1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Formic acid

Product Number : 399388
Brand : Sigma-Aldrich
Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : CH2O2

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formic acid</td>
<td>64-18-6</td>
<td>200-579-1</td>
<td>607-001-00-0</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>231-791-2</td>
<td>-</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Target Organ Effect, Harmful by ingestion., Corrosive

Target Organs
Kidney, Liver, Central nervous system, Blood

HMIS Classification

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

NFPA Rating

Health hazard: 3
Fire: 2
Reactivity Hazard: 0

Potential Health Effects
### Inhalation
May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

### Skin
May be harmful if absorbed through skin. Causes skin burns.

### Eyes
Causes eye burns.

### Ingestion
Harmful if swallowed. Causes burns.

## 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
Take off contaminated clothing and shoes immediately. Wash off with soap and plenty of water. Consult a physician.

### In case of eye contact
Continue rinsing eyes during transport to hospital. 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. FIRE-FIGHTING MEASURES

### Flammable properties
- **Flash point**: 48 °C (118 °F)
- **Ignition temperature**: 540 °C (1,004 °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 (floodling) of water 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
Use personal protective equipment. 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
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). Keep in suitable, closed containers for disposal.

## 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.
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>Formic acid</td>
<td>64-18-6</td>
<td>TWA</td>
<td>5 ppm</td>
<td>2007-01-01</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Eye, skin, &amp; Upper Respiratory Tract irritation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>10 ppm</td>
<td>2007-01-01</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Eye, skin, &amp; Upper Respiratory Tract irritation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>5 ppm 9 mg/m³</td>
<td>1989-01-19</td>
<td>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA</td>
<td>5 ppm 9 mg/m³</td>
<td>2006-02-28</td>
<td>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</td>
</tr>
</tbody>
</table>

The value in mg/m³ is approximate. Substance listed; for more information see OSHA document 1910.1012

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.

Eye protection
Tightly fitting safety goggles. Faceshield (8-inch minimum).

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
Form clear, liquid
Colour colourless

Safety data

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>2.2 at 2.2 g/l at 20 °C (68 °F)</td>
</tr>
<tr>
<td>Melting point</td>
<td>no data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>100 °C (212 °F)</td>
</tr>
<tr>
<td>Flash point</td>
<td>48 °C (118 °F)</td>
</tr>
<tr>
<td>Ignition temperature</td>
<td>540 °C (1,004 °F)</td>
</tr>
<tr>
<td>Lower explosion limit</td>
<td>18 %(V)</td>
</tr>
<tr>
<td>Upper explosion limit</td>
<td>57 %(V)</td>
</tr>
<tr>
<td>Water solubility</td>
<td>completely miscible</td>
</tr>
<tr>
<td>Partition coefficient:</td>
<td>log Pow: -0.54</td>
</tr>
</tbody>
</table>

n-octanol/water

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions. Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents, Strong bases, Powdered metals

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

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 1,100 mg/kg (Formic acid)
LC50 Inhalation - rat - 4 h - 7.4 mg/l(Formic acid)

Irritation and corrosion
Skin - rabbit - Severe skin irritation (Formic acid)
Eyes - rabbit - Severe eye irritation (Formic acid)

Sensitisation
Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals. (Formic acid)

Chronic exposure
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.

**Signs and Symptoms of Exposure**

Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting (Formic acid)

**Potential Health Effects**

- **Inhalation**
  May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

- **Skin**
  May be harmful if absorbed through skin. Causes skin burns.

- **Eyes**
  Causes eye burns.

- **Ingestion**
  Harmful if swallowed. Causes burns.

**Target Organs**

Kidney, Liver, Central nervous system, Blood,

**Additional Information**

RTECS: LQ4900000

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**12. ECOLOGICAL INFORMATION**

**Elimination information (persistence and degradability)**

| Biodegradability | Result: > 90 % - Readily biodegradable. |

**Ecotoxicity effects**

- **Toxicity to fish**
  LC50 - Leuciscus idus (Golden orfe) - 46 - 100 mg/l - 96 h (Formic acid)

- **Toxicity to daphnia and other aquatic invertebrates.**
  EC50 - Daphnia magna (Water flea) - 34.2 mg/l - 48 h (Formic acid)

- **Toxicity to bacteria**
  - Pseudomonas putida - 46.7 mg/l - 17 h (Formic acid)

**Further information on ecology**

| Biochemical Oxygen Demand (BOD) | 86 mg/g (Formic acid) |
| Chemical Oxygen Demand (COD)    | 348 mg/g |
| Additional ecological information | no data available |

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**13. DISPOSAL CONSIDERATIONS**

**Product**

This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. 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: 1779  Class: 8 (3)  Packing group: II
Proper shipping name: Formic acid
Reportable Quantity (RQ): 5682 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1779  Class: 8 (3)  Packing group: II
Proper shipping name: FORMIC ACID
Marine pollutant: No

IATA
UN-Number: 1779  Class: 8 (3)  Packing group: II
Proper shipping name: Formic acid

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Target Organ Effect, Harmful by ingestion., Corrosive

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

<table>
<thead>
<tr>
<th>CAS-No.</th>
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<tbody>
<tr>
<td>64-18-6</td>
<td>2007-07-01</td>
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Formic acid

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

Massachusetts Right To Know Components

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Formic acid

Pennsylvania Right To Know Components

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Water
Formic acid

New Jersey Right To Know Components

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</tr>
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</table>

Water
Formic acid

California Prop. 65 Components
This product does not contain any chemicals known to the State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information
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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.