SAFETY DATA SHEET

1. PRODUCT AND COMPANY IDENTIFICATION

A. Product name: Tetrahydrofuran

Other means of identification

Product No.: 2858, 8498, 9432, 9439, 9440, 9441, 9446, 9447, 9450, 9923, V530, V558

B. Recommended use and Limitations on use:

Recommended use: For Laboratory, Research or Manufacturing Use.
Restrictions on use: Not determined.

C. Details of the supplier of the safety data sheet:

Company Name:	Avantor Performance Materials Korea Limited
Address:	201-204, Ace Gwanggyo tower 1, Daehak 4ro 17, Yeongtong-gu, Suwon, Korea 16226
Telephone:	82-31-645-7250
Fax:	82-31-645-7279

Emergency telephone number: CHEMTREC: 080-822-1374 (24/7)

2. HAZARDS IDENTIFICATION

A. Hazard category/Classification:

Physical Hazards

Flammable liquids	Category 2

Health Hazards

Acute toxicity (Oral)	Category 4
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 2
Specific Target Organ Toxicity - Single Exposure	Category 3[1.]

Target Organs

1. Respiratory tract irritation.

B. Warning label items including precautionary statement:

Pictograms:

Signal Words: Danger

Hazard Statement(s):

H225: Highly flammable liquid and vapor.
H302: Harmful if swallowed.
H315: Causes skin irritation.
H319: Causes serious eye irritation.
H351: Suspected of causing cancer.
H335: May cause respiratory irritation.
H336: May cause drowsiness or dizziness.

Precautionary Statements:

Prevention:

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P281: Use personal protective equipment as required.
P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233: Keep container tightly closed.
P240: Ground and bond container and receiving equipment.
P241: Use explosion-proof [electrical/ventilating/lighting] equipment.
P242: Use non-sparking tools.
P243: Take action to prevent static discharges.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P261: Avoid breathing dust/mist/vapors/spray.
P271: Use only outdoors or in a well-ventilated area.
P270: Do not eat, drink or smoke when using this product.
P264: Wash thoroughly after handling.

Response:

P370+P378: In case of fire: Use water spray, foam, dry powder or carbon dioxide for extinction.
P308+P313: IF exposed or concerned: Get medical advice/attention.
P301+P312: IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P330: Rinse mouth.
P304+P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P312: Call a POISON CENTER/doctor if you feel unwell.
P303+P361+P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P332+P313: If skin irritation occurs: Get medical advice/attention.
P362: Take off contaminated clothing.
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.

Storage:

P233: Keep container tightly closed.
P403: Store in a well-ventilated place.
P235: Keep cool.
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.

C. Other hazards not included in the hazard category criteria: No data available.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Substances

Chemical name	Common name and synonyms	CAS number	KECI No.	Content in percent (%)
Tetrahydrofuran		109-99-9	KE-33454	99 - 100%

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. FIRST AID MEASURES

General: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

A. In case of eye contact Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Get medical attention.

B. In case of skin contact: Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

C. In case of inhalation: Move to fresh air. Get medical attention if symptoms persist. If breathing is difficult, give oxygen. If breathing stops, provide artificial respiration.

D. In case of swallowing: Call a physician or poison control center immediately. Do not induce vomiting without advice from poison control center. Never give liquid to an unconscious person.

E. Notes to the physician:

Hazards: Suspected of causing cancer.

Symptoms: Irritating to eyes, respiratory system and skin.

Treatment: Treat symptomatically. Symptoms may be delayed.

5. FIRE-FIGHTING MEASURES

General Fire Hazards: Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back.

A. Suitable (and unsuitable) extinguishing media:

Suitable extinguishing media: Water spray, foam, dry powder or carbon dioxide.

Unsuitable extinguishing media: Avoid water in straight hose stream; will scatter and spread fire.

B.Special hazards arising from the substance or mixture: Vapors may cause a flash fire or ignite explosively. Vapors may travel considerable distance to a source of ignition and flash back. Prevent buildup of vapors or gases to explosive concentrations. May form explosive peroxides.

C. Specific methods of fire-fighting: Use water spray to keep fire-exposed containers cool. Water may be ineffective in fighting the fire. Fight fire from a protected location. Move containers from fire area if you can do so without risk. Cool containers exposed to flames with water until well after the fire is out. Vapors may travel considerable distance to a source of ignition and flash back. Vapors may cause a flash fire or ignite explosively.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures: Use personal protective equipment. Keep unauthorized personnel away. Keep upwind. Ventilate closed spaces before entering them. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). See Section 8 of the SDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

B. Environmental Precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so. Avoid discharge into drains, water courses or onto the ground.

C. Methods and material for containment and cleaning up: In case of leakage, eliminate all ignition sources. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Dike for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Stop the flow of material, if this is without risk. Inform authorities if large amounts are involved.

7. HANDLING AND STORAGE

A. Precautions for safe handling: DO NOT handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Take precautionary measures against static discharges. Contact with air and light may form explosive peroxides. If peroxide formation is suspected, do not open or move container. Use personal protective equipment as required. Avoid breathing mists or vapors. Do not taste or swallow. Use only with adequate ventilation. Avoid contact with eyes, skin, and clothing. Wash hands thoroughly after handling. See Section 8 of the SDS for Personal Protective Equipment.

B. Conditions for safe storage, including any incompatibilities: Keep away from food, drink and animal feeding stuffs. Prolonged contact with air may cause formation of explosive peroxides. Nitrogen blanketing of containers is recommended. Keep container tightly closed in a cool, well-ventilated place. Ground container and transfer equipment to eliminate static electric sparks. Comply with all national, state, and local codes pertaining to the storage, handling, dispensing, and disposal of flammable liquids.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

A. Exposure limit values, biological values, etc.:

Occupational Exposure Limits

Chemical name	Type	Exposure Limit Values	Source
Tetrahydrofuran	STEL	100 ppm	Korea. OELs. Standards for Exposure to Chemical Substances and Physically Hazardous Factors (08 2016)
	TWA	50 ppm	Korea. OELs. Standards for Exposure to Chemical Substances and Physically Hazardous Factors (08 2016)

Biological Limit Values

Chemical Identity	Exposure Limit Values	Source
Tetrahydrofuran (tetrahydrofuran: Sampling time: End of shift.)	2 mg/l (Urine)	ACGIH BEI (03 2013)

B. Appropriate engineering controls: No data available.

C. Personal protective equipment (ppe):

Respiratory Protection: In case of inadequate ventilation use suitable respirator. Chemical respirator with organic vapor cartridge and full facepiece.

Eye Protection: Wear safety glasses with side shields (or goggles) and a face shield.

Hand Protection: Chemical resistant gloves

Body protection: Wear suitable protective clothing.

Hygiene measures: Provide eyewash station and safety shower. Observe good industrial hygiene practices. Do not eat, drink or smoke when using the product. Wash hands before breaks and immediately after handling the product. Wash contaminated clothing before reuse. Avoid contact with eyes, skin, and clothing.

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance:

Physical state: Liquid
Form: