

SAFETY DATA SHEET



Revision Date
Version / Revision

15-Sep-2015
5 .01***

product code
Issuing date

TP07
27-Jun-2016

Norbornene

1: Identification

Product Identifier

Identification of the substance/preparation

Norbornene

Chemical Name Bicyclo-[2.2.1] hept-2-ene

CAS-No 498-66-8

Recommended uses and restrictions on use

Use of the Substance / Preparation Intermediate, Monomer.

Supplier information

Supplier TOPAS Advanced Polymers GmbH
D-65926 Frankfurt
Germany

Product Information +49 (0)1805-1-86727

Emergency telephone number in USA, call 800 424 9300
outside USA, call 703 527 3887, collect calls accepted
available 24/7

2. Hazards identification

2.1. Classification of the substance or mixture

This substance is classified in accordance with paragraph (d) of §1910.1200 (GHS-US classification).

Serious eye damage/eye irritation Category 2A, H319
Reproductive toxicity Category 2, H361
Flammable solid Category 2, H228
Environmental hazard Aquatic Chronic 2; H411; Aquatic Acute 2; H401

OSHA Specified Hazards Not applicable.

2.2. Label elements

Labeling according to §1910.1200 (GHS-US labeling).

Hazard symbol(s)

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Signal word

Warning

Hazard statements

H228: Flammable solid.
H319: Causes serious eye irritation.
H361: Suspected of damaging fertility or the unborn child.
H411: Toxic to aquatic life with long lasting effects.
H401: Toxic to aquatic life

Precautionary statements

Prevention

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P240: Ground and bond container and receiving equipment.
P241: Use explosion-proof electrical/ ventilating/ lighting equipment.
P280: Wear protective gloves/eye protection/face protection.
P264: Wash hands thoroughly after handling.
P273: Avoid release to the environment.

Response

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.
P391: Collect spillage.
P308 + P313: IF exposed or concerned: Get medical advice/ attention.

Storage

P405: Store locked up.

Disposal

P501: Dispose of contents/container in accordance with local regulation.

2.3. Other hazards

None known

3. Composition / Information on ingredients

Substance

Component	CAS-No	Concentration (%)
Bicyclo [2.2.1]-hept-2-en	498-66-8	> 98
Toluene	108-88-3	< 2%

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4. First aid measures

Description of first aid measures

General advice

Remove/Take off immediately all contaminated clothing. Remove contaminated, soaked clothing immediately and dispose of safely. First aider needs to protect himself.

Inhalation

Aerate with fresh air. When symptoms persist or in all cases of doubt seek medical advice.

Eyes

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin

Wash off immediately with soap and plenty of water. When symptoms persist or in all cases of doubt seek medical advice.

Ingestion

Do not induce vomiting without medical advice. Obtain medical attention.

Most important symptoms and effects, both acute and delayed

Main symptoms

Exposure may result in reddening, tears and itching of the eyes and soreness in the nose and throat, together with coughing. Repeated and prolonged exposure to solvents may cause brain and nervous system damage.

Special hazard

None known.

Indication of medical attention/treatment

Treat symptomatically

5. Firefighting measures

Extinguishing media

Suitable extinguishing media

foam, dry chemical, carbon dioxide (CO₂).

Unsuitable Extinguishing Media

Do not use a solid water stream as it may scatter and spread fire.

Special hazards arising from the substance or mixture

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Vapours are heavier than air and may spread along floors
Under conditions giving incomplete combustion, hazardous gases produced may consist of:
carbon monoxide (CO)
carbon dioxide (CO₂)
Combustion gases of organic materials must in principle be graded as inhalation poisons

Protective equipment and precautions for fire fighters

Special protective equipment for firefighters

Fire fighter protection should include a self-contained breathing apparatus (NIOSH-approved or EN 133) and full fire-fighting turn out gear.

Precautions for firefighting

Keep people away from and upwind of fire. Cool closed containers exposed to fire with water spray. Dike and collect water used to fight fire.

