SAFETY DATA SHEETS

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

Version: 1.0

Creation Date: Aug 12, 2017

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1. Identification

1.1 GHS Product identifier

Product name	quinoline

1.2 Other means of identification

Product number	-
Other names	Leucol

1.3 Recommended use of the chemical and restrictions on use

Identified uses	For industry use only. Quinoline is used mainly as an intermediate in the manufacture of other products. Quinoline is also used as a catalyst, a corrosion inhibitor, in metallurgical processes, in the manufacture of dyes, as a preservative for anatomical specimens, in polymers and agricultural chemicals, and as a solvent for resins and terpenes. It is also used as an antimalarial medicine.
Uses advised against	no data available

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2. Hazard identification

2.1 Classification of the substance or mixture

Acute toxicity - Oral, Category 4

Acute toxicity - Dermal, Category 4

Skin irritation, Category 2

Eye irritation, Category 2

Germ cell mutagenicity, Category 2

Carcinogenicity, Category 1B

Hazardous to the aquatic environment, long-term (Chronic) - Category Chronic 2

2.2 GHS label elements, including precautionary statements

Pictogram(s)	
Signal word	Danger
Hazard statement(s)	H302 Harmful if swallowed H312 Harmful in contact with skin H315 Causes skin irritation H319 Causes serious eye irritation H341 Suspected of causing genetic defects H350 May cause cancer H411 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. P280 Wear protective gloves/protective clothing/eye protection/face protection. P201 Obtain special instructions before use. P202 Do not handle until all safety precautions have been read and understood. P273 Avoid release to the environment.

Response	P301+P312 IF SWALLOWED: Call a POISON CENTER/doctor/…if you feel unwell. P330 Rinse mouth. P302+P352 IF ON SKIN: Wash with plenty of water/... P312 Call a POISON CENTER/doctor/…if you feel unwell. P321 Specific treatment (see ... on this label). P362+P364 Take off contaminated clothing and wash it before reuse. P332+P313 If skin irritation occurs: Get medical advice/attention. P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P337+P313 If eye irritation persists: Get medical advice/attention. P308+P313 IF exposed or concerned: Get medical advice/ attention. P391 Collect spillage.
Storage	P405 Store locked up.
Disposal	P501 Dispose of contents/container to ...

2.3 Other hazards which do not result in classification

none

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3. Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
quinoline	quinoline	91-22-5	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. Refer for medical attention.

In case of skin contact

Remove contaminated clothes. Rinse and then wash skin with water and soap.

In case of eye contact

Rinse with plenty of water (remove contact lenses if easily possible). Refer for medical attention.

If swallowed

Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

4.2 Most important symptoms/effects, acute and delayed

Vapors are irritating to nose and throat and may cause headaches, dizziness, and nausea if inhaled. Ingestion causes irritation of mouth and stomach; vomiting may occur. Contact with eyes or skin causes irritation. (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 pulmonary edema and treat if necessary ... . Monitor for shock 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 ... . /Aromatic hydrocarbons and related compounds/

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

EXTINGUISH WITH WATER, DRY CHEMICALS, FOAM, OR CARBON DIOXIDE.

5.2 Specific hazards arising from the chemical

Special Hazards of Combustion Products: Toxic oxides of nitrogen may form in fires. Behavior in Fire: Heat exposure may cause pressure build-up in closed containers. (USCG, 1999)

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

Personal protection: filter respirator for organic gases and vapours adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Collect leaking and spilled liquid in sealable containers as far as possible. 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

Spread over with the 9:1 mixture of sand and soda ash. After mixing, transfer into a paper carton, stuffed with ruffled paper.

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

Provision to contain effluent from fire extinguishing. Separated from strong oxidants, acids, acid anhydrides and food and feedstuffs. Dry. Keep in the dark. Well closed. Store in an area without drain or sewer access.PROTECT FROM LIGHT & MOISTURE.

8. Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure limit values

no data available

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

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9. Physical and chemical properties

Physical state	colourless to brown liquid
Colour	COLORLESS TO BROWN /SRP: TECHNICAL GRADE/
Odour	Penetrating odor, not as offensive as pyridine
Melting point/ freezing point	-15°C(lit.)
Boiling point or initial boiling point and boiling range	113-114°C/11mmHg(lit.)
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	101°C
Auto-ignition temperature	480°C
Decomposition temperature	no data available
pH	Weak tertiary base
Kinematic viscosity	2.997 millipascal second (=cP) at 30°C
Solubility	In water:slightly soluble
Partition coefficient n-octanol/water (log value)	log Kow= 2.03
Vapour pressure	0.07 mm Hg (20 °C)
Density and/or relative density	1.093g/mLat 25°C(lit.)
Relative vapour density	4.5 (vs air)
Particle characteristics	no data available

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10. Stability and reactivity

10.1 Reactivity

no data available

10.2 Chemical stability

DARKENS ON STORAGE IN ORDINARY, STOPPERED BOTTLE

10.3 Possibility of hazardous reactions

IT IS MODERATELY FLAMMABLE BUT DOES NOT EVOLVE A FLAMMABLE CONCN OF VAPOR AT TEMP OF BELOW 99 DEG C.QUINOLINE is hygroscopic. It absorbs as much as 22% water. It is sensitive to light and moisture. It darkens on storage. This chemical is a weak base. A potentially explosive reaction may occur with hydrogen peroxide. It reacts violently with dinitrogen tetraoxide. It also reacts violently with perchromates. It is incompatible with (linseed oil + thionyl chloride) and maleic anhydride. It is also incompatible with strong oxidizers and strong acids. This chemical can be unpredictably violent. It dissolves sulfur, phosphorus and arsenic trioxide. It may attack some forms of plastics. It is a preparative hazard.

10.4 Conditions to avoid

no data available

10.5 Incompatible materials

VIOLENT REACTION WITH DINITROGEN TETRAOXIDE; PERCHROMATES.

10.6 Hazardous decomposition products

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

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11. Toxicological information

Acute toxicity

- Oral: LD50 Rat oral 460 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

no data available

Reproductive toxicity

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

STOT-single exposure

no data available

STOT-repeated exposure

no data available

Aspiration hazard

no data available

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12. Ecological information

12.1 Toxicity

- Toxicity to fish: no data available
- 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

With 9 natural water samples, 1 ppm quinoline had 3-10 day lag then 100% degradation in 24-48 hr; 1 ppm redose had 2-4 hr lag then 100% degradation in 24-48 hr(1). Using a 9 L aerated fermentor with 3 natural water samples and 1 sewage plant aeration effluent spiked with 10 ug/ml quinoline, an adaptation period was observed and greater than or equal to 95% biodegradation in 48 hr

(25°C), 60 hr (25°C), 11 days (15°C) and 60 hours (25°C), respectively(2). Batch fermentations using low level inocula from a eutrophic pond initially spiked with 1,3,5 and 10 ug/ml quinoline resulted in 100% biodegradation in <16 hr(2). Major metabolites expected: 2-hydroxyquinoline, 2,3-dihydroxyquinoline(2). 66% theoretical BOD (TBOD) was observed after 5 days with the standard dilution method and sewage as seed(4). Using 100 ppm quinoline and 30 ppm activated sludge, < 30% TBOD was observed in 2 weeks(5). With 10 ug/ml quinoline with pond water in 9 l bottle, approximately 2 day lag period followed by 100% biodegradation in < 24 hr; four subsequent redoses in shaker flasks with 0.2% v/v (NH4)2SO4 - potassium phosphate buffer resulted in 100% biodegradation in less than or equal to 24 hours(3). Bacterium isolated from soil used quinoline as sole carbon during aerobic degradation(6). Quinoline was degraded to 2-hydroxyquinoline by soil Pseudomonads in enrichment cultures isolated from a creosote-contaminated site in Pensacola, FL(7).

