Section 1 - Product and Company Information

Product Name: ACETALDEHYDE, 99.5+%, A.C.S. REAGENT
Product Number: 402788
Brand: Aldrich Chemical
Company: Sigma-Aldrich
Street Address: 3050 Spruce Street
City, State, Zip, Country: St. Louis, MO 63103 US
Technical Phone: 314 771 5765
Fax: 800 325 5052

Emergency Phone: 414 273 3850 Ext.5996

Section 2 - Composition/Information on Ingredient

Substance Name: ACETALDEHYDE
CAS #: 75-07-0
SARA 313: Yes

Formula: C2H4O
Synonyms: Acetaldehyde (German), Acetaldehyde (ACGIH:OSHA), Acetic aldehyde, Acetyladlehyde, Aldehyde acetique (French), Aldeide acetica (Italian), Ethanal, NCI-C56326, Octowy aldehyd (Polish), RCRA waste number U001

Section 3 - Hazards Identification

Emergency Overview:

HMIS Rating:
Health: 2* Flammability: 4 Reactivity: 0

NFPA Ratings:
Health: 2 Flammability: 4 Reactivity: 0

*Chronic hazards present. For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

Oral Exposure:
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

Inhalation Exposure:
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Dermal Exposure:
In case of contact, immediately wash skin with soap and copious amounts of water.
Eye Exposure
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

Explosion Hazards
May explode when heated. Closed containers may rupture and explode during runaway polymerization. Vapors may form explosive mixtures with air.

Flash Point: -40 °F -40 °C
Explosion Limits: Lower: 4 % Upper: 60 %
Autoignition Temp: 175 °C Flammability: Yes

Extinguishing Media
Suitable
Carbon dioxide, dry chemical powder, or appropriate foam.

Unsuitable
Water may be effective for cooling, but may not effect extinguishment.

Firefighting
Protective Equipment
Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s)
Extremely flammable. Emits toxic fumes under fire conditions. Vapor may travel considerable distance to source of ignition and flash back.

Specific Method(s) of Fire Fighting
Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

Procedure to be Followed in Case of Leak or Spill
Evacuate area. Shut off all sources of ignition. Use nonsparking tools.

Procedure(s) of Personal Precaution(s)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

Methods for Cleaning Up
Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

Handling
User Exposure
Do not breathe vapor. Do not get in eyes, on skin, on clothing. Open carefully. Avoid all contamination. Always open containers slowly to allow any excess pressure to vent.

Storage
Suitable

Section 8 - Exposure Controls / PPE

Engineering Controls
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

Personal Protective Equipment

Aldrich Chemical - 402788 Sigma-Aldrich Corporation
Page 2 www.sigma-aldrich.com
Respiratory
NIOSH/MSHA-approved respirator.

Hand
Compatible chemical-resistant gloves.

Eye
Chemical safety goggles.

General Hygiene Measures
Remove and wash contaminated clothing promptly. Wash thoroughly after handling.

<table>
<thead>
<tr>
<th>Exposure Limits, RTECS</th>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td></td>
<td></td>
<td>Ceiling concentration</td>
<td>45 MG/M3 (25 PPM)</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>MSHA</td>
<td>Standard-air</td>
<td>TWA</td>
<td>100 PPM (180 MG/M3)</td>
<td></td>
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<tr>
<td>USA</td>
<td>OSHA</td>
<td></td>
<td>PEL</td>
<td>8H TWA 200 PPM (360 MG/M3)</td>
<td>check ACGIH TLV</td>
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<tr>
<td>New Zealand</td>
<td>OEL</td>
<td></td>
<td></td>
<td>(18 PPM LOQ)</td>
<td></td>
</tr>
<tr>
<td>USA</td>
<td>NIOSH</td>
<td></td>
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</table>

Section 9 - Physical/Chemical Properties

<table>
<thead>
<tr>
<th>Appearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State</td>
</tr>
<tr>
<td>Clear liquid</td>
</tr>
</tbody>
</table>

