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## SECTION 1: Identification

### 1.1 GHS Product identifier

Product name Ketene

### 1.2 Other means of identification

Product number -  
Other names Ethen-1-one; Keten; ethylene-oxide

### 1.3 Recommended use of the chemical and restrictions on use

Identified uses Industrial and scientific research uses.  
Uses advised against no data available

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## SECTION 2: Hazard identification

### 2.1 Classification of the substance or mixture

Flammable gases, Category 1A, Flammable gas  
Skin irritation, Category 2  
Serious eye damage, Category 1  
Acute toxicity - Category 1, Inhalation  
Specific target organ toxicity â€“ single exposure, Category 3

### 2.2 GHS label elements, including precautionary statements

Pictogram(s)



Signal word

Danger

Hazard statement(s)

H220 Extremely flammable gas  
H315 Causes skin irritation  
H318 Causes serious eye damage  
H330 Fatal if inhaled  
H335 May cause respiratory irritation

Precautionary statement(s)

Prevention

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
P264 Wash ... thoroughly after handling.  
P280 Wear protective gloves/protective clothing/eye protection/face protection/hearing protection/...  
P260 Do not breathe dust/fume/gas/mist/vapours/spray.  
P271 Use only outdoors or in a well-ventilated area.  
P284 [In case of inadequate ventilation] wear respiratory protection.  
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.

Response

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.  
P381 In case of leakage, eliminate all ignition sources.  
P302+P352 IF ON SKIN: Wash with plenty of water/...  
P321 Specific treatment (see ... on this label).  
P332+P317 If skin irritation occurs: Get medical help.  
P362+P364 Take off contaminated clothing and wash it before reuse.  
P305+P354+P338 IF IN EYES: Immediately rinse with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.  
P317 Get medical help.  
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.  
P316 Get emergency medical help immediately.  
P320 Specific treatment is urgent (see ... on this label).  
P319 Get medical help if you feel unwell.

Storage

P403 Store in a well-ventilated place.  
P403+P233 Store in a well-ventilated place. Keep container tightly closed.  
P405 Store locked up.

Disposal

P501 Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

### 2.3 Other hazards which do not result in classification

no data available

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## SECTION 3: Composition/information on ingredients

### 3.1 Substances

Chemical name	Common names and synonyms	CAS number	EC number	Concentration
Ketene	Ketene	463-51-4	207-336-9	100%

## SECTION 4: First-aid measures

### 4.1 Description of necessary first-aid measures

#### If inhaled

Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.

#### Following skin contact

Remove contaminated clothes. Rinse skin with plenty of water or shower.

#### Following eye contact

First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

#### Following ingestion

Rinse mouth with water. Do not induce vomiting. Never give anything by mouth to an unconscious person. Call a doctor or Poison Control Center immediately.

### 4.2 Most important symptoms/effects, acute and delayed

Exposure Routes: inhalation, skin and/or eye contact Symptoms: Irritation eyes, skin, nose, throat, respiratory system; pulmonary edema Target Organs: Eyes, skin, respiratory system (NIOSH, 2016)

### 4.3 Indication of immediate medical attention and special treatment needed, if necessary

no data available

## SECTION 5: Fire-fighting measures

### 5.1 Suitable extinguishing media

Excerpt from ERG Guide 131P [Flammable Liquids - Toxic]: CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. SMALL FIRE: Dry chemical, CO<sub>2</sub>, water spray or alcohol-resistant foam. LARGE FIRE: Water spray, fog or alcohol-resistant foam. Move containers from fire area if you can do it without risk. Dike fire-control water for later disposal; do not scatter the material. Use water spray or fog; do not use straight streams. FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2016)

### 5.2 Specific hazards arising from the chemical

Excerpt from ERG Guide 131P [Flammable Liquids - Toxic]: HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion and poison hazard indoors, outdoors or in sewers. Those substances designated with a (P) may polymerize explosively when heated or involved in a fire. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. (ERG, 2016)

### 5.3 Special protective actions for fire-fighters

Use powder, carbon dioxide. NO water. In case of fire: keep cylinder cool by spraying with water. NO direct contact with water.

## SECTION 6: Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures

Evacuate danger area! Consult an expert! Ventilation. Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus.

### 6.2 Environmental precautions

Evacuate danger area! Consult an expert! Ventilation. Personal protection: gas-tight chemical protection suit including self-contained breathing apparatus.

### 6.3 Methods and materials for containment and cleaning up

Persons not wearing protective equipment and clothing should be restricted from areas of leaks until cleanup has been completed. if ketene is leaked, the following steps should be taken: 1. remove all ignition sources. 2. ventilate the area of leak. 3. stop flow of gas. disposal methods: ketene may be disposed of by burning at a safe location or in a suitable combustion chamber.

