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

1.1 Product identifiers

Product name: Benzene
Product Number: 270709
Brand: SIGALD
Index-No.: 601-020-00-8
CAS-No.: 71-43-2

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

Identified uses: Laboratory chemicals, Synthesis of substances

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
- Eye irritation (Category 2A), H319
- Germ cell mutagenicity (Category 1B), H340
- Carcinogenicity (Category 1A), H350
- Reproductive toxicity (Category 2), H361
- Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
- Specific target organ toxicity - repeated exposure (Category 1), Blood, H372
- Aspiration hazard (Category 1), H304
- Long-term (chronic) aquatic hazard (Category 3), H412
2.2 **GHS Label elements, including precautionary statements**

**Pictogram**

![Pictogram](image)

**Signal Word** Danger

**Hazard Statements**
- **H225** Highly flammable liquid and vapor.
- **H304** May be fatal if swallowed and enters airways.
- **H319** Causes serious eye irritation.
- **H335** May cause respiratory irritation.
- **H340** May cause genetic defects.
- **H350** May cause cancer.
- **H361** Suspected of damaging fertility or the unborn child.
- **H372** Causes damage to organs (Blood) through prolonged or repeated exposure.
- **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.
- **P270** Do not eat, drink or smoke when using this product.
- **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.
- **P305 + P351 + P338** IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- **P308 + P313** IF exposed or concerned: Get medical advice/ attention.
- **P331** Do NOT induce vomiting.
- **P337 + P313** If eye irritation persists: Get medical advice/ attention.
- **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.
2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

SECTION 3: Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Component</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>benzene</td>
<td>Flam. Liq. 2; Skin Irrit. 2;</td>
<td>&lt;= 100 %</td>
</tr>
<tr>
<td></td>
<td>Eye Irrit. 2A; Muta. 1B;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Carc. 1A; STOT RE 1; Asp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Tox. 1; Aquatic Chronic 3;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H225, H315, H319, H340, H350,</td>
<td></td>
</tr>
<tr>
<td></td>
<td>H372, H304, H412</td>
<td></td>
</tr>
</tbody>
</table>

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

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
Carbon dioxide (CO2) Foam 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. Chemizorb®). 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. Keep locked up or in an area accessible only to qualified or authorized persons.

**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**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>benzene</td>
<td>71-43-2</td>
<td>TWA</td>
<td>0.5 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

**Remarks**
Leukemia
Substances for which there is a Biological Exposure Index or Indices (see BEI® section)
Confirmed human carcinogen
Danger of cutaneous absorption

<table>
<thead>
<tr>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>STEL</td>
<td>2.5 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
</tbody>
</table>

Leukemia
Substances for which there is a Biological Exposure Index or Indices (see BEI® section)
Confirmed human carcinogen
Danger of cutaneous absorption
### Exposure limits

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>USA. Occupational Exposure Limits (OSHA) - Table Z-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>10 ppm</td>
<td>Z37.40-1969</td>
</tr>
<tr>
<td>CEIL</td>
<td>25 ppm</td>
<td>Z37.40-1969</td>
</tr>
<tr>
<td>Peak</td>
<td>50 ppm</td>
<td>Z37.40-1969</td>
</tr>
</tbody>
</table>

See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028. The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>USA. NIOSH Recommended Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.1 ppm</td>
<td>Potential Occupational Carcinogen See Appendix A</td>
</tr>
<tr>
<td>ST</td>
<td>1 ppm</td>
<td>Potential Occupational Carcinogen See Appendix A</td>
</tr>
</tbody>
</table>

### 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).

Full contact
Material: Viton®
Minimum layer thickness: 0.7 mm
Break through time: 480 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)
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: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 10 min
Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

**Body Protection**
Flame retardant antistatic protective clothing.

**Respiratory protection**
Recommended Filter type: Filter A-(P3)
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        | No data available |
| c) Odor Threshold | No data available |
| d) pH          | No data available |
| e) Melting point/freezing point | 5.5 °C (41.9 °F) |
| f) Initial boiling point and boiling range | 80.1 °C 176.2 °F |
| g) Flash point | -11.0 °C (12.2 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 8.0 % (V)  
Lower explosion limit: 1.2 % (V) |
| k) Vapor pressure | 221.3 hPa at 37.7 °C (99.9 °F)  
99.5 hPa at 20.0 °C (68.0 °F) |
9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
Vapors may form explosive mixture with air.

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

10.3 Possibility of hazardous reactions
Exothermic reaction with:
- halogens
- Halogenated hydrocarbon
  in the presence of:
- Light metals
Risk of explosion with:
- halogen-halogen compounds
- Nitric acid
- Boranes
- Ozone
- peroxi compounds
- perchlorates
- permanganic acid
- perchloryl fluoride
- Strong oxidizing agents
- Chlorine
- fluorides
- uranium hexafluoride
- Oxygen
- liquid

SIGALD - 270709
Risk of ignition or formation of inflammable gases or vapours with:
chromium(VI) oxide
Fluorine
nitril compounds
Oxygen
oxyhalogenic compounds
Violent reactions possible with:
mineral acids
sulfur

10.4 Conditions to avoid
Warming.

10.5 Incompatible materials
No data available

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 - > 2,000 mg/kg
(OECD Test Guideline 401)
Symptoms: Nausea
LD50 Oral - Rat - male and female - 3,002 mg/kg
(OECD Test Guideline 401)
Symptoms: Risk of aspiration upon vomiting., Aspiration may cause pulmonary edema and pneumonitis.
Inhalation: No data available
Symptoms: mucosal irritations
LD50 Dermal - Rabbit - 13,630 mg/kg
Remarks: (IUCLID)
No data available

Skin corrosion/irritation
Skin - Rabbit
Result: irritating
(OECD Test Guideline 404)
Remarks: (ECHA)

Serious eye damage/eye irritation
Eyes - Rabbit
Result: Irritating to eyes.
(OECD Test Guideline 405)
Remarks: (IUCLID)
Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)

Respiratory or skin sensitization
Maximization Test - Guinea pig
The life science business of Merck KGaA, Darmstadt, Germany operates as MilliporeSigma in the US and Canada.

**Result:** negative
(OECD Test Guideline 406)

**Germ cell mutagenicity**
May cause genetic defects.
Test Type: Ames test
Test system: Escherichia coli/Salmonella typhimurium
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 471
Result: negative
Test Type: In vitro mammalian cell gene mutation test
Test system: mouse lymphoma cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 476
Result: negative
Test Type: Chromosome aberration test in vitro
Test system: Chinese hamster lung cells
Metabolic activation: with and without metabolic activation
Method: OECD Test Guideline 473
Result: negative
Test Type: Mutagenicity (mammal cell test): micronucleus.
Species: Mouse
Cell type: Bone marrow
Application Route: inhalation (vapor)
Method: OECD Test Guideline 474
Result: positive

**Carcinogenicity**
May cause cancer. Positive evidence from human epidemiological studies.
IARC: 1 - Group 1: Carcinogenic to humans (benzene)
NTP: Known - Known to be human carcinogen (benzene)
OSHA: OSHA specifically regulated carcinogen (benzene)

**Reproductive toxicity**
No data available

**Specific target organ toxicity - single exposure**
No data available

**Specific target organ toxicity - repeated exposure**
Causes damage to organs through prolonged or repeated exposure.
- Blood
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) - 600 mg/kg

RTECS: CY1400000
Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased.

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

After absorption of large quantities:

- narcosis
- respiratory arrest
- Convulsions

Possible damages:

- Damage to:
  - Liver
  - Kidney
  - Central nervous system

Handle in accordance with good industrial hygiene and safety practice.

Stomach - Irregularities - Based on Human Evidence

---

**SECTION 12: Ecological information**

**12.1 Toxicity**

<table>
<thead>
<tr>
<th>Toxicity to fish</th>
<th>semi-static test LC50 - Oryzias latipes (Orange-red killifish) - &gt; 100 mg/l - 96 h (OECD Test Guideline 203)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity to daphnia and other aquatic invertebrates</td>
<td>semi-static test EC50 - Daphnia magna (Water flea) - &gt; 1,000 mg/l - 48 h (OECD Test Guideline 202)</td>
</tr>
<tr>
<td></td>
<td>semi-static test NOEC - Daphnia magna (Water flea) - &gt; 1,000 mg/l - 48 h</td>
</tr>
</tbody>
</table>

SIGALD - 270709
Toxicity to algae
static test ErC50 - Pseudokirchneriella subcapitata (green algae) - > 1,000 mg/l - 72 h
(OECD Test Guideline 202)
static test NOEC - Pseudokirchneriella subcapitata (green algae) - >= 1,000 mg/l - 72 h
(OECD Test Guideline 201)
Toxicity to bacteria
static test EC50 - activated sludge - > 1,000 mg/l - 3 h
(OECD Test Guideline 209)
Toxicity to fish (Chronic toxicity)
flow-through test NOEC - Pimephales promelas (fathead minnow) - 0.8 mg/l - 32 d
Remarks: (ECHA)
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)
semi-static test LC50 - Daphnia magna (Water flea) - > 100 mg/l - 21 d
(OECD Test Guideline 211)

12.2 Persistence and degradability
Biodegradability
aerobic - Exposure time 28 d
Result: 96 % - Readily biodegradable.
(OECD Test Guideline 301F)

12.3 Bioaccumulative potential
Bioaccumulation
Leuciscus idus (Golden orfe) - 3 d - 0.05 mg/l (benzene)
Bioconcentration factor (BCF): 10

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
Endangers drinking-water supplies if allowed to enter soil or water. Discharge into the environment must be avoided.
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: 1114  Class: 3  Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Reportable Quantity (RQ): 10 lbs
Poison Inhalation Hazard: No

IMDG
UN number: 1114  Class: 3  Packing group: II
Proper shipping name: BENZENE
EMS-No: F-E, S-D

IATA
UN number: 1114  Class: 3  Packing group: II
Proper shipping name: Benzene

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:

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>benzene</td>
<td>71-43-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard:
Reportable Quantity: D018 lbs

Massachusetts Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>benzene</td>
<td>71-43-2</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

Pennsylvania Right To Know Components

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>benzene</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**California Prop. 65 Components**

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>71-43-2</td>
<td>2009-02-01</td>
</tr>
</tbody>
</table>

, which is/are known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov.benzene

**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.

Copyright 2020 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.

The branding on the header and/or footer of this document may temporarily not visually match the product purchased as we transition our branding. However, all of the information in the document regarding the product remains unchanged and matches the product ordered. For further information please contact misbranding@sial.com.

Version: 6.11  Revision Date: 12/07/2023  Print Date: 12/30/2023