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

Product Name
Crotonaldehyde

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
Email: Info.Chemicals.CN@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 2</td>
</tr>
<tr>
<td>Acute oral toxicity</td>
<td>Category 3</td>
</tr>
<tr>
<td>Acute dermal toxicity</td>
<td>Category 1</td>
</tr>
<tr>
<td>Acute inhalation toxicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Skin corrosion/irrititation</td>
<td>Category 2</td>
</tr>
<tr>
<td>Serious eye damage/eye irritation</td>
<td>Category 1</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Category 2</td>
</tr>
<tr>
<td>Specific target organ systemic toxicity (single exposure)</td>
<td>Category 3</td>
</tr>
<tr>
<td>Specific target organ systemic toxicity (repeated exposure)</td>
<td>Category 2</td>
</tr>
<tr>
<td>Acute aquatic toxicity</td>
<td>Category 1</td>
</tr>
</tbody>
</table>

Labeling
Signal Word
Danger

Hazard Statements
H225 - Highly flammable liquid and vapor
H301 - Toxic if swallowed
H310 - Fatal in contact with skin
H330 - Fatal if inhaled
H315 - Causes skin irritation
H318 - Causes serious eye damage
H341 - Suspected of causing genetic defects
H353 - May cause respiratory irritation
H373 - May cause damage to organs through prolonged or repeated exposure
H400 - Very toxic 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/sparks/open flames/hot surfaces. - No smoking
P273 - Avoid release to the environment
P281 - Use personal protective equipment as required
P284 - Wear respiratory protection
P308 + P313 - IF exposed or concerned: Get medical attention/advice

3. Composition/Information on ingredients

Chemical characterization
2-Butenol

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No</th>
<th>Percent %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>4170-30-3</td>
<td>&gt; 99.0</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 soap and plenty of water while removing all contaminated clothes and shoes. 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
If swallowed give 1-2 glasses of water to drink immediatly. Call a physician immediately.

Notes to physician
Observe for latent pulmonary edema. Treat as an alkaline substance (similar to ammonia).

5. Fire-fighting measures

NFPA: Health: 4  Flammability: 3  Instability: 2

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

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread 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 Vapors may travel to source of ignition and flash back

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
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. Oxidation 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.

Specific end use(s)
None known

8. Exposure controls / personal protection

ACGIH Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>Ceiling Limit Value:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>0.3 PPM</td>
</tr>
</tbody>
</table>

OSHA Exposure Limits

<table>
<thead>
<tr>
<th>Components</th>
<th>TWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crotonaldehyde</td>
<td>2 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.
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 A 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

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

Evaluation: according to EN 374: level 4

Material thickness: Approx. 0.7 mm

Break through time: approx. 120 min

9. Physical and chemical properties

Appearance

Form: liquid
Color: yellowish
Odor: pungent

Odor Threshold: 0.0210 mg/l (gas in air)
Molecular Weight: 70.09 g/mol
Flash point: 13°C
Method: closed cup
Ignition temperature: 165°C
Method: DIN 51794
Decomposition: Not determined
Temperature

Lower explosion limit: 2.1 Vol. %
Upper explosion limit: 15.5 Vol. %
Flammability (solids): not applicable
Melting point/range: -76°C
Boiling point/range: 102.2°C @ 1013 hPa
Density: 0.852 g/ml @ 20°C
pH: Not determined
Viscosity: 0.27 mPa*s @ 20°C
Method: calculated
Vapor pressure: 40 hPa @ 25°C
Vapor density: 2.41 (Air=1)
Evaporation Rate: Not determined
Water solubility: 181 g/l @ 20°C
Solubility in other solvents: miscible with, Benzene, very soluble in, Ethanol, Diethyl ether, Acetone
Partition coefficient (n-octanol/water): 0.60 (calculated)
9. Physical and chemical properties

Explosive Properties: not applicable based on consideration of the structure
Oxidizing Properties: not applicable based on consideration of the structure
Surface Tension: not determined
Dissociation constant: not determined
Self-Accelerating decomposition temperature (SADT): >75 °C
Self-Accelerating polymerization temperature (SAPT): >50 °C

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

<table>
<thead>
<tr>
<th>Route</th>
<th>Effects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skin</td>
<td>May be fatal if absorbed through skin. May cause skin irritation. Symptoms of overexposure include: Central nervous system depression with headache, stupor, uncoordinated or strange behavior or unconsciousness. Crusting, scaling, weeping and itching of skin.</td>
</tr>
<tr>
<td>Eyes</td>
<td>Severely irritating to eyes. Symptoms of exposure may include: Eye irritation, burning sensation, pain, watering, and/or change of vision.</td>
</tr>
<tr>
<td>Inhalation</td>
<td>May be fatal if inhaled. Causes respiratory tract irritation. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior or unconsciousness. Nasal discharge, hoarseness, coughing, chest pain and breathing difficulty.</td>
</tr>
<tr>
<td>Ingestion</td>
<td>Harmful if swallowed. Symptoms of exposure may include: Central nervous system depression with nausea, dizziness, headache, stupor, uncoordinated or strange behavior, or unconsciousness. Inflammation of mouth, throat, esophagus and/or stomach.</td>
</tr>
</tbody>
</table>

Target organ effects

Overexposure (prolonged or repeated exposure) may cause:
- Central nervous system depression
- Injury to the eyes
- Irritation of the respiratory tract
- Allergic reaction and local irritation of the skin

