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
Skin irritation (Category 2), H315
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 1B), H340
Carcinogenicity (Category 1A), H350
Specific target organ toxicity - repeated exposure (Category 1), Blood, H372
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 3), H412
2.2 GHS Label elements, including precautionary statements

Pictogram

Signal Word | Danger
---|---

Hazard statement(s)
- H225: Highly flammable liquid and vapor.
- H304: May be fatal if swallowed and enters airways.
- H315: Causes skin irritation.
- H319: Causes serious eye irritation.
- H340: May cause genetic defects.
- H350: May cause cancer.
- H372: Causes damage to organs (Blood) through prolonged or repeated exposure.
- H401: Toxic to aquatic life.
- H412: Harmful to aquatic life with long lasting effects.

Precautionary statement(s)
- 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.
- 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.
- 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.
- P332 + P313: If skin irritation occurs: Get medical advice/ attention.
- P337 + P313: If eye irritation persists: 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 + 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

<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; Eye Irrit. 2A; Muta. 1B; Carc. 1A; STOT RE 1; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 3; H225, H315, H319, H340, H350, H372, H304, H401, H412</td>
<td>&lt;= 100 %</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>Component</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<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

<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>TWA</td>
<td></td>
<td></td>
<td>10 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
</tr>
<tr>
<td>Z37.40-1969</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CEIL</td>
<td></td>
<td>25 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
<td></td>
</tr>
<tr>
<td>Z37.40-1969</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peak</td>
<td></td>
<td>50 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-2</td>
<td></td>
</tr>
<tr>
<td>Z37.40-1969</td>
<td></td>
<td></td>
<td></td>
<td></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>Exposure</th>
<th>Limit</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TWA</td>
<td>0.1 ppm</td>
<td>USA, NIOSH Recommended Exposure Limits</td>
</tr>
<tr>
<td>ST</td>
<td>1 ppm</td>
<td>USA, NIOSH Recommended Exposure Limits</td>
</tr>
</tbody>
</table>

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**
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.

Full contact
- Material: Fluorinated rubber
- Minimum layer thickness: 0.7 mm
- Break through time: 480 min
- Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact
- Material: Fluorinated rubber
- Minimum layer thickness: 0.7 mm
- Break through time: 480 min
- Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the EC approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

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

**Respiratory protection**
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  
|              | Color: colorless |
| 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) |
| l) Vapor density | No data available |
| m) Density | 0.88 g/cm³  
| Relative density | No data available |
| n) Water solubility | ca.1.88 g/l at 23.5 °C (74.3 °F) - soluble |
| o) Partition coefficient: n-octanol/water | log Pow: 2.13 at 25 °C (77 °F) - Bioaccumulation is not expected., (ECHA) |
| p) Autoignition temperature | 498 °C (928 °F) at 1,013.5 hPa |
| q) Decomposition temperature | No data available |
r) Viscosity 0.604 mm²/s at 25 °C (77 °F) -
s) Explosive properties No data available
t) Oxidizing properties none

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
  - Florides
  - Uranium hexafluoride
  - Oxygen liquid
- Risk of ignition or formation of inflammable gases or vapours with:
  - Chromium(VI) oxide
  - Fluorine
  - Nitryl compounds
  - Oxygen
  - Oxyhalogenic compounds
  - Violent reactions possible with:
    - Mineral acids
    - Sulfur

10.4 Conditions to avoid
Warming.
10.5 **Incompatible materials**
rubber, various plastics

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
  - LC₅₀ Inhalation - Rat - female - 4 h - 43.7 mg/l - vapor

  - (OECD Test Guideline 403)
  - LD₅₀ Dermal - Rabbit - male and female - > 8,260 mg/kg
  - (OECD Test Guideline 402)
  - No data available

- **Skin corrosion/irritation**
  - Skin - Rabbit
  - Result: Irritating to skin - 4 h
  - (OECD Test Guideline 404)
  - Remarks: Drying-out effect resulting in rough and chapped skin.

- **Serious eye damage/eye irritation**
  - Eyes - Rabbit
  - Result: Eye irritation
  - Remarks: (ECHA)

- **Respiratory or skin sensitization**
  - Maximization Test - Guinea pig
  - Result: negative
  - (OECD Test Guideline 406)

- **Germ cell mutagenicity**
  - May cause genetic defects.
  - Test Type: Ames test
  - Test system: Salmonella typhimurium
  - Metabolic activation: with and without metabolic activation
  - Method: OECD Test Guideline 471
  - Result: negative
  - Test Type: Mutagenicity (mammal cell test): chromosome aberration.
  - Test system: Chinese hamster lung cells
  - Metabolic activation: with and without metabolic activation
  - Method: US-EPA
  - Result: positive
  - Test Type: In vitro mammalian cell gene mutation test
  - Metabolic activation: with and without metabolic activation
  - Method: US-EPA
  - Result: positive
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

**Aspiration hazard**
May be fatal if swallowed and enters airways.

### Additional Information

Repeated dose toxicity - Rat - male and female - Oral - 120 d - NOAEL (No observed adverse effect level) - 100 mg/kg - LOAEL (Lowest observed adverse effect level) - 25 mg/kg

Remarks: Subchronic toxicity

RTECS: CY14000000
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. Blood disorders
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Systemic effects:
After absorption:

agitation
Headache
Dizziness
Inebriation
Tiredness
CNS disorders
Narcosis
Respiratory arrest

Subacute toxicity

After a latency period:

Changes in the blood count
Haemolysis

Other dangerous properties cannot be excluded.

This substance should be handled with particular care.

Stomach - Irregularities - Based on Human Evidence

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish
flow-through test LC50 - Oncorhynchus mykiss (rainbow trout) - 5.3 mg/l - 96 h
(OECD Test Guideline 203)

Toxicity to daphnia and other aquatic invertebrates
static test EC50 - Daphnia magna (water flea) - 10 mg/l - 48 h
(OECD Test Guideline 202)

Toxicity to algae
static test ErC50 - Pseudokirchneriella subcapitata (green algae) - 100 mg/l - 72 h
(OECD Test Guideline 201)

Toxicity to bacteria
static test IC50 - 13 mg/l - 24 h
Remarks: (ECHA)

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)
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  
- 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:
benzene CAS-No. 71-43-2 Revision Date 2007-07-01

**SARA 311/312 Hazards**
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

**Reportable Quantity** D018 lbs

**Massachusetts Right To Know Components**
benzene CAS-No. 71-43-2 Revision Date 2007-07-01

**Pennsylvania Right To Know Components**
benzene CAS-No. 71-43-2 Revision Date 2007-07-01

**California Prop. 65 Components**
, 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 CAS-No. 71-43-2 Revision Date 2009-02-01

**SECTION 16: Other information**

**Further information**
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. 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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