1. Identification of the substance/preparation and the company/undertaking

Product Name
Acetaldehyde

Manufacturer or supplier's details

Celanese (Shanghai) International Trading Co., Ltd.
Room 239, Xinmao Building
South Taizhong Road
Waigaoqiao Free Trade Zone
Shanghai, China

Celanese Pte Ltd
60 Anson Road
Maple Tree Anson #13-02
Singapore 079914

Product Information
HazCom@celanese.com

Emergency telephone number
+(65) 62656917 (Operations Room direct dial)
or fax request to +(65) 62664696 (Facsimile to Operations Room)
or email to posh.er@paccoffshore.com.sg

In China Emergency Number: 86-532-83889090 (NRCC)

Identified uses
Chemical intermediate

2. Hazards identification

GHS Classification

<table>
<thead>
<tr>
<th>Hazards</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquid</td>
<td>Category 1</td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>Category 2A</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Specific target organ systemic toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Acute aquatic toxicity</td>
<td>Category 3</td>
</tr>
</tbody>
</table>

Labeling
SAFETY DATA SHEET

Product Name: Acetaldehyde
MSDS number: 80001
Revision Number: 8.01
Revision Date: Aug.20.2018
Issuing Date: Feb.12.2019

Signal Word: Danger
Hazard Statements:
- H224 - Extremely flammable liquid and vapor
- H319 - Causes serious eye irritation
- H351 - Suspected of causing cancer
- H335 - May cause respiratory irritation
- H402 - Harmful to aquatic life

Precautionary Statements:
- P201 - Obtain special instructions before use
- P202 - Do not handle until all safety precautions have been read and understood
- P210 - Keep away from heat
- P243 - Take precautionary measures against static discharge
- P281 - Use personal protective equipment as required
- P308 + P313 - IF exposed or concerned: Get medical attention/advice
- P273 - Avoid release to the environment

3. Composition/Information on ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>75-07-0</td>
<td>&gt; 99.5</td>
</tr>
</tbody>
</table>

4. First aid measures

General Information
Remove contaminated, soaked clothing immediately and dispose of safely. Pay attention to own protection. In any case show the physician the Safety Data Sheet.

Skin
Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Eyes
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Call a physician immediately.

Inhalation
Keep at rest. Move to fresh air. Call a physician immediately.

Ingestion
Rinse with plenty of water. If swallowed give 1-2 glasses of water to drink immediately. Call a physician immediately.
5. Fire-fighting measures

NFPA:  Health: 2  Flammability: 4  Instability: 2

Suitable extinguishing media
Foam, Dry chemical, Carbon dioxide (CO2), Water spray

Extinguishing media which must not be used for safety reasons
Do not use water jet, to avoid propagation of a fire.

Special exposure hazards arising from the substance or preparation itself, its combustion products, or released gases
Under conditions giving incomplete combustion, hazardous gases produced may consist of
Carbon monoxide
Carbon dioxide (CO2)
Combustion gases of organic materials must in principle be graded as inhalation poisons

Special protective equipment for fire-fighters
self-contained breathing apparatus (EN 133).

Environmental precautions
Dike and collect water used to fight fire.

Other Information
Cool containers / tanks with water spray.

6. Accidental release measures

Personal precautions
Avoid contact with the skin and the eyes. Keep away from heat and sources of ignition. Provide adequate ventilation.

Environmental precautions
Prevent further leakage or spillage. Do not discharge into the drains/surface waters/groundwater.

Methods for cleaning up
Soak up with inert absorbent material. Do not use rags, paper towels or combustible materials to clean up a spill, because spontaneous combustion can occur. Keep in suitable, closed containers for disposal. Dispose of in accordance with local regulations.

7. Handling and storage

Advice on safe handling
Vapors may form explosive mixtures with air. The pressure in sealed containers can increase under the influence of heat. Refill and handle product only in closed system. Provide sufficient air exchange and/or exhaust in work rooms.

Incompatible products
Keep away from: Acids, Bases, Amines, Oxygen, Oxidizing agents, Reducing agents
Protection - fire and explosion:
Keep away from sources of ignition - No smoking. Vapours are heavier than air and may spread along floors. Take necessary action to avoid static electricity discharge. Ground and bond containers when transferring material. In case of fire, emergency cooling with water spray should be available.

Material storage
Store locked up. The product will oxidize in air and release heat. Oxidization creates acids and peroxides, that may lead to corrosive damages in storage and handling equipment.

Incompatible products
Keep away from: Acids, Bases, Amines, Oxygen, Oxidizing agents, Reducing agents

Technical measures/Storage conditions
Keep tightly closed in a dry, cool and well-ventilated place. Handle an open container with care. Store under nitrogen.