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
- Digestive tract

Crotonaldehyde

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute oral toxicity</td>
<td>LD50: 174 mg/kg- Harmful to toxic</td>
</tr>
<tr>
<td>Acute dermal toxicity</td>
<td>LD50: 26 mg/kg- toxic</td>
</tr>
<tr>
<td>Acute inhalation toxicity</td>
<td>LC50 (4h): 336 mg/m³- Highly toxic</td>
</tr>
<tr>
<td>Method</td>
<td>OECD 403</td>
</tr>
<tr>
<td>Skin corrosion/irritation</td>
<td>irritating</td>
</tr>
<tr>
<td>Species</td>
<td>rabbit</td>
</tr>
<tr>
<td>Skin Sensitization</td>
<td>nonsensitizer</td>
</tr>
</tbody>
</table>
12. Ecological Information

Crotonaldehyde

**Acute fish toxicity**
Species: Oncorhynchus mykiss (rainbow trout)
Method: EPA OTS 797.1400
LC50: 0.65 mg/l (96h)

**Chronic fish toxicity**
Species: Oryzias Latipes (Medaka)
Method: OECD 210
NOEC (41d): 0.0247 mg/l

**Acute daphnia toxicity**
Species: Daphnia magna
Method: EPA OTS 797.1300
EC50: 2 mg/l (48h)

**Toxicity to aquatic plants**
Species: Pseudokirchneriella subcapitata
Method: EPA OTS 797.1050
EC50: < 0.881 mg/l (96h)

**Toxicity to bacteria**
Species: Pseudomonas putida
Method: DIN 38412 T.8
EC10: 10.4 mg/l (18h)

**Biodegradation**
Method: EPS OTS 796.3200
Readily biodegradable (but failed the 10-day window criterion)

**Bioaccumulation**
Method: Does not bioaccumulate

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

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**Species: mouse female**
Species: highly irritating
Humans:

**Carcinogenic effects**
No evidence of carcinogenicity

**in vitro Mutagenicity**

**in vivo Mutagenicity**
No toxicological effects to fertility or offspring
oral gavage
rat
NOAEL: 10 mg/kg bw/day
12. Ecological Information

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 1143</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Crotonaldehyde</td>
</tr>
<tr>
<td>Hazard class</td>
<td>6.1</td>
</tr>
<tr>
<td>Subsidiary hazard</td>
<td>3</td>
</tr>
<tr>
<td>Packing Group</td>
<td>I</td>
</tr>
<tr>
<td>Reportable Quantity (RQ)</td>
<td>100 lb/45.4kg</td>
</tr>
<tr>
<td>Emergency Resp. Guide</td>
<td>131P</td>
</tr>
<tr>
<td>Poison Inhalation Hazard</td>
<td>Zone B</td>
</tr>
<tr>
<td>Marine pollutant</td>
<td>Yes</td>
</tr>
</tbody>
</table>

### ADR/RID

<table>
<thead>
<tr>
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<th>UN 1143</th>
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<td>Crotonaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>6.1</td>
</tr>
<tr>
<td>Subsidiary Risk</td>
<td>3</td>
</tr>
<tr>
<td>Classification Code</td>
<td>TF1</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Environmentally</td>
<td>yes</td>
</tr>
<tr>
<td>hazardous</td>
<td></td>
</tr>
<tr>
<td>Tunnel Restriction Code</td>
<td>(C/D)</td>
</tr>
<tr>
<td>Hazard Label(s)</td>
<td>6.1 + 3 + Fish and tree</td>
</tr>
<tr>
<td>Hazard Number</td>
<td>663</td>
</tr>
</tbody>
</table>

### ADN

<table>
<thead>
<tr>
<th>UN/ID No.</th>
<th>ADN: Container and Tanker</th>
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</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Crotonaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>6.1</td>
</tr>
<tr>
<td>Subsidiary Risk</td>
<td>3</td>
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<tr>
<td>Classification Code</td>
<td>TF1</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Environmentally</td>
<td>yes</td>
</tr>
<tr>
<td>hazardous</td>
<td></td>
</tr>
<tr>
<td>Hazard Labels</td>
<td>6.1 + 3 + Fish and tree</td>
</tr>
</tbody>
</table>
14. Transport information

ICAO/IATA
FORBIDDEN

IMDG

<table>
<thead>
<tr>
<th>UN/ID No.</th>
<th>UN 1143</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name</td>
<td>Crotonaldehyde</td>
</tr>
<tr>
<td>Hazard Class</td>
<td>6.1</td>
</tr>
<tr>
<td>Subsidiary Risk</td>
<td>3</td>
</tr>
<tr>
<td>Packing group</td>
<td>I</td>
</tr>
<tr>
<td>Marine pollutant</td>
<td>yes</td>
</tr>
<tr>
<td>Hazard Labels</td>
<td>6.1 + 3 + Fish and tree</td>
</tr>
<tr>
<td>EmS Code</td>
<td>F-E, S-D</td>
</tr>
</tbody>
</table>

Remarks
The product is not classified as self-reactive substance in class 4.1 according to UN-Transportation regulation (SADT >75°C). Special provision 386 taken into account.

15. Regulatory information

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)
- Japan (ISHL)
- Korea (KECI)
- Philippines (PICCS)
- United States (TSCA)

16. Other information

HMIS: Health: 4 Flammability: 3 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)