, zinc and aluminum, and acids. Couples readily with phenols and aromatic amines. Easily acylated and alkylated. Corrosive to copper and copper alloys. Can react vigorously with oxidizing materials (including perchloric acid, fuming nitric acid, sodium peroxide and ozone). Reacts violently with BCl₃. Mixtures with toluene diisocyanate may ignite. Undergoes explosive reactions with benzenediazonium-2-carboxylate, dibenzoyl peroxide, fluorine nitrate, nitrosyl

perchlorate, peroxydisulfuric acid and tetranitromethane. Violent reactions may occur with peroxyformic acid, diisopropyl peroxydicarbonate, fluorine, trichloronitromethane (145°C), acetic anhydride, chlorosulfonic acid, hexachloromelamine, (HNO₃ + N₂O₄ + H₂SO₄), (nitrobenzene + glycerin), oleum, (HCHO + HClO₄), perchromates, K₂O₂, beta-propiolactone, AgClO₄, Na₂O₂, H₂SO₄, trichloromelamine, acids, FO₃Cl, diisopropyl peroxydicarbonate, n-haloimides and trichloronitromethane. Ignites on contact with sodium peroxide + water. Forms heat or shock sensitive explosive mixtures with anilinium chloride (detonates at 464 F/7.6 bar), nitromethane, hydrogen peroxide, 1-chloro-2,3-epoxypropane and peroxomonosulfuric acid. Reacts with perchloryl fluoride form explosive products. .

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

It can react vigorously with oxidizing materials ... Spontaneously explosive reactions occur with benzenedazonium-2-carboxylate, dibenzoyl peroxide, fluorine nitrate, nitrosyl perchlorate, red fuming nitric acid, peroxydisulfuric acid, and tetranitromethane. Violent reactions with boron trichloride, peroxyformic acid, diisopropyl peroxydicarbonate, fluorine, trichloronitromethane (145°C), acetic anhydride, chlorosulfonic acid, hexachloromelamine, (/nitric acid/ + /dinitrogen tetroxide/ + sulfuric acid), (nitrobenzene + glycerin), oleum, (/formaldehyde/ + /perchloric acid/), perchromates, /potassium peroxide/, beta-propiolactone, /silver perchlorate/, /sodium peroxide/, /sulfuric acid/, trichloromelamine, acids, peroxydisulfuric acid, /perchloryl fluoride/, diisopropyl peroxy-dicarbonate, n-haloimides, and trichloronitromethane. Ignites on contact with sodium peroxide + water. Forms heat- or shock-sensitive explosive mixtures with anilinium chloride (detonates at 240°C/7.6 bar), nitromethane, hydrogen peroxide, 1-chloro-2,3-epoxypropane, and peroxomonosulfuric acid. Reactions with perchloryl fluoride, perchloric acid, and ozone form explosive products.

10.6 Hazardous decomposition products

The substance decomposes on heating at temperatures above 190°C, producing toxic and corrosive fumes (ammonia and nitrogen oxides) and flammable vapors.

11. Toxicological information

Acute toxicity

- Oral: LD50 Rat oral 250 mg/kg
- Inhalation: no data available
- Dermal: LD50 Cat percutaneous 254 mg/kg

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

Classification of carcinogenicity: Overall summary evaluation of carcinogenic risk to humans is Group 3: The agent is not classifiable as to its carcinogenicity to humans.

Reproductive toxicity

No information is available on the reproductive or developmental effects of aniline in humans. Birth defects were observed in animals given aniline by gavage (placing the chemical experimentally in the stomachs of the animals). The total number of offspring in mice given aniline by gavage was lower than in the control group even though the average number of offspring per litter was not affected. However, some of the pregnant mice treated with aniline died during pregnancy. Survival of offspring in the aniline-treated group was decreased.

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

12. Ecological information

12.1 Toxicity

- Toxicity to fish: LC50; Species: *Pimephales promelas* (fathead minnow, 33 days old); Conditions: 26.1°C, pH 7.58, hardness 47 mg/L of CaCO₃; Concentration: 134 mg/L for 96 hr (95% confidence limit: 122-148 mg/L) /purity 99+%/ /Conditions of bioassay not specified
- Toxicity to daphnia and other aquatic invertebrates: LC50; Species: *Daphnia magna*; Concentration: 0.65 mg/L for 48 hr /Conditions of bioassay not specified
- Toxicity to algae: EC50; Species: *Pseudokirchneriella subcapitata* (green algae); Conditions: freshwater, static; Concentration: 19000 ug/L for 96 hr; Effect: growth, general /active ingredient
- Toxicity to microorganisms: no data available

12.2 Persistence and degradability

AEROBIC: Aniline is a benchmark chemical for aerobic biodegradability tests and there are abundant data on its biodegradation. Degradation is frequently 90-100% in laboratory tests utilizing activated sludge or sewage seed lasting from 3 to 28 days with acclimation not always being required(1-14).

12.3 Bioaccumulative potential

The measured log BCF for aniline in three species of fish was 0.78(1) and less than 1(2,4). According to a classification scheme(5), these measured BCF values suggests the potential for bioconcentration in aquatic organisms is low(SRC). The log BCF for algae was reported as 0.6(2,3).

12.4 Mobility in soil

Primary anilines may bind to soils due to the ability of the aromatic amino group to form covalent bonds with humic and fulvic material in soils(1). The Koc of aniline in 5 European soils was reported in the range of 43.8-497.7(2). The Koc values in 2 silt loams were 130 and 410 with the higher value occurring in the more acidic soil(3). The Koc of aniline in colloidal organic carbon from groundwater (pH 6.5) was reported as 3,870(4). The adsorption constant for adsorption to H-montmorillonite (pH 8.35) and Na-montmorillonite (pH 6.8) is 1,300 and 130(5). The Koc of aniline in 3 silt-clay loams were 269 (pH 4.4), 48 (pH

6.5) and 16 (pH 7.2)(6). A mean Koc value of 55 was determined for aniline in 4 sewage sludges(7). The Koc in five second-generation reference EUROSOILS was 8, 32, 19, 27 and 137(8). According to a classification scheme(9), this Koc data suggests that aniline may have very high to medium mobility in soil. The pKa of aniline is 4.60(10, indicating that this compound will partially exist in the protonated (cation) form; however, in the pH range between pH5 and pH9, aniline will exist primarily in the non-protonated form; in the protonated form in the environment, cations generally adsorb more strongly to soils containing organic carbon and clay than their neutral counterparts(11). In a sorption study using pond sediment from Cherokee Park pond in Athens GA, the sorption kinetics of aniline were characterized by a rapid initial loss of aniline from the aqueous phase followed by a much slower rate of disappearance. The initial sorption was a reversible cation-exchange followed by a slower covalent-binding. It was shown that at pH values greater than the pKa, sorption kinetics were slower than at pH3.75 (rate constants of 4.53-7.95/hr above versus 13.3 below)(12).

12.5 Other adverse effects

no data available

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.

14. Transport information

14.1 UN Number

ADR/RID: UN1547

IMDG: UN1547

IATA: UN1547

14.2 UN Proper Shipping Name

ADR/RID: ANILINE

IMDG: ANILINE

IATA: ANILINE

14.3 Transport hazard class(es)

ADR/RID: 6.1

IMDG: 6.1

IATA: 6.1

14.4 Packing group, if applicable

ADR/RID: II

IMDG: II

IATA: II

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 Annex II of MARPOL 73/78 and the IBC Code

no data available

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
aniline	aniline	62-53-3	none
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.

16. Other information

Information on revision

Creation Date Aug 12, 2017

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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/>
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