6. Accidental release measures

Personal precautions

Avoid contact with skin and eyes. Keep away from heat and sources of ignition. Avoid breathing vapors or mists. Ensure adequate ventilation, especially in confined areas. Keep people away from and upwind of spill/leak. For emergency responders: Personal protection see section 8.

Environmental precautions

Prevent further leakage or spillage. Do not flush into surface water or sanitary sewer system.

Methods for containment

Stop the flow of material, if possible without risk.

Methods for cleaning up

DO NOT use combustible materials such as sawdust. Soak up with inert absorbent material. Allow to solidify, use mechanical handling equipment. Sweep up or vacuum up spillage and collect in suitable container for disposal. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours).

7. Handling and storage

Precautions for safe handling

Advice on safe handling

Provide sufficient air exchange and/or exhaust in work rooms. Refill and handle product only in closed system.

Hygiene measures

When using, do not eat, drink or smoke Wash hands before breaks and immediately after handling the product

Advice on the protection of the environment

See Section 8: Environmental exposure controls

Conditions for safe storage

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Technical measures/Storage conditions

Keep containers tightly closed in a dry, cool and well-ventilated place.

Advice on protection against fire and explosion

Keep away from sources of ignition - No smoking. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). Ground and bond containers when transferring material. Vapour is heavier than air and can travel considerable distance to a source of ignition and flashback. Vapours may form explosive mixture with air. In case of fire, emergency cooling with water spray should be available.

Incompatible products

Incompatible products:
strong oxidizing agents
acids and bases
radical initiators

8. Exposure controls / Personal protection

Exposure limits United States of America

US ACGIH

Component	TWA (mg/m ³)	TWA (ppm)	STEL (mg/m ³)	STEL (ppm)
Toluene CAS: 108-88-3		20		
Component	Asphyxia	Carcinogenic category	Included w/o limits	Exposure as low as possible
Toluene CAS: 108-88-3		A4		

US ACGIH BEIs

Component	Status
Toluene CAS: 108-88-3	listed

US OSHA Z-2

Component	TWA (mg/m ³)	TWA (ppm)	Ceiling (mg/m ³)	Ceiling (ppm)	Max. conc.	Time
Toluene CAS: 108-88-3		200		300	500 ppm	10MIN

US NIOSH Pocket Guide

Component	STEL (mg/m ³)	STEL (ppm)	REL (mg/m ³)	REL (ppm)
Toluene CAS: 108-88-3	560	150	375	100

US NIOSH IDHL

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Component	Potential cancer hazard	Concentration (mg/m ³)	Concentration (ppm)	Listed w/o limits
Toluene CAS: 108-88-3			500	

Appropriate Engineering controls

Handle product only in closed system or provide appropriate exhaust ventilation at machinery. Explosion-proof equipment (for example fans, switches, and grounded ducts) should be used in mechanical ventilation systems. Vapors may cause flash fire or explosion.

Engineering and risk Management measures should maintain strictly controlled conditions. This also applies to environmental exposure controls.

Personal protective equipment

General industrial hygiene practice

Do not breathe vapours or spray mist. Avoid contact with skin, eyes and clothing. Ensure that eyewash stations and safety showers are close to the workstation location.

Hygiene measures

When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.

Respiratory protection

Based on workplace contaminant levels and working limits of the respirator, use a respirator approved by NIOSH

Hand protection

Wear protective gloves. Recommendations are listed below. Other protective material may be used, depending on the situation, if adequate degradation and permeation data is available. If other chemicals are used in conjunction with this chemical, material selection should be based on protection for all chemicals present.

Suitable material Viton

Eye protection

Safety glasses with side-shields. In addition to goggles, wear a face shield if there is a reasonable chance for splash to the face.

Skin and body protection

Impervious clothing.

Environmental exposure controls

Use product only in closed system. If leakage can not be prevented, the substance needs to be suck off at the emersion point, if possible without danger. Inform the responsible authorities in case of leakage into the atmosphere, or of entry into waterways, soil or drains.

9. Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance solid
Colour colourless
Odour pungent

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Odour threshold	No data available
pH	No data available
Melting point/range	46 - 47 °C
Boiling point/range	95 - 96 °C @ 1013 hPa
Flash point	-8 °C
Evaporation rate	No data available
Flammability (solid, gas)	Not applicable
Lower explosion limit	0,77 Vol %
Upper explosion limit	6,5 Vol %
Vapour pressure	301 hPa @ 59 °C
Vapour density	No data available
Relative density	0.8706 g/cm ³ @20°C
Water solubility	0.13 g/l @20°C
log Pow	4.1 (measured)
Autoignition temperature	450 °C
Decomposition temperature	No data available
Viscosity	No data available

9.2. Other information

Molecular weight 94.2

10. Stability and reactivity

Reactivity

The reactivity of the product corresponds to the typical reactivity shown by the substance group as described in any text book on organic chemistry.

Chemical stability

Stable under normal conditions of handling, use and transportation.

Possibility of hazardous reactions

Hazardous polymerisation may occur. Polymerization is a highly exothermic reaction and may generate sufficient heat to cause thermal decomposition and/or rupture containers.

Conditions to avoid

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

Incompatible materials

oxygen, oxidizing agents, radical initiators, strong acids, strong bases.

Hazardous decomposition products

No decomposition if stored and applied as directed.

11. Toxicological information

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Likely routes of exposure

Inhalation, Eye contact, Skin contact

Main symptoms

Exposure may result in reddening, tears and itching of the eyes and soreness in the nose and throat, together with coughing Repeated and prolonged exposure to solvents may cause brain and nervous system damage

Acute toxicity				
Bicyclo [2.2.1]-hept-2-en (498-66-8)				
Routes of Exposure	Endpoint	Values	Species	Method
Oral	LD50	9577 mg/kg	rat	
Dermal	LD50	> 4350 ml/kg	rabbit	
Inhalative	LC50	> 26,6 mg/l (4h)	rat	

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Assessment

Based on available data, the classification criteria are not met for:

Acute oral toxicity

Acute dermal toxicity

Acute inhalation toxicity

STOT SE

Irritation and corrosion				
Bicyclo [2.2.1]-hept-2-en (498-66-8)				
Target Organ Effects	Species	Result	Method	
Eyes	rabbit	Low irritating potential severe irritation		
Skin	rabbit	No skin irritation		

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Assessment

The available data lead to the classification given in section 2

Sensitization				
Bicyclo [2.2.1]-hept-2-en (498-66-8)				
Target Organ Effects	Species	Evaluation	Method	
Skin	mouse	not sensitizing	OECD 429	

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Assessment

Based on available data, the classification criteria are not met for:

Skin sensitization

Subacute, subchronic and prolonged toxicity				
Bicyclo [2.2.1]-hept-2-en (498-66-8)				
Type	Dose	Species	Method	
28-day	NOAEL: 500 mg/kg/d	rat, male/female	OECD 422	

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90-day	NOAEL: 2,02 mg/l	rat, male/female	OECD 413	
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Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Assessment

Based on available data, the classification criteria are not met for:
STOT RE

Carcinogenicity, Mutagenicity, Reproductive toxicity					
Bicyclo [2.2.1]-hept-2-en (498-66-8)					
Type	Dose	Species	Evaluation	Method	
Mutagenicity		V79 cells, Chinese hamster	negative	OECD 473 (Chromosomal Aberration)	In vitro study
Mutagenicity		V79 cells, Chinese hamster	negative	OECD 476 (Mammalian Gene Mutation)	In vitro study
Reproductive toxicity	NOAEL 500 mg/kg/d	rat, parental	negative	OECD 422	
Reproductive toxicity	NOAEL 500 mg/kg/d	rat, 1. Generation, male/female	negative	OECD 422	
Mutagenicity	5000 µg/plate	Salmonella typhimurium	negative	OECD 471 (Ames)	
Reproductive toxicity	NOAEL 300 mg/kg/d	rat	positive	OECD 414, Oral	

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

CMR Classification

not evaluated by:

NTP: (National Toxicity Program)

IARC: (International Agency for Research on Cancer)

OSHA: (Occupational Safety & Health Administration)