12.3 Bioaccumulative potential

At an initial concentration of 0.8 and 0.08 mg/l, quinoline had a BCF ranging from <0.1-2.5 and <1.0-3.8, respectively, in orange red killifish(1). Rainbow trout swimup fry, ranging from 0.21-0.41 g in size, were exposed to quinoline at 1 mg/l for 48 hours and analyzed for bioconcentration(2). Whole body levels of quinoline increased rapidly during the first 4 hours of exposure and reached an apparent plateau after about 24 hours. Quinoline had a calculated bioconcentration factor of 3.73. After 48 hours, the fish were placed in non-quinoline contaminated water for 24 hours and monitored for depuration(2). Less than 2% of unmetabolized quinoline remained after the 24-hour depuration period. Metabolites found within fish tissues included hydroxyquinolines and quinolinethiols(2). In a static exposure study using fathead minnows, Pimephales promelas, a bioconcentration factor (BCF) of 8 was measured(3). According to a classification scheme(4), these BCF values suggest the potential for bioconcentration in aquatic organisms is low(SRC).

12.4 Mobility in soil

The measured log Koc for quinoline is 2.84(1). The adsorption coefficients of quinoline to Ca-montmorillonite and creek sediments are 7.3 and 10.9, respectively(2). A Koc of 43 was reported using low-organic-carbon subsurface materials(11). According to a classification scheme(3), these Koc values suggest that quinoline is expected to have very high mobility in soil. Quinoline was found to be relatively mobile using a Danish sandy soil(10). Intensity of quinoline added to a natural sand aquifer on the Canadian Air Force Base Borden, Ontario, Canada via a field study using coal tar creosote were found to increase after 278 days, about 25 m from the croesote source, added at an initial concn of 10.1 g/kg creosote(4). Aromatic amines are expected to bind strongly to humus or organic matter in soils due to the high reactivity of the aromatic amino group(7,8), suggesting that mobility may be much lower in some soils(SRC). The pKa of quinoline is 4.90(5), indicating that this compound will partially exist in the protonated form in the environment and cations generally adsorb to organic carbon and clay more strongly than their neutral counterparts(6); therefore, adsorption increases with increasing soil acidity(11). Sorption onto airborne particulates has been observed(9). A Kd value of 0.83 was measured using a Danish sandy soil from Lundgaard, Jutland, characterized by 2.47% organic carbon content, 80.2% sand, 13.2% silt, 4.8% clay, and a pH of 5.8(10).

12.5 Other adverse effects

no data available

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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.

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14. Transport information

14.1 UN Number

ADR/RID: UN2656	IMDG: UN2656	IATA: UN2656

14.2 UN Proper Shipping Name

ADR/RID: QUINOLINE
IMDG: QUINOLINE
IATA: QUINOLINE

14.3 Transport hazard class(es)

ADR/RID: 6.1	IMDG: 6.1	IATA: 6.1

14.4 Packing group, if applicable

ADR/RID: III	IMDG: III	IATA: III

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

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15. Regulatory information

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

<table>
<tr><td>Chemical name</td><td>Common names and synonyms</td><td>CAS number</td><td>EC number</td></tr>
<tr><td>quinoline</td><td>quinoline</td><td>91-22-5</td><td>none</td></tr>
<tr><td colspan="3">European Inventory of Existing Commercial Chemical Substances (EINECS)</td><td>Listed.</td></tr>
<tr><td colspan="3">EC Inventory</td><td>Listed.</td></tr>
<tr><td colspan="3">United States Toxic Substances Control Act (TSCA) Inventory</td><td>Listed.</td></tr>
<tr><td colspan="3">China Catalog of Hazardous chemicals 2015</td><td>Listed.</td></tr>
<tr><td colspan="3">New Zealand Inventory of Chemicals (NZIoC)</td><td>Listed.</td></tr>
<tr><td colspan="3">Philippines Inventory of Chemicals and Chemical Substances (PICCS)</td><td>Listed.</td></tr>
<tr><td colspan="3">Vietnam National Chemical Inventory</td><td>Not Listed.</td></tr>
<tr><td colspan="3">Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)</td><td>Listed.</td></tr>
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16. Other information

Information on revision

Creation Date	Aug 12, 2017
Revision Date	Aug 12, 2017

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/