1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Toluene
Product Number: 648566
Brand: Sigma-Aldrich
Supplier: Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052
Emergency Phone #: (314) 776-6555
Preparation Information: Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Target Organ Effect, Irritant, Teratogen, Reproductive hazard

Target Organs
Bladder, Liver, Kidney, Brain.

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Inhalation (Category 4)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Reproductive toxicity (Category 2)
Specific target organ toxicity - single exposure (Category 2)
Specific target organ toxicity - single exposure (Category 3)
Aspiration hazard (Category 1)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word
Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H319 Causes serious eye irritation.
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.
H361 Suspected of damaging fertility or the unborn child.
H371 May cause damage to organs.
H401  Toxic to aquatic life.

Precautionary statement(s)
P210  Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260  Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P281  Use personal protective equipment as required.
P301 + P310  IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338  IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331  Do NOT induce vomiting.

HMIS Classification
- Health hazard: 2
- Chronic Health Hazard: *
- Flammability: 3
- Physical hazards: 0

NFPA Rating
- Health hazard: 2
- Fire: 3
- Reactivity Hazard: 0

Potential Health Effects
- Inhalation: May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.
- Skin: May be harmful if absorbed through skin. Causes skin irritation.
- Eyes: Causes eye irritation.
- Ingestion: May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula: C_7H_8
Molecular Weight: 92.14 g/mol

<table>
<thead>
<tr>
<th>Component</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Toluene</strong></td>
<td></td>
</tr>
<tr>
<td>CAS-No.</td>
<td>108-88-3</td>
</tr>
<tr>
<td>EC-No.</td>
<td>203-625-9</td>
</tr>
<tr>
<td>Index-No.</td>
<td>601-021-00-3</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>TWA</td>
<td>100 ppm</td>
<td>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>150 ppm</td>
<td>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>560 mg/m3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>200 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z2</td>
</tr>
<tr>
<td>Remarks</td>
<td>Z37.12-1967</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CEIL</td>
<td>300 ppm</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z2</td>
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<tr>
<td></td>
<td>Z37.12-1967</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Peak</td>
<td>500 ppm</td>
<td></td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z2</td>
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<tr>
<td></td>
<td>Z37.12-1967</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>20 ppm</td>
<td></td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Visual impairment Female reproductive Pregnancy loss 2010 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>USA. NIOSH Recommended Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TWA</strong></td>
<td>100 ppm</td>
<td>375 mg/m³</td>
</tr>
<tr>
<td><strong>ST</strong></td>
<td>150 ppm</td>
<td>560 mg/m³</td>
</tr>
</tbody>
</table>

### Personal protective equipment

**Respiratory protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Hand 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 CE 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.

**Eye protection**

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

**Skin and body protection**

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Hygiene measures**

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

### 9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th><strong>Appearance</strong></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Form</td>
<td>liquid</td>
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<tr>
<td>Colour</td>
<td>colourless</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Safety data</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>no data available</td>
</tr>
<tr>
<td>Melting point/range</td>
<td>-93 °C (-135 °F)</td>
</tr>
<tr>
<td>Boiling point</td>
<td>110 - 111 °C (230 - 232 °F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>4.0 °C (39.2 °F) - closed cup</td>
</tr>
</tbody>
</table>
Ignition temperature 535 °C (995 °F)
Auto-ignition temperature 535.0 °C (995.0 °F)
Lower explosion limit 1.2 %(V)
Upper explosion limit 7 %(V)
Vapour pressure 29.1 hPa (21.8 mmHg) at 20.0 °C (68.0 °F)
Density 0.865 g/mL at 25 °C (77 °F)
Water solubility no data available
Partition coefficient: n-octanol/water no data available
Relative vapour density no data available
Odour no data available
Odour Threshold no data available
Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity
Oral LD50
LD50 Oral - rat - > 5,580 mg/kg

Inhalation LC50
LC50 Inhalation - rat - 4 h - 12,500 - 28,800 mg/m3

Dermal LD50
LD50 Dermal - rabbit - 12,196 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Skin irritation - 24 h

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitisation
no data available

Germ cell mutagenicity
Genotoxicity in vitro - rat - Liver
DNA damage

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Toluene)

NTP: No component 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 identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Reproductive toxicity - rat - Inhalation

Paternal Effects: Spermatogenesis (including genetic material, sperm morphology, motility, and count).

Experiments have shown reproductive toxicity effects in male and female laboratory animals.

Teratogenicity

Developmental Toxicity - rat - Oral

Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Damage to fetus possible

Suspected human reproductive toxicant

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.

Ingestion May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.

Skin May be harmful if absorbed through skin. Causes skin irritation.

Eyes Causes eye irritation.

Signs and Symptoms of Exposure

Lung irritation, chest pain, pulmonary edema. Inhalation studies on toluene have demonstrated the development of inflammatory and ulcerous lesions of the penis, prepuce, and scrotum in animals.

Synergistic effects
no data available

Additional Information

RTECS: XS5250000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish
LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 340.00 mg/l - 96 h
LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h
NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
LOEC - Pimephales promelas (fathead minnow) - 8.04 mg/l - 7 d

Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h
Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae
EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h
EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

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

IMDG
UN number: 1294  Class: 3  Packing group: II  EMS-No: F-E, S-D
Proper shipping name: TOLUENE
Marine pollutant: No

IATA
UN number: 1294  Class: 3  Packing group: II
Proper shipping name: Toluene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Target Organ Effect, Irritant, Teratogen, Reproductive hazard

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

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

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>Revision Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>108-88-3</td>
<td>2007-07-01</td>
</tr>
</tbody>
</table>

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

Massachusetts Right To Know Components
Pennsylvania Right To Know Components
Toluene
CAS-No. 108-88-3
Revision Date 2007-07-01

New Jersey Right To Know Components
Toluene
CAS-No. 108-88-3
Revision Date 2007-07-01

California Prop. 65 Components
WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.
Toluene
CAS-No. 108-88-3
Revision Date 2009-02-01

16. OTHER INFORMATION

Further information
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