## SECTION 7: Handling and storage

### 7.1 Precautions for safe handling

NO open flames, NO sparks and NO smoking. Closed system, ventilation, explosion-proof electrical equipment and lighting. Handling in a well ventilated place. Wear suitable protective clothing. Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Use non-sparking tools. Prevent fire caused by electrostatic discharge steam.

## 7.2 Conditions for safe storage, including any incompatibilities

The substance cannot be stored or shipped....CANNOT BE...STORED IN A GASEOUS STATE.

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## SECTION 8: Exposure controls/personal protection

### 8.1 Control parameters

#### Occupational Exposure limit values

TLV: 0.5 ppm as TWA; 1.5 ppm as STEL

#### Biological limit values

no data available

### 8.2 Appropriate engineering controls

Ensure adequate ventilation. Handle in accordance with good industrial hygiene and safety practice. Set up emergency exits and the risk-elimination area.

### 8.3 Individual protection measures, such as personal protective equipment (PPE)

#### Eye/face protection

Wear safety goggles or eye protection in combination with breathing protection.

#### Skin protection

Protective gloves.

#### Respiratory protection

Use ventilation, local exhaust or breathing protection.

#### Thermal hazards

no data available

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## SECTION 9: Physical and chemical properties and safety characteristics

#### Physical state

Ketene is a colorless highly reactive gas with a penetrating odor. mp: -150Å°C, bp: -56Å°C. Reacts violently with water. Soluble in diethyl ether and acetone. Severely irritates the eyes, the skin and the respiratory tract. Used in the manufacture of acetic anhydride, sorbic acid, cinnamic acids, chloroacetyl chloride and other materials. Readily polymerizes and cannot be shipped or stored. Is obtained instead as needed from diketene. DIKETENE (CAS: 674-82-8; Formula: C<sub>4</sub>H<sub>2</sub>O<sub>2</sub>) is a colorless liquid with a pungent odor. mp: -6.5Å°C; bp: 127Å°C. Density 1.08 g/cm<sup>3</sup>. Reacts violently with water. Is obtained from the dimerization of ketene and can be stored and transported under refrigeration. A severe lachrymator (irritates the eyes, the respiratory tract, and the skin as well). Depolymerizes at 650Å°C to give ketene.

#### Colour

COLORLESS GAS

#### Odour

PENETRATING ODOR

#### Melting point/freezing point

-150Å°C

#### Boiling point or initial boiling point and boiling range

-56Å°C

#### Flammability

Flammable Gas

#### Lower and upper explosion limit/flammability limit

no data available

#### Flash point

Flammable gas

#### Auto-ignition temperature

no data available

#### Decomposition temperature

no data available

#### pH

no data available

#### Kinematic viscosity

no data available

#### Solubility

Reacts with water (NIOSH, 2016)

#### Partition coefficient n-octanol/water

no data available

#### Vapour pressure

12600mmHg at 25Å°C

#### Density and/or relative density

0.712 g/cm<sup>3</sup>

#### Relative vapour density

1.45 (AIR= 1)

#### Particle characteristics

no data available

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## SECTION 10: Stability and reactivity

### 10.1 Reactivity

The substance may readily polymerize. Reacts violently with many organic compounds. Reacts with water. This produces acetic acid. Decomposes in alcohol and ammonia.

### 10.2 Chemical stability

no data available

### 10.3 Possibility of hazardous reactions

The gas is heavier than air and may travel along the ground; distant ignition possible. KETENE is extremely flammable. Mixtures with air are explosive. Reacts violently with water; reacts vigorously with alcohols, ammonia. Readily polymerizes and cannot be shipped or stored. Is obtained instead as needed from diketene. DIKETENE is extremely flammable. Forms explosive vapor/air mixtures above 33°C. Undergoes a further exothermic polymerization that is retarded by storage in the solid state (below -6.5°C) or by the use of stabilizing additives. This polymerization becomes violent (with risk of fire or explosion) with warming or on contact with acids or bases. Reacts violently with water.

### 10.4 Conditions to avoid

no data available

### 10.5 Incompatible materials

Water, alcohols, ammonia [Note: Readily polymerizes. Reacts with water to form acetic acid].

### 10.6 Hazardous decomposition products

no data available

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## SECTION 11: Toxicological information

#### Acute toxicity

- Oral: no data available
- Inhalation: no data available
- Dermal: no data available

#### Skin corrosion/irritation

no data available

#### Serious eye damage/irritation

no data available

#### Respiratory or skin sensitization

no data available

#### Germ cell mutagenicity

no data available

#### Carcinogenicity

no data available

#### Reproductive toxicity

no data available

#### STOT-single exposure

The substance is irritating to the eyes, skin and respiratory tract. Inhalation of this gas may cause lung oedema. The effects may be delayed. Medical observation is indicated. See Notes.

#### STOT-repeated exposure

Repeated or prolonged inhalation may cause effects on the lungs. This may result in emphysema and fibrosis.

#### Aspiration hazard

A harmful concentration of this gas in the air will be reached very quickly on loss of containment.