8. Exposure controls / personal protection

ACGIH Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>Ceiling Limit Value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>25 PPM</td>
</tr>
</tbody>
</table>

OSHA Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>TWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>200 PPM</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Components</th>
<th>STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetaldehyde</td>
<td>150 PPM</td>
</tr>
</tbody>
</table>

Exposure controls

Engineering measures
General or dilution ventilation is frequently insufficient as the sole means of controlling employee exposure. Local ventilation is usually preferred. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems.

Personal protective equipment

General advice
Avoid contact with skin and eyes. Do not breathe vapors or spray mist. Use only in an area equipped with a safety shower. Hold eye wash fountain available.

Hygiene measures
When using, do not eat, drink or smoke. Take off all contaminated clothing immediately. Wash hands before breaks and immediately after handling the product.
Respiratory protection

Respirator with AX filter. Full mask with above mentioned filter according to producers using requirements or self-contained breathing apparatus. Equipment should conform to EN 136 or EN 140 and EN 143.

Eye protection

Tightly fitting safety goggles. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.. Equipment should conform to EN 166.

Skin protection

Impervious clothing

Hand protection

Chemicals resistant gloves

Suitable material

- Butyl-rubber

Reference substance

- Vinyl acetate

Type

- Butoject (Company KCL) or comparable article;
  or refer to glove manufacturer's recommendation

Evaluation

- according to EN 374: level 5

Material thickness

- Approx. 0.7 mm

Break through time

- approx. 240 min

9. Physical and chemical properties

Appearance

- liquid

Form

- colourless

Color

- pungent

Odor

Odor Threshold

- 0.21 mg/l (gas in air)

Molecular Weight

- 44.05 g/mol

Flash point

- -39°C

Method

- closed cup

Ignition temperature

- 155°C

Method

- DIN 51794

Decomposition

- 420 °C

Temperature

Lower explosion limit

- 4 Vol. %

Upper explosion limit

- 60 Vol. %

Flammability (solids)

- not applicable

Melting point/range

- -123°C

Boiling point/range

- 20°C @ 1013 hPa

Density

- 0.783 g/ml @ 18°C

pH

- Not determined

Viscosity

- 0.25 mPa*s @ 15°C

Vapor pressure

- 1203 hPa @ 25°C

- 2794 hPa @ 50°C

Vapor density

- 1.52 (Air=1)

Evaporation Rate

- Not determined

Water solubility

- miscible

Solubility in other solvents

- miscible with, Ethanol, Diethyl ether, Benzene

Partition coefficient

- 0.45 (measured)

(n-octanol/water)

Explosive Properties

- not applicable based on consideration of the structure

Oxidizing Properties

- not applicable based on consideration of the structure

Surface Tension

- 20.50 mN/m @ 25°C

Dissociation constant

- 13.57 @ 25°C
9. Physical and chemical properties

10. Stability and reactivity

Reactivity
Stable if protected from heat and exposure to air.

Conditions to avoid
Avoid any source of ignition. Avoid contact with heat, sparks, open flame, and static discharge.

Incompatible Materials
Keep away from: Oxygen, Oxidizing agents, Reducing agents, Acids, Bases

Hazardous Combustion or Decomposition Products:
In the presence of sufficient oxygen, combustion may produce oxides of nitrogen and carbon dioxide. Nitrogen oxides can react with water to produce nitric acid. Combustion under oxygen starved conditions may produce numerous toxic products including carbon monoxide, cyanides and nitriles. Thermal decomposition products may include oxides of carbon.
11. Toxicological information

Potential health effects

Routes of exposure

Skin, eyes, inhalation, ingestion.

Immediate effects

Skin

May cause skin irritation. Symptoms of overexposure include: Redness or discoloration, swelling, itching, burning or blisters of skin.

Eyes

Causes eye irritation. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.

Inhalation

May cause irritation of respiratory tract. Symptoms of exposure may include: Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.

Ingestion

May be harmful if swallowed. Symptoms of exposure may include: Nausea, vomiting, loss of appetite, gastrointestinal irritation and/or diarrhea.

