1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Ethanol
Product Number: E7023
Brand: Sigma-Aldrich
Company: Sigma-Aldrich
3550 Surose Street
SAINT LOUIS MO 63103
USA
Telephone: +1 800-325-5832
Fax: +1 800-325-5052
Emergency Phone #: (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms: Ethyl alcohol
Formula: C2H6O
Molecular Weight: 46.07 g/mol

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>64-17-5</td>
<td>200-578-6</td>
<td>803-002-00-5</td>
<td>-</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

Emergency Overview:

OSHA Hazards:
Flammable Liquid
Target Organ Effect: Irritant
Target Organs: Nerves, Liver, Heart

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.
Skin: May be harmful if absorbed through skin. Causes skin irritation.
Eyes: Causes eye irritation.
Ingestion: May be harmful if swallowed.

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:
Flush eyes with water as a precaution.

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

5. FIRE-FIGHTING MEASURES

Flammable properties:
Flash point: 14.0 °C (57.2 °F) - closed cup
Ignition temperature: 353 °C (665 °F)

Suitable extinguishing media:
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters:
Wear self-contained breathing apparatus for fire fighting if necessary.

Further information:
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Avoid breathing vapors, 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.

Methods for cleaning up:
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

7. HANDLING AND STORAGE

Handling:
Avoid inhalation of vapour or mist. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage:
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resaled and kept upright to prevent leakage. Store in cool place.
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>Update</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
<td>TWA</td>
<td>1,000 ppm 1,880 mg/m³</td>
<td>1996-05-18</td>
<td>US, American Conference of Governmental and Industrial Hygienists, Threshold Limit Values for Chemical Substances in the Work Environment; Annual Reports for the Year 2004; Committees on Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)</td>
</tr>
</tbody>
</table>

Remarks: Refers to Appendix A - Carcinogens.
1995 Adoption

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 ABK (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.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

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

Appearance

<table>
<thead>
<tr>
<th>Form</th>
<th>Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liquid, clear</td>
<td>Colourless</td>
</tr>
</tbody>
</table>

Safety data

| pH | no data available |
| Melting point | -14.0 °C (-227.2 °F) |
| Boiling point | 78.0 - 80.0 °C (172.4 - 176.0 °F) |
| Flash point | 14.0 °C (57.2 °F) - closed cup |
| Ignition temperature | 363 °C (685 °F) |
| Lower explosion limit | 3.3 % (V) |
| Upper explosion limit | 19 % (V) |
| Vapour pressure | 59.5 HPa (44.6 mmHg) at 20.0 °C (68.0 °F) |
| Density | 0.79 g/cm³ |
| Water solubility | Completely soluble |

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Alkali metals, Ammonia, Oxidizing agents, Perchloric Acid

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions - None known.

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat: 7,060 mg/kg
Remarks: Lungs, Thorax, or Respiration: Other changes.

LC50 Inhalation - rat: 10 h: 20000 ppm

Irritation and corrosion
Skin - rabbit: Skin irritation - 24 h
Eyes - rabbit: Mild eye irritation - 24 h

Sensitisation
no data available

Chronic exposure
Carcinogenicity - mouse - Oral

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as...
a carcinogen or potential carcinogen by ACGIH.

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 - Human - female - Oral
Effects on Newborn: Agar score (human only). Effects on Newborn: Other neonatal measures or effects. Effects on Newborn: Drug dependence.

Signs and Symptoms of Exposure
Central nervous system depression, nausea. Damage to the heart. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects
Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.
Target Organs Nerves, Liver, Heart.

12. ECOLOGICAL INFORMATION
Elimination information (persistence and degradability) no data available

Ecotoxicity effects
Toxicity to fish
LC50 - Oncorhynchus mykiss (rainbow trout) - 13,000.00 mg/l - 96 h
LC50 - Oncorhynchus mykiss (rainbow trout) - 10,400.00 mg/l - 96 h
LC50 - Pinephales promelas (fathead minnow) - 15,300.00 mg/l - 96 h
LC50 - other fish - 10,000.00 mg/l - 24 h
Toxicity to daphnia and other aquatic invertebrates
EC50 - Daphnia magna (Water flea) - 9.30 mg/l - 48 h

Further information on ecology no data available

13. DISPOSAL CONSIDERATIONS
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in ignition as this material is highly flammable. Observe all federal, state, and local environmental regulations. 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: 1170 Class: 3 Packing group: II Proper shipping name: Ethanol

15. REGULATORY INFORMATION
OSHA Hazards Flammable Liquid, Target Organ Effect, Irritant
TSCA Status On TSCA Inventory
DSL Status All components of this product are on the Canadian DSL list.
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 SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards Fire Hazard, Acute Health Hazard, Chronic Health Hazard
Massachusetts Right To Know Components

Pennsylvania Right To Know Components

New Jersey Right To Know Components

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION
Further information
Copyright 2007 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
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 Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.