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## SECTION 12: Ecological information

### 12.1 Toxicity

- Toxicity to fish: no data available
- Toxicity to daphnia and other aquatic invertebrates: no data available
- Toxicity to algae: no data available
- Toxicity to microorganisms: no data available

### 12.2 Persistence and degradability

no data available

### 12.3 Bioaccumulative potential

no data available

### 12.4 Mobility in soil

no data available

## 12.5 Other adverse effects

no data available

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## SECTION 13: Disposal considerations

### 13.1 Disposal methods

#### Product

The material can be disposed of by removal to a licensed chemical destruction plant or by controlled incineration with flue gas scrubbing. Do not contaminate water, foodstuffs, feed or seed by storage or disposal. Do not discharge to sewer systems.

#### Contaminated packaging

Containers can be triply rinsed (or equivalent) and offered for recycling or reconditioning. Alternatively, the packaging can be punctured to make it unusable for other purposes and then be disposed of in a sanitary landfill. Controlled incineration with flue gas scrubbing is possible for combustible packaging materials.

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## SECTION 14: Transport information

### 14.1 UN Number

ADR/RID: UN1955 (For reference only, please check.) IMDG: UN1955 (For reference only, please check.) IATA: UN1955 (For reference only, please check.)

### 14.2 UN Proper Shipping Name

ADR/RID: COMPRESSED GAS, TOXIC, N.O.S. (For reference only, please check.) IMDG: COMPRESSED GAS, TOXIC, N.O.S. (For reference only, please check.) IATA: COMPRESSED GAS, TOXIC, N.O.S. (For reference only, please check.)

### 14.3 Transport hazard class(es)

ADR/RID: 2.3 (For reference only, please check.) IMDG: 2.3 (For reference only, please check.) IATA: 2.3 (For reference only, please check.)

### 14.4 Packing group, if applicable

ADR/RID: (For reference only, please check.) IMDG: (For reference only, please check.) IATA: (For reference only, please check.)

### 14.5 Environmental hazards

ADR/RID: No IMDG: No IATA: No

### 14.6 Special precautions for user

no data available

### 14.7 Transport in bulk according to IMO instruments

no data available

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## SECTION 15: Regulatory information

### 15.1 Safety, health and environmental regulations specific for the product in question

Chemical name	Common names and synonyms	CAS number	EC number
Ketene	Ketene	463-51-4	207-336-9
European Inventory of Existing Commercial Chemical Substances (EINECS)			Listed.
EC Inventory			Listed.
United States Toxic Substances Control Act (TSCA) Inventory			Listed.
China Catalog of Hazardous chemicals 2015			Not Listed.
New Zealand Inventory of Chemicals (NZIoC)			Listed.
Philippines Inventory of Chemicals and Chemical Substances (PICCS)			Not Listed.
Vietnam National Chemical Inventory			Listed.
Chinese Chemical Inventory of Existing Chemical Substances (China IECSC)			Not Listed.
Korea Existing Chemicals List (KECL)			Listed.

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## SECTION 16: Other information

#### Information on revision

Creation Date July 15, 2019

Revision Date July 15, 2019

#### Abbreviations and acronyms

- CAS: Chemical Abstracts Service
- ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
- RID: Regulation concerning the International Carriage of Dangerous Goods by Rail

- IMDG: International Maritime Dangerous Goods
- IATA: International Air Transportation Association
- TWA: Time Weighted Average
- STEL: Short term exposure limit
- LC50: Lethal Concentration 50%
- LD50: Lethal Dose 50%
- EC50: Effective Concentration 50%

## References

- IPCS - The International Chemical Safety Cards (ICSC), website: <http://www.ilo.org/dyn/icsc/showcard.home>
- HSDB - Hazardous Substances Data Bank, website: <https://toxnet.nlm.nih.gov/newtoxnet/hsdb.htm>
- IARC - International Agency for Research on Cancer, website: <http://www.iarc.fr/>
- eChemPortal - The Global Portal to Information on Chemical Substances by OECD, website: [http://www.echemportal.org/echemportal/index?pageID=0&request\\_locale=en](http://www.echemportal.org/echemportal/index?pageID=0&request_locale=en)
- CAMEO Chemicals, website: <http://cameochemicals.noaa.gov/search/simple>
- ChemIDplus, website: <http://chem.sis.nlm.nih.gov/chemidplus/chemidlite.jsp>
- ERG - Emergency Response Guidebook by U.S. Department of Transportation, website: <http://www.phmsa.dot.gov/hazmat/library/erg>
- Germany GESTIS-database on hazard substance, website: <http://www.dguv.de/ifa/gestis/gestis-stoffdatenbank/index-2.jsp>
- ECHA - European Chemicals Agency, website: <https://echa.europa.eu/>

## Other Information

Reacts violently with fire extinguishing agents such as water. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate spray, by a doctor or a person authorized by him/her, should be considered.