SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form: Substance
Physical state: Solid
Substance name: NORBORNENE
Product code: ENEN3060
Formula: C7H10
Synonyms: BICYCLO[2.2.1]HEPTENE
            NORBORNYLENE
            8,9,10-TRINORBORN-2-ENE
Chemical family: HYDROCARBON

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture: Chemical intermediate
For research and industrial use only

1.3. Details of the supplier of the safety data sheet

GELEST, INC.
11 East Steel Road
Morrisville, PA 19067
USA
T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST
info@gelest.com - www.gelest.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification
Flam. Sol. 2 H228
Eye Irrit. 2A H319
Full text of H statements: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US): 

Signal word (GHS-US): Warning
Hazard statements (GHS-US): H228 - Flammable solid
                                      H319 - Causes serious eye irritation
Precautionary statements (GHS-US): P280 - Wear protective gloves/protective clothing/eye protection/face protection
                                      P210 - Keep away from heat, open flames, sparks. - No smoking
                                      P240 - Ground/Bond container and receiving equipment
                                      P241 - Use explosion-proof electrical equipment
                                      P264 - Wash hands thoroughly after handling
                                      P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
                                      P337+P313 - If eye irritation persists: Get medical advice/attention
                                      P370+P378 - In case of fire: Use water spray or fog, foam, carbon dioxide, dry chemical to extinguish

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

No data available
SECTION 3: Composition/Information on ingredients

3.1. Substance

Substance type: Mono-constituent
Name: NORBORNENE
CAS No: 498-66-8
EC no: 207-866-0

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norbornene</td>
<td>(CAS No) 498-66-8</td>
<td>95 - 100</td>
<td>Flam. Sol. 2, H228 Eye Irrit. 2A, H319</td>
</tr>
</tbody>
</table>

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general: Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.

First-aid measures after skin contact: Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact: Immediately flush eyes thoroughly with water for at least 15 minutes. Get medical advice/attention.

First-aid measures after ingestion: Never give anything by mouth to an unconscious person. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation: May be harmful if inhaled.
Symptoms/injuries after skin contact: May cause mild skin irritation. May be harmful in contact with skin.
Symptoms/injuries after eye contact: Causes serious eye irritation.
Symptoms/injuries after ingestion: May be harmful if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Unsuitable extinguishing media: None known.

5.2. Special hazards arising from the substance or mixture

Fire hazard: Flammable solid. Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.

5.3. Advice for firefighters

Firefighting instructions: Exercise caution when fighting any chemical fire. Use water spray or fog for cooling exposed containers.
Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Avoid contact with skin and eyes. Do not breathe dust.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures: Eliminate every possible source of ignition. Use special care to avoid static electric charges.

6.1.1. For non-emergency personnel

Protective equipment: Wear protective equipment as described in Section 8.
Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters.
6.3. Methods and material for containment and cleaning up

For containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for cleaning up: Sweep or shovel spills into appropriate container for disposal.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed: Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Precautions for safe handling: Avoid contact with skin and eyes. Avoid dust formation. Do not breathe dust. Ground/bond container and receiving equipment. Provide local exhaust or general room ventilation to minimize exposure to dust.

Hygiene measures: Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures: Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof electrical equipment.

Storage conditions: Keep container tightly closed.

Incompatible materials: Oxidizing agent.

Storage area: Store in a well-ventilated place. Store away from heat.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Exposure controls

Appropriate engineering controls: Provide local exhaust or general room ventilation.

Personal protective equipment: Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection: Neoprene or nitrile rubber gloves.

Eye protection: Chemical goggles. Contact lenses should not be worn.

Skin and body protection: Wear suitable protective clothing.

Respiratory protection: Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified dust and mist (teal cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state: Solid

Appearance: Crystalline solid.

Molecular mass: 94.15 g/mol

Color: Colorless.

Odor: Mild. Pungent.

Odor threshold: No data available

Refractive index: No data available

pH: No data available

Relative evaporation rate (butyl acetate=1): No data available

Relative evaporation rate (ether=1): ~ 1

Melting point: 45 - 47 °C

Freezing point: No data available

Boiling point: 96 °C

Flash point: 7 °C

Auto-ignition temperature: 445 °C

Decomposition temperature: No data available

Flammability (solid, gas): Flammable solid

Vapor pressure: ~ 250 mm Hg @ 65°C

Relative vapor density at 20 °C: > 1
Relative density: 0.85
VOC content: 100 %
Solubility: Water: 0.07 g/l
Log Pow: No data available
Log Kow: No data available
Viscosity, kinematic: No data available
Viscosity, dynamic: No data available
Explosive properties: No data available
Oxidizing properties: No data available
Explosion limits: 0.77 - 6.5 vol % (lower; upper)

9.2. Other information
No additional information available

SECTION 10: Stability and reactivity
10.1. Reactivity
No additional information available
10.2. Chemical stability
Stable.
10.3. Possibility of hazardous reactions
No additional information available
10.4. Conditions to avoid
Heat. Sparks. Open flame.
10.5. Incompatible materials
Oxidizing agent.
10.6. Hazardous decomposition products