Evaluation

Suspected of damaging the unborn child

In the absence of specific alerts no cancer testing is required

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Aspiration toxicity

Due to the viscosity, this product does not present an aspiration hazard

12. Ecological information

Ecotoxicity

Acute aquatic toxicity			
Bicyclo [2.2.1]-hept-2-en (498-66-8)			
Species	Exposure time	Dose	Method
Danio rerio (Zebra fish)	96h	LC50: > 7,5 mg/l	OECD 203
Poecilia reticulata (guppy)	5 d	EC50: > 40 mg/l	

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Daphnia magna (Water flea)	48h	EC50: 7,3 mg/l	OECD 202
Scenedesmus subspicatus	72h	EC50: 9,9 mg/l (Biomass)	OECD 201
Activated sludge (domestic)	3 h	EC50: > 1000 mg/l	OECD 209

Persistence/Degradability

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Biodegradation

no significant degradation.

Bioaccumulative potential

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

Bioaccumulative potential

log Pow: 4,1

log Pow 4.1 (measured)

Mobility in soil

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

No data available

Other Adverse Effects

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

No data available

Note

Avoid release to the environment.

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

ICAO-TI / IATA-DGR

UN/ID No

UN 1325

Proper shipping name

Flammable solid, organic, n.o.s.

Hazard Inducer

(Norbornene)

Class

4.1

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Marking Fish and tree
Packing group II

IMDG

UN/ID No UN 1325
Proper shipping name Flammable solid, organic, n.o.s.
Hazard Inducer (Norbornene)
Class 4.1
Marking Fish and tree
Packing group II
EmS F-A, S-G

D.O.T. (49CFR) D.O.T. (49CFR)
UN/ID No UN 1325
Proper shipping name Flammable solid, organic, n.o.s.
Hazard Inducer (Norbornene)
Class 4.1
Marking Fish and tree
Packing group II
Emergency Response Guide 133

15. Regulatory information

OSHA Regulatory Status

This material is hazardous as defined by the American OSHA Hazard Communication Standard (29CFR 1910.1200).

Federal Regulations

This product is listed on the TSCA inventory

Toluene, CAS: 108-88-3

40CFR 63.100-.106, Table 2
40CFR 63.100-.106, Table 1: Group I
Clean Water Act Section 304(a)
Clean Water Act Section 307(a)
CERCLA Hazardous Substance
CERCLA RQ 1000 LBS
EPCRA SARA Title III 313
de minimis concentration 1.0 %
DEA Essential Chemicals: Chemical Code Number: 6594

Toluene, CAS: 108-88-3

CA Hazardous Substances (Director's) List
CA Proposition 65
WARNING: This product contains a chemical known to the State of California to cause cancer, birth defects or other reproductive harm
IL Chemical Safety Act
MN Hazardous Substances List
NJ RTK List
PA RTK List

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RI RTK List

International Inventories

Bicyclo [2.2.1]-hept-2-en, CAS: 498-66-8

AICS (AU)
NDSL (CA)
EC-No. 2078660 (EU)
ENCS (4)-1763 (JP)
ISHL 7-(2)-108 (JP)
KECI 2012-3-5388 (KR)
PICCS (PH)
TSCA (US)
NZIoC (NZ)

16. Other information

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Training advice

For effective first-aid, special training / education is needed.

Hazard Rating Systems

NFPA (National Fire Protection Association)

Health Hazard	2
Fire Hazard	3
Reactivity	1

HMIS (Hazardous Material Information System)

Health Hazard	2 (*)***
Flammability	3
Physical Hazard	1

Sources of key data used to compile the datasheet

Information contained in this safety data sheet is based on TOPAS owned data and public sources deemed valid or acceptable. The absence of data elements required by OSHA, ANSI or Annex II, Regulation 1907/2006/EC indicates, that no data meeting these requirements is available.

Further information for the safety data sheet

For more information, consult the Technical Data Sheet (www.topas.com). Observe national and local legal requirements. Changes against the previous version are marked by ***.

Disclaimer

The information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. TOPAS Advanced Polymers, Inc. makes no warranty of any kind, express or implied, concerning the safe use of this material in your process or in combination with other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. User has sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards