

SAFETY DATA SHEET

Version 6.13
Revision Date 03/13/2024
Print Date 04/14/2024

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

1.1 Product identifiers

Product name : Toluene

Product Number : RTC000096
Brand : Sigma-Aldrich
Index-No. : 601-021-00-3
CAS-No. : 108-88-3

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

Uses advised against : The product is being supplied under the TSCA R&D Exemption (40 CFR Section 720.36). It is the recipient's responsibility to comply with the requirements of the R&D exemption. The product may not be used for a non-exempt commercial purpose under TSCA unless appropriate consent is granted in writing by MilliporeSigma.

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 2), H225
Skin irritation (Category 2), H315
Reproductive toxicity (Category 2), H361
Specific target organ toxicity - single exposure (Category 3), Central nervous system, H336

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Specific target organ toxicity - repeated exposure, Inhalation (Category 2), Central nervous system, H373

Aspiration hazard (Category 1), H304

Short-term (acute) aquatic hazard (Category 2), H401

Long-term (chronic) aquatic hazard (Category 3), H412

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal Word

Danger

Hazard Statements

H225

Highly flammable liquid and vapor.

H304

May be fatal if swallowed and enters airways.

H315

Causes skin irritation.

H336

May cause drowsiness or dizziness.

H361

Suspected of damaging fertility or the unborn child.

H373

May cause damage to organs (Central nervous system) through prolonged or repeated exposure if inhaled.

H401

Toxic to aquatic life.

H412

Harmful to aquatic life with long lasting effects.

Precautionary Statements

P201

Obtain special instructions before use.

P202

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

P210

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

P233

Keep container tightly closed.

P240

Ground/bond container and receiving equipment.

P241

Use explosion-proof electrical/ ventilating/ lighting/ equipment.

P242

Use only non-sparking tools.

P243

Take precautionary measures against static discharge.

P260

Do not breathe mist or vapors.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

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/ doctor.

P303 + P361 + P353

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/ shower.

P304 + P340 + P312

IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/ doctor if you feel unwell.

P308 + P313

IF exposed or concerned: Get medical advice/ attention.

P331

Do NOT induce vomiting.

P332 + P313

If skin irritation occurs: Get medical advice/ attention.

P362

Take off contaminated clothing and wash before reuse.

P370 + P378

In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.

| | |
|-------------|---|
| P403 + P233 | Store in a well-ventilated place. Keep container tightly closed. |
| P403 + P235 | Store in a well-ventilated place. Keep cool. |
| P405 | Store locked up. |
| P501 | Dispose of contents/ container to an approved waste disposal plant. |

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

| | |
|------------------|----------------|
| Formula | : C7H8 |
| Molecular weight | : 92.14 g/mol |
| CAS-No. | : 108-88-3 |
| EC-No. | : 203-625-9 |
| Index-No. | : 601-021-00-3 |

| Component | Classification | Concentration |
|----------------|--|---------------|
| Toluene | | |
| | Flam. Liq. 2; Skin Irrit. 2; Repr. 2; STOT SE 3; STOT RE 2; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H361, H336, H373, H304, H401, H412 Concentration limits: 20 %: STOT SE 3, H336; | <= 100 % |

For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4: First aid measures

4.1 Description of first-aid measures

General advice

Show this material safety data sheet to the doctor in attendance.

If inhaled

After inhalation: fresh air. Call in physician.

In case of skin contact

In case of skin contact: Take off immediately all contaminated clothing. Rinse skin with water/ shower. Consult a physician.

In case of eye contact

After eye contact: rinse out with plenty of water. Call in ophthalmologist. Remove contact lenses.

If swallowed

After swallowing: caution if victim vomits. Risk of aspiration! Keep airways free. Pulmonary failure possible after aspiration of vomit. Call a physician immediately.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures**5.1 Extinguishing media****Suitable extinguishing media**

Foam Carbon dioxide (CO₂) Dry powder

Unsuitable extinguishing media

For this substance/mixture no limitations of extinguishing agents are given.

5.2 Special hazards arising from the substance or mixture

Carbon oxides

Combustible.

Pay attention to flashback.

Vapors are heavier than air and may spread along floors.

Development of hazardous combustion gases or vapours possible in the event of fire.

Forms explosive mixtures with air at ambient temperatures.

5.3 Advice for firefighters

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

5.4 Further information

Remove container from danger zone and cool with water. Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6: Accidental release measures**6.1 Personal precautions, protective equipment and emergency procedures**

Advice for non-emergency personnel: Do not breathe vapors, aerosols. Avoid substance contact. Ensure adequate ventilation. Keep away from heat and sources of ignition.

Evacuate the danger area, observe emergency procedures, consult an expert.

For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains. Risk of explosion.

6.3 Methods and materials for containment and cleaning up

Cover drains. Collect, bind, and pump off spills. Observe possible material restrictions (see sections 7 and 10). Take up carefully with liquid-absorbent material (e.g.

Chemisorb®). Dispose of properly. Clean up affected area.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Work under hood. Do not inhale substance/mixture. Avoid generation of vapours/aerosols.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharge.

Hygiene measures

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions

Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition.

Storage class

Storage class (TRGS 510): 3: Flammable liquids

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Ingredients with workplace control parameters

| Component | CAS-No. | Value | Control parameters | Basis |
|-----------|----------|-------------|----------------------------------|--|
| Toluene | 108-88-3 | TWA | 100 ppm 375 mg/m ³ | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
| | | STEL | 150 ppm 560 mg/m ³ | USA. Table Z-1-A Limits for Air Contaminants (1989 vacated values) |
| | | TWA | 200 ppm | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | Remarks | Z37.12-1967 | | |
| | | CEIL | 300 ppm | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z37.12-1967 | | |

| | | | | |
|--|--|--|----------------------------------|--|
| | | Peak | 500 ppm | USA. Occupational Exposure Limits (OSHA) - Table Z-2 |
| | | Z37.12-1967 | | |
| | | TWA | 20 ppm | USA. ACGIH Threshold Limit Values (TLV) |
| | | Visual impairment Female reproductive Pregnancy loss 2023 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen | | |
| | | TWA | 100 ppm 375 mg/m ³ | USA. NIOSH Recommended Exposure Limits |
| | | ST | 150 ppm 560 mg/m ³ | USA. NIOSH Recommended Exposure Limits |

Biological occupational exposure limits

| Component | CAS-No. | Parameters | Value | Biological specimen | Basis |
|-----------|----------|--|--------------------|---------------------|---|
| Toluene | 108-88-3 | Toluene | 0.02 mg/l | In blood | ACGIH - Biological Exposure Indices (BEI) |
| | Remarks | Prior to last shift of workweek | | | |
| | | Toluene | 0.03 mg/l | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | | End of shift (As soon as possible after exposure ceases) | | | |
| | | o-Cresol | 0.3mg/g creatinine | Urine | ACGIH - Biological Exposure Indices (BEI) |
| | | End of shift (As soon as possible after exposure ceases) | | | |

Derived No Effect Level (DNEL)

| Application Area | Routes of exposure | Health effect | Value |
|------------------|--------------------|----------------------------|------------------------|
| Workers | Inhalation | Acute systemic effects | 384 mg/m ³ |
| Workers | Inhalation | Acute local effects | 384 mg/m ³ |
| Workers | Skin contact | Long-term systemic effects | 384mg/kg BW/d |
| Workers | Inhalation | Long-term systemic effects | 192 mg/m ³ |
| Workers | Inhalation | Long-term local effects | 192 mg/m ³ |
| Consumers | Inhalation | Acute systemic effects | 226 mg/m ³ |
| Consumers | Inhalation | Acute local effects | 226 mg/m ³ |
| Consumers | Skin contact | Long-term systemic effects | 226mg/kg BW/d |
| Consumers | Inhalation | Long-term systemic effects | 56.5 mg/m ³ |
| Consumers | Ingestion | Long-term systemic effects | 8.13mg/kg BW/d |

Predicted No Effect Concentration (PNEC)

| Compartment | Value |
|------------------------------|-------------|
| Soil | 2.89 mg/kg |
| Sea water | 0.68 mg/l |
| Fresh water | 0.68 mg/l |
| Sea sediment | 16.39 mg/kg |
| Fresh water sediment | 16.39 mg/kg |
| Sewage treatment plant | 13.61 mg/l |
| Aquatic intermittent release | 0.68 mg/l |

8.2 Exposure controls

Appropriate engineering controls

Immediately change contaminated clothing. Apply preventive skin protection. Wash hands and face after working with substance.

Personal protective equipment

Eye/face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). Safety glasses

Skin protection

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Full contact

Material: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

This recommendation applies only to the product stated in the safety data sheet, supplied by us and for the designated use. When dissolving in or mixing with other substances and under conditions deviating from those stated in EN 16523-1 please contact the supplier of CE-approved gloves (e.g. KCL GmbH, D-36124 Eichenzell, Internet: www.kcl.de).

Splash contact

Material: Viton®

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Body Protection

Flame retardant antistatic protective clothing.

Respiratory protection

Recommended Filter type: Filter A (acc. to DIN 3181) for vapours of organic compounds

The entrepreneur has to ensure that maintenance, cleaning and testing of respiratory protective devices are carried out according to the instructions of the producer.

These measures have to be properly documented.

required when vapours/aerosols are generated. Our recommendations on filtering respiratory protection are based on the following standards: DIN EN 143, DIN 14387 and other accompanying standards relating to the used respiratory protection system.

Control of environmental exposure

Do not let product enter drains. Risk of explosion.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

| | |
|---|--|
| a) Appearance | Form: liquid |
| b) Odor | benzene-like |
| c) Odor Threshold | 0.2 ppm |
| d) pH | Not applicable |
| e) Melting point/freezing point | Melting point/range: -95 - -93 °C (-139 - -135 °F) |
| f) Initial boiling point and boiling range | 110.6 °C 231.1 °F at 1,013 hPa |
| g) Flash point | 4 °C (39 °F) |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 7.1 %(V) Lower explosion limit: 1.2 %(V) |
| k) Vapor pressure | 30.88 hPa at 21.1 °C (70.0 °F) |
| l) Vapor density | 3.18 |
| m) Density | 0.87 g/cm ³ at 20 °C (68 °F) |
| Relative density | No data available |
| n) Water solubility | 0.58 g/l at 25 °C (77 °F) - partly soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 2.73 at 20 °C (68 °F) - Bioaccumulation is not expected. |
| p) Autoignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | none |

9.2 Other safety information

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| | |
|------------------------|---|
| Conductivity | < 0.01 $\mu\text{S}/\text{cm}$ |
| Surface tension | 27.73 mN/m at 0.516g/l at 25 °C (77 °F) |
| Relative vapor density | 3.18 |

SECTION 10: Stability and reactivity

10.1 Reactivity

Vapors may form explosive mixture with air.
Vapors may form explosive mixture with air.

10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature) .
The product is chemically stable under standard ambient conditions (room temperature) .

10.3 Possibility of hazardous reactions

Risk of explosion with:
fuming sulfuric acid
Nitric acid
silver
perchlorates
nitrogen dioxide
nonmetallic halides
halogen-halogen compounds
uranium hexafluoride
organic nitro compounds
Violent reactions possible with:
Strong acids
Strong oxidizing agents
sulfur
with
Heat.

10.4 Conditions to avoid

Warming.
Warming.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

In the event of fire: see section 5

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - male - 5,580 mg/kg

(Directive 67/548/EEC, Annex V, B.1.)

LC50 Inhalation - Rat - male - 4 h - 25.7 mg/l - vapor

(OECD Test Guideline 403)

LD50 Dermal - Rabbit - male - > 5,000 mg/kg

Remarks: (ECHA)

Skin corrosion/irritation

Skin - Rabbit

Result: irritating - 4 h

(Regulation (EC) No. 440/2008, Annex, B.4)

Serious eye damage/eye irritation

Eyes - Rabbit

Result: No eye irritation

(OECD Test Guideline 405)

Respiratory or skin sensitization

Maximization Test - Guinea pig

Result: negative

(Regulation (EC) No. 440/2008, Annex, B.6)

Germ cell mutagenicity

Test Type: In vitro mammalian cell gene mutation test

Test system: Mouse lymphoma test

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 476

Result: negative

Test Type: Ames test

Test system: *S. typhimurium*

Metabolic activation: with and without metabolic activation

Method: Regulation (EC) No. 440/2008, Annex, B.13/14 (Ames test)

Result: negative

Test Type: Chromosome aberration test

Species: Rat

Cell type: Bone marrow

Application Route: Intraperitoneal

Result: negative

Remarks: (ECHA)

Carcinogenicity

IARC: No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

Suspected of damaging the unborn child.

Specific target organ toxicity - single exposure

Inhalation - May cause drowsiness or dizziness. - Central nervous system

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Specific target organ toxicity - repeated exposure

Inhalation - May cause damage to organs through prolonged or repeated exposure.

- Central nervous system

Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Aspiration hazard

Aspiration may cause pulmonary edema and pneumonitis.

11.2 Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 13 Weeks - NOAEL (No observed adverse effect level) - 625 mg/kg - LOAEL (Lowest observed adverse effect level) - 1,250 mg/kg

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Drowsiness, irritant effects, Dizziness, Convulsions, Headache, Nausea, Vomiting, Circulatory collapse, somnolence, inebriation, Unconsciousness, respiratory arrest, CNS disorders, respiratory paralysis, death

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish flow-through test LC50 - Oncorhynchus kisutch (coho salmon) - 5.5 mg/l - 96 h
Remarks: (ECHA)

Toxicity to daphnia and other aquatic invertebrates EC50 - Ceriodaphnia dubia (water flea) - 3.78 mg/l - 48 h (US-EPA)

Toxicity to bacteria static test EC50 - Bacteria - 84 mg/l - 24 h
Remarks: (ECHA)

Toxicity to fish(Chronic toxicity) flow-through test NOEC - Oncorhynchus kisutch (coho salmon) - 1.39 mg/l - 40 d
Remarks: (ECHA)

Toxicity to daphnia NOEC - Ceriodaphnia dubia (water flea) - 0.74 mg/l - 7 d

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and other aquatic (US-EPA)
invertebrates(Chronic
toxicity)

12.2 Persistence and degradability

Biodegradability aerobic - Exposure time 20 d
Result: 86 % - Readily biodegradable.
Remarks: (IUCLID)

12.3 Bioaccumulative potential

Bioaccumulation Leuciscus idus (Golden orfe) - 3 d
- 0.05 mg/l(Toluene)

Bioconcentration factor (BCF): 90

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not
conducted

12.6 Endocrine disrupting properties

No data available

12.7 Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations.
Leave chemicals in original containers. No mixing with other waste. Handle uncleaned
containers like the product itself.

SECTION 14: Transport information

DOT (US)

UN number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Poison Inhalation Hazard: No

IMDG

UN number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D

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The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

MILLIPORE
SIGMA

Proper shipping name: TOLUENE

IATA

UN number: 1294 Class: 3

Packing group: II

Proper shipping name: Toluene

SECTION 15: Regulatory information

SARA 302 Components

This material does not contain any components with a section 302 EHS TPQ.

SARA 313 Components

The following components are subject to reporting levels established by SARA Title III, Section 313:

| | CAS-No. | Revision Date |
|---------|----------|---------------|
| Toluene | 108-88-3 | 2007-07-01 |

Massachusetts Right To Know Components

| | CAS-No. | Revision Date |
|---------|----------|---------------|
| Toluene | 108-88-3 | 2007-07-01 |

Pennsylvania Right To Know Components

| | CAS-No. | Revision Date |
|---------|----------|---------------|
| Toluene | 108-88-3 | 2007-07-01 |

California Prop. 65 Components

| | CAS-No. | Revision Date |
|--|----------|---------------|
| , which is/are known to the State of California to cause birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov . Toluene | 108-88-3 | 2009-02-01 |

SECTION 16: Other information

Further information

The information is believed to be correct but is not exhaustive and will be used solely as a guideline, which is based on current knowledge of the chemical substance or mixture and is applicable to appropriate safety precautions for the product. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

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