1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers
Product name : Crotyl chloride
Product Number : 28115
Brand : Aldrich
CAS-No. : 591-97-9

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses : Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet
Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO  63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number
Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 2), H225
Acute toxicity, Oral (Category 4), H302
Acute toxicity, Inhalation (Category 4), H332
Skin corrosion (Category 1B), H314
Serious eye damage (Category 1), H318
Skin sensitisation (Category 1), H317
Acute aquatic toxicity (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word : Danger

Hazard statement(s)
H225 : Highly flammable liquid and vapour.
H302 + H332 : Harmful if swallowed or if inhaled
H314 : Causes severe skin burns and eye damage.
H317 : May cause an allergic skin reaction.
H402 : Harmful to aquatic life.

Precautionary statement(s)
P210 : Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233 : Keep container tightly closed.
2.3  Hazards not otherwise classified (HNOC) or not covered by GHS

Lachrymator.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2  Mixtures

Synonyms : cis,trans-1-Chloro-2-butene

Formula : C₄H₇Cl

Molecular Weight : 90.55 g/mol

<table>
<thead>
<tr>
<th>Hazardous components</th>
<th>Classification</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1-Chlorobut-2-ene</strong></td>
<td></td>
<td></td>
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<tr>
<td>CAS-No.</td>
<td>591-97-9</td>
<td></td>
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<tr>
<td>EC-No.</td>
<td>209-739-5</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flam. Liq. 2; Acute Tox. 4; Skin Irrit. 2; Eye Dam. 1; H225, H302 + H332, H315, H318</td>
<td>60 - 100 %</td>
</tr>
<tr>
<td><strong>3-Chlorobut-1-ene</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAS-No.</td>
<td>563-52-0</td>
<td></td>
</tr>
<tr>
<td>EC-No.</td>
<td>209-252-8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flam. Liq. 2; Skin Sens. 1; H225, H317</td>
<td>30 - 60 %</td>
</tr>
</tbody>
</table>

For the full text of the H-Statements mentioned in this Section, see Section 16.

4. FIRST AID MEASURES

4.1  Description of 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
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Continue rinsing eyes during transport to hospital.

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

4.2 Most important symptoms and effects, both acute and delayed
The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed
no data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media
Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special hazards arising from the substance or mixture
Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

5.4 Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, 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. For personal protection see section 8.

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters
Contains no substances with occupational exposure limit values.

8.2 Exposure controls

Appropriate engineering controls
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Personal protective equipment

Eye/face protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact
Material: Fluorinated rubber
Minimum layer thickness: 0.7 mm
Break through time: 120 min
Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose 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).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance
Form: clear, liquid
Colour: colourless

b) Odour
pungent

c) Odour Threshold
no data available

d) pH
no data available

e) Melting point/freezing point
Melting point/range: -65 °C (-85 °F)

f) Initial boiling point and
85 - 86 °C (185 - 187 °F) - lit.
boiling range

g) Flash point  
-12 °C (10 °F) - closed cup - DIN 51755 Part 1

h) Evaporation rate  
no data available

i) Flammability (solid, gas)  
no data available

j) Upper/lower flammability or explosive limits  
no data available

k) Vapour pressure  
116 hPa (87 mmHg) at 20 °C (68 °F)

l) Vapour density  
no data available

m) Relative density  
0.923 g/mL at 20 °C (68 °F)

n) Water solubility  
ca.14 g/l at 20 °C (68 °F) - hydrolyses

o) Partition coefficient: n-octanol/water  
no data available

p) Auto-ignition temperature  
no data available

q) Decomposition temperature  
no data available

r) Viscosity  
no data available

s) Explosive properties  
no data available

t) Oxidizing properties  
no data available

9.2 Other safety information  
no data available

10. STABILITY AND REACTIVITY

10.1 Reactivity  
no data available

10.2 Chemical stability  
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions  
Vapours may form explosive mixture with air.

10.4 Conditions to avoid  
Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials  
Strong oxidizing agents

10.6 Hazardous decomposition products  
Other decomposition products - no data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - rat - 385 mg/kg  
(OECD Test Guideline 401)

no data available

LC50 Inhalation - rat - 4 h - 16.3 mg/l  
(OECD Test Guideline 403)

Inhalation: no data available
Dermal: no data available

no data available

**Skin corrosion/irritation**

Skin - rabbit
Result: Corrosive - 4 h
(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

Eyes - rabbit
Result: Moderate eye irritation
(OECD Test Guideline 405)

**Respiratory or skin sensitisation**

Buehler Test - guinea pig
May cause allergic skin reaction.
(OECD Test Guideline 406)

**Germ cell mutagenicity**

no data available

Ames test
S. typhimurium
Result: positive

**Carcinogenicity**

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**

no data available

no data available

**Specific target organ toxicity - single exposure**

no data available

**Specific target organ toxicity - repeated exposure**

no data available

**Aspiration hazard**

no data available

**Additional Information**

RTECS: EM4264000

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

Stomach - Irregularities - Based on Human Evidence
Stomach - Irregularities - Based on Human Evidence (3-Chlorobut-1-ene)

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**12. ECOLOGICAL INFORMATION**

**12.1 Toxicity**

no data available
Toxicity to daphnia and other aquatic invertebrates

12.2 Persistence and degradability
Biodegradability

Exposure time 28 d  

12.3 Bioaccumulative potential

no data available

12.4 Mobility in soil

no data available

12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. 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: 2924  Class: 3 (8)  Packing group: II
Proper shipping name: Flammable liquids, corrosive, n.o.s. (1-Chlorobut-2-ene, 3-Chlorobut-1-ene)
Reportable Quantity (RQ):
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN number: 2924  Class: 3 (8)  Packing group: II
Proper shipping name: FLAMMABLE LIQUID, CORROSIVE, N.O.S. (1-Chlorobut-2-ene, 3-Chlorobut-1-ene)
Marine pollutant: No

IATA

UN number: 2924  Class: 3 (8)  Packing group: II
Proper shipping name: Flammable liquid, corrosive, n.o.s. (1-Chlorobut-2-ene, 3-Chlorobut-1-ene)

15. REGULATORY INFORMATION

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

<table>
<thead>
<tr>
<th>Chemical</th>
<th>CAS-No.</th>
<th>Revision Date</th>
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<tbody>
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Pennsylvania Right To Know Components

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New Jersey Right To Know Components

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</table>

California Prop. 65 Components

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

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

| Acute Tox. | Acute toxicity |
| Eye Dam.   | Serious eye damage |
| Flam. Liq. | Flammable liquids |
| H225       | Highly flammable liquid and vapour. |
| H302       | Harmful if swallowed. |
| H302 + H332| Harmful if swallowed or if inhaled |
| H314       | Causes severe skin burns and eye damage. |
| H315       | Causes skin irritation. |
| H317       | May cause an allergic skin reaction. |
| H318       | Causes serious eye damage. |
| H332       | Harmful if inhaled. |
| H402       | Harmful to aquatic life. |
| Skin Irrit.| Skin irritation |
| Skin Sens. | Skin sensitisation |

HMIS Rating

| Health hazard: | 3 |
| Chronic Health Hazard: | * |
| Flammability: | 3 |
| Physical Hazard | 0 |

NFPA Rating

| Health hazard: | 3 |
| Fire Hazard:   | 3 |
| Reactivity Hazard: | 0 |

Further information

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Preparation Information
Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 3.8 Revision Date: 06/30/2014 Print Date: 06/20/2016