Molecular Weight: 44.05 AMU

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>BP/BP Range</td>
<td>21 °C</td>
<td></td>
</tr>
<tr>
<td>MP/MP Range</td>
<td>-125 °C</td>
<td></td>
</tr>
<tr>
<td>Freezing Point</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>756.4 mmHg</td>
<td>20 °C</td>
</tr>
<tr>
<td></td>
<td>2,415.4 mmHg</td>
<td>55 °C</td>
</tr>
<tr>
<td></td>
<td>1.52 g/l</td>
<td></td>
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<tr>
<td>Vapor Density</td>
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<tr>
<td>Saturated Vapor Conc.</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>SG/Density</td>
<td>0.785 g/cm³</td>
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</tr>
<tr>
<td>Bulk Density</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Volatile%</td>
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<td></td>
</tr>
<tr>
<td>VOC Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Water Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Solvent Content</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>N/A</td>
<td></td>
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<tr>
<td>Viscosity</td>
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<td></td>
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<tr>
<td>Partition Coefficient</td>
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<td></td>
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<tr>
<td>Decomposition Temp.</td>
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</tr>
<tr>
<td>Flash Point °F</td>
<td>-40 °F</td>
<td></td>
</tr>
<tr>
<td>Flash Point °C</td>
<td>-40 °C</td>
<td></td>
</tr>
<tr>
<td>Explosion Limits</td>
<td>Lower: 4 %</td>
<td>Upper: 60 %</td>
</tr>
<tr>
<td>Autoignition Temp</td>
<td>175 °C</td>
<td></td>
</tr>
<tr>
<td>Refractive Index</td>
<td>1.3320</td>
<td></td>
</tr>
<tr>
<td>Solubility</td>
<td>N/A</td>
<td></td>
</tr>
</tbody>
</table>

Section 10 - Stability and Reactivity

Stability
Stable
Unstable.

Conditions of Instability
Oxidized readily in air to form unstable peroxides that can lead to spontaneous explosion.
Conditions to Avoid
Sensitive to air. Sensitive to heat.

Materials to Avoid
Oxidizing agents, Reducing agents, Acids, Nitric acid, Peroxides, Bases, Caustic soda, Amines, Ammonia, Oxygen, Chemical contamination...

Hazardous Decomposition Products
Hazardous Decomposition Products
Carbon monoxide, Carbon dioxide.

Hazardous Polymerization
Hazardous Polymerization
May undergo autopolymerization, Uncontrolled polymerization can cause rapid evolution of heat and increased pressure which can result in violent rupture of storage vessels or containers.

Section 11 - Toxicological Information

Route of Exposure
Skin Contact
Causes skin irritation.

Skin Absorption
May be harmful if absorbed through the skin.

Eye Contact
Causes severe eye irritation. Lachrymator.

Inhalation
May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.

Ingestion
Harmful if swallowed.

Sensitization
Skin
May cause allergic skin reaction.

Target Organ(s) or System(s)

Signs and Symptoms of Exposure

RTECS Number: AB1925000

Toxicity Data

Oral - Rat: 661 mg/kg (LD50)
Remarks: Peripheral Nerve and Sensation: Spastic paralysis with or without sensory change.
Behavioral: Altered sleep time (including change in righting reflex).
Lungs, Thorax, or Respiration: Dyspnea.

Inhalation - Rat: 13,300 ppm (LC50)
Lungs, Thorax, or Respiration: Dyspnea.

Subcutaneous - Rat: 640 MG/KG (LD50)
Remarks: Behavioral: General anesthetic.

Oral - Mouse: 900 mg/kg (LD50)

Inhalation - Mouse: 23,000 mg/m3 (LC50)

Intraperitoneal - Mouse: 500 MG/KG (LD50)

Subcutaneous - Mouse: 560 MG/KG (LD50)
Remarks: Behavioral: General anesthetic.

Skin - Rabbit: 3,540 mg/kg (LD50)
Inhalation - Hamster: 17,000 ppm (LC50)
Intratracheal - Hamster: 96 MG/KG (LD50)
Inhalation - Mammal: 20,100 mg/m3 (LC50)
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Other.
Behavioral:Excitement.
Lungs, Thorax, or Respiration:Dyspnea.

Irritation Data
Eyes - Human: 50 ppm 15M
Skin - Rabbit: 500 mg
Remarks: Open irritation test
Eyes - Rabbit: 40 mg
Remarks: Severe irritation effect

Chronic Exposure Carcinogen
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Rat - Inhalation: 735 PPM 6H/2Y

Hamster - Inhalation: 2040 PPM 7H/52W

Rat - Inhalation: 1410 PPM 6H/65W

IARC Carcinogen List
Rating
Group 2B

NTP Carcinogen List
Rating
Anticipated to be a carcinogen.

Chronic Exposure - Teratogen

<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Route of Application</th>
<th>Exposure Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rat</td>
<td>4800 MG/KG</td>
<td>Oral</td>
<td>(1-20D PREG)</td>
</tr>
<tr>
<td></td>
<td>Result: Effects on Embryo or Fetus: Fetal toxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Respiratory system. Specific Developmental Abnormalities: Hepatobiliary system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rat</td>
<td>5040 MG/KG</td>
<td>Oral</td>
<td>(1-21D PREG)</td>
</tr>
<tr>
<td>Rat</td>
<td>100 MG/KG</td>
<td>Intraperitoneal</td>
<td>(12D PREG)</td>
</tr>
<tr>
<td></td>
<td>Result: Specific Developmental Abnormalities: Homeostasis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rat</td>
<td>400 MG/KG</td>
<td>Intraperitoneal</td>
<td>(8-15D PREG)</td>
</tr>
<tr>
<td></td>
<td>Result: Specific Developmental Abnormalities: Eye, ear. Specific Developmental Abnormalities: Musculoskeletal system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rat</td>
<td>600 MG/KG</td>
<td>Intraperitoneal</td>
<td>(8-15D PREG)</td>
</tr>
<tr>
<td></td>
<td>Result: Specific Developmental Abnormalities: Craniofacial (including nose and tongue). Specific Developmental Abnormalities: Musculoskeletal system.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mouse</td>
<td>640 UG/KG</td>
<td>Intraperitoneal</td>
<td>(10D PREG)</td>
</tr>
<tr>
<td></td>
<td>Result: Specific Developmental Abnormalities: Musculoskeletal system.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Chronic Exposure - Mutagen

<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Route</th>
<th>Exposure Time</th>
<th>Cell Type</th>
<th>Mutation test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Result: Laboratory experiments have shown mutagenic effects.
<table>
<thead>
<tr>
<th>Species</th>
<th>Dose</th>
<th>Route of Application</th>
<th>Exposure Time</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rat</td>
<td>5040 MG/KG</td>
<td>Oral</td>
<td>(1-21D PREG)</td>
<td>Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).</td>
</tr>
<tr>
<td>Rat</td>
<td>300 MG/KG</td>
<td>Intraperitoneal</td>
<td>(8-13D PREG)</td>
<td>Result: Effects on Newborn: Behavioral.</td>
</tr>
<tr>
<td>Rat</td>
<td>50 MG/KG</td>
<td>Intraperitoneal</td>
<td>(12D PREG)</td>
<td>Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).</td>
</tr>
<tr>
<td>Mouse</td>
<td>120 MG/KG</td>
<td>Intravenous</td>
<td>(7-9D PREG)</td>
<td>Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).</td>
</tr>
<tr>
<td>Mouse</td>
<td>4 GM/KG</td>
<td>Intravenous</td>
<td>(6D PREG)</td>
<td>Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Specific Developmental Abnormalities: Central nervous system.</td>
</tr>
</tbody>
</table>

### Section 12 - Ecological Information

### Section 13 - Disposal Considerations

**Appropriate Method of Disposal of Substance or Preparation**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable.

Observe all federal, state, and local environmental regulations.
Section 14 - Transport Information

DOT
Proper Shipping Name: Acetaldehyde
UN#: 1089
Class: 3
Packing Group: Packing Group I
PIH: Not PIH

IATA
Proper Shipping Name: Acetaldehyde
IATA Number: 1089
Hazard Class: 3
Packing Group: I

Section 15 - Regulatory Information

EU Directives Classification
Symbol of Danger: F+ Xn
Indication of Danger
Extremely Flammable. Harmful.
Risk Statements
R: 12 36/37 40
Extremely flammable. Irritating to eyes and respiratory system. Possible risk of irreversible effects.
Safety Statements
S: 16 33 36/37
Keep away from sources of ignition - no smoking. Take precautionary measures against static discharges. Wear suitable protective clothing and gloves.

US Classification and Label Text
Indication of Danger
Flammable (USA) Extremely Flammable (EU). Toxic.
Risk Statements
May cause cancer. Risk of serious damage to eyes. Irritating to eyes, respiratory system, and skin. May cause sensitization by skin contact. Possible risk of harm to the unborn child. Possible risk of irreversible effects. Harmful if swallowed.
Safety Statements
Keep away from sources of ignition - no smoking. Take precautionary measures against static discharges. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements

Handling and Storage

United States Regulatory Information
SARA 313 Listed: Yes
Deminimis: 0.1 %
Notes: This product is subject to SARA section 313 reporting requirements.

TSCA Inventory Item: Yes

United States - State Regulatory Information
California Prop - 65
California Proposition 65: This product is or contains chemical(s) known to the state of California to cause cancer.

Section 16 - Other Information

Warranty
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. Sigma-Aldrich Inc., 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. Copyright 2000 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.