SECTION 11: Toxicological information
11.1. Information on toxicological effects
Acute toxicity: Not classified

<table>
<thead>
<tr>
<th>Norbornene (498-66-8)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>11300 mg/kg</td>
</tr>
<tr>
<td>LD50 oral mouse</td>
<td>13000 mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>&gt; 5 ml/kg</td>
</tr>
<tr>
<td>LC50 inhalation rat</td>
<td>26.6 mg/l</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>11300.000 mg/kg body weight</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation: Not classified
Serious eye damage/irritation: Causes serious eye irritation.
Respiratory or skin sensitization: Not classified
Germ cell mutagenicity: Not classified
Carcinogenicity: Not classified
Reproductive toxicity: Not classified
Specific target organ toxicity (single exposure): Not classified
Specific target organ toxicity (repeated exposure): Not classified
Aspiration hazard: Not classified
Symptoms/injuries after inhalation: May be harmful if inhaled.
Symptoms/injuries after skin contact: May cause mild skin irritation. May be harmful in contact with skin.
Symptoms/injuries after eye contact: Causes serious eye irritation.
Symptoms/injuries after ingestion: May be harmful if swallowed.

SECTION 12: Ecological information
12.1. Toxicity

<table>
<thead>
<tr>
<th>Norbornene (498-66-8)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 1</td>
<td>8.6 - 11.7 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])</td>
</tr>
</tbody>
</table>
12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential
No additional information available

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects
Other adverse effects: This substance may be hazardous to the environment.
Effect on ozone layer: No additional information available
Effect on the global warming: No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Sewage disposal recommendations: Do not dispose of waste into sewer.
Waste disposal recommendations: Incinerate. Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to licensed waste disposal facility.
Ecology - waste materials: Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number
UN-No.(DOT) : 1325
DOT NA no. : UN1325

14.2. UN proper shipping name
Proper Shipping Name (DOT) : Flammable solids, organic, n.o.s. (NORBORNENE)
Class (DOT) : 4.1 - Class 4.1 - Flammable Solid 49 CFR 173.124
Hazard labels (DOT) : 4.1 - Flammable solid

DOT Symbols : G - Identifies PSN requiring a technical name
Packing group (DOT) : II - Medium Danger
DOT Packaging Exceptions (49 CFR 173.xxx) : 151
DOT Packaging Non Bulk (49 CFR 173.xxx) : 212
DOT Packaging Bulk (49 CFR 173.xxx) : 240

14.3. Additional information
Emergency Response Guide (ERG) Number : 133
Other information: No supplementary information available.

Transport by sea
DOT Vessel Stowage Location: B - (i) The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) “On deck only” on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded

Air transport
DOT Quantity Limitations Passenger aircraft/rail: 15 kg
(49 CFR 173.27)
DOT Quantity Limitations Cargo aircraft only: 50 kg
(49 CFR 175.75)

SECTION 15: Regulatory information

15.1. US Federal regulations
Norbornene (498-66-8): Listed on the United States TSCA (Toxic Substances Control Act) inventory
## 15.2. International regulations

<table>
<thead>
<tr>
<th>Norbornene (498-66-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Listed on the AICS (Australian Inventory of Chemical Substances)</td>
</tr>
<tr>
<td>Listed on the Canadian NDSL (Non-Domestic Substances List)</td>
</tr>
<tr>
<td>Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)</td>
</tr>
<tr>
<td>Listed on the Japanese ISHL (Industrial Safety and Health Law)</td>
</tr>
<tr>
<td>Listed on NZIoC (New Zealand Inventory of Chemicals)</td>
</tr>
<tr>
<td>Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)</td>
</tr>
</tbody>
</table>

## 15.3. US State regulations

### NORBORNENE(498-66-8)

<table>
<thead>
<tr>
<th>U.S. - California - Proposition 65 - Carcinogens List</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. - California - Proposition 65 - Developmental Toxicity</td>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</td>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</td>
<td>No</td>
</tr>
</tbody>
</table>

### Norbornene (498-66-8)

<table>
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<tr>
<th>U.S. - California - Proposition 65 - Carcinogens List</th>
<th>U.S. - California - Proposition 65 - Developmental Toxicity</th>
<th>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</th>
<th>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</th>
<th>Non-significant risk level (NSRL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

## SECTION 16: Other information

### Abbreviations and acronyms

| Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development. |

### Full text of H-phrases:

<table>
<thead>
<tr>
<th>H228</th>
<th>Flammable solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
</tbody>
</table>

### HMIS III Rating

<table>
<thead>
<tr>
<th>Health</th>
<th>2 Moderate Hazard - Temporary or minor injury may occur</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability</td>
<td>4 Severe Hazard</td>
</tr>
<tr>
<td>Physical</td>
<td>0 Minimal Hazard</td>
</tr>
</tbody>
</table>

Prepared by safety and environmental affairs.

Date of issue: 08/02/2016  
Version: 1.0

SDS US (GHS HazCom 2012) - Custom

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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