Other:

Acetaldehyde is listed as IARC 2B, possible carcinogen and an anticipated carcinogen by the National Toxicology Program (NTP)

Target organ effects

Overexposure (prolonged or repeated exposure) may cause:

Injury to the eyes
Irritation of the respiratory tract

Medical conditions which may be aggravated by exposure:

Significant exposure to this chemical may adversely affect people with acute or chronic disease of the:

Respiratory Tract
Skin
Eyes

Acetaldehyde

Acute oral toxicity

LD50: 660-1930 mg/kg

Acute dermal toxicity

no data available

Acute inhalation toxicity

LC50 (4h): 24040 mg/m³

Method

OECD 403

Skin corrosion/irritation

slight irritant effect - does not require labelling

Species

rabbit

Method

OECD 404

Skin Sensitization

nonsensitizer

Species

guinea pig female

Method

OECD 406

Serious eye damage/eye irritation

irritant

Species

Humans

Carcinogenic effects

Suspected of causing cancer
12. Ecological Information

**Acetaldehyde**

**Acute fish toxicity**
- Species: Leuciscus idus (Golden orfe)
- Method: DIN 38412 T.15
- LC50: 124 mg/l (48h)

**Chronic fish toxicity**
- Species: Poecilia reticulata (guppy)
- Method: OECD 204
- LC50 (14d): 35 mg/l

**Acute daphnia toxicity**
- Species: Daphnia magna
- Method: OECD 202
- EC50: 57.4 mg/l (48h)

**Toxicity to aquatic plants**
- Species: Pseudokirchneriella subcapitata
- Method: OECD 201
- EC50: > 100 mg/l (72h)

**Toxicity to bacteria**
- Species: Chilomonas paramaecium
- Method: OECD 301 C
- NOEC: 82 mg/l

**Biodegradation**
- Method: Readily biodegradable

**Other potential hazards**
- The substance does not meet the criteria for PBT / vPvB according to REACH, Annex XIII

13. Disposal considerations

**Product information**
Disposal required in compliance with all waste management related state and local regulations. The choice of the appropriate method of disposal depends on the product composition by the time of disposal as well as the local statutes and possibilities for disposal.
Uncleaned empty packaging
Contaminated packaging should be emptied as far as possible and after appropriate cleansing may be taken for reuse

14. Transport information

US Department of Transportation

<table>
<thead>
<tr>
<th>UN/NA Number:</th>
<th>UN 1089</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Hazard class</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>I</td>
</tr>
<tr>
<td>Reportable Quantity (RQ)</td>
<td>1000 lb/454kg</td>
</tr>
<tr>
<td>Emergency Resp. Guide</td>
<td>129</td>
</tr>
</tbody>
</table>

ADR/RID

<table>
<thead>
<tr>
<th>UN/ID No.</th>
<th>UN 1089</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Classification Code</td>
<td>F1</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Environmentally hazardous</td>
<td>no</td>
</tr>
<tr>
<td>Tunnel Restriction Code</td>
<td>(D/E)</td>
</tr>
<tr>
<td>Hazard Label(s)</td>
<td>3</td>
</tr>
<tr>
<td>Hazard Number</td>
<td>33</td>
</tr>
</tbody>
</table>

ADN

<table>
<thead>
<tr>
<th>UN/ID No.</th>
<th>UN 1089</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Classification Code</td>
<td>F1</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Environmentally hazardous</td>
<td>no</td>
</tr>
<tr>
<td>Hazard Labels</td>
<td>3</td>
</tr>
</tbody>
</table>

ICAO/IATA

<table>
<thead>
<tr>
<th>UN-No.</th>
<th>UN 1089</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Environmentally hazardous</td>
<td>no</td>
</tr>
<tr>
<td>Hazard Labels</td>
<td>3</td>
</tr>
</tbody>
</table>

IMDG

<table>
<thead>
<tr>
<th>UN/ID No.</th>
<th>UN 1089</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Acetaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>3</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
</tbody>
</table>
SAFETY DATA SHEET

Product Name: Acetaldehyde
MSDS number: 80001
Revision Number: 8.01
Revision Date: Aug.20.2018
Issuing date: Feb.12.2019

14. Transport information
- Marine pollutant: no
- Hazard Labels: 3
- EmS Code: F-E, S-D

15. Regulatory information

INTERNATIONAL REGULATIONS
This substance is classified as dangerous according to Chinese legislation

International Inventories
Listed on the chemical inventories of the following countries or qualifies for an exemption:
- Australia (AICS)
- Canada (DSL)
- China (IECSC)
- Europe (EINECS)
- Japan (ENCS)
- Korea (KECI)
- New Zealand (NZIoC)
- Philippines (PICCS)
- United States (TSCA)

16. Other information

HMIS: Health: 2*  Flammability: 4  Physical Hazard: 2

Prepared By
Product Stewardship Department
Celanese

Other Information:
Observe national and local legal requirements.

Changes against the previous version are marked by ***

Sources of key data used to compile the datasheet
Information contained in this safety data sheet is based on Celanese owned data and public sources deemed valid or acceptable. The absence of data elements required by ANSI or 1907/2006/EC indicates that no data meeting these requirements is available.

Further information
This information is based on our present state of knowledge. It shall describe our products regarding safety requirements and shall not be construed as a guarantee or statement of condition and/or quality. For more information, other material safety data sheets or technical data sheets please consult the Celanese homepage (www.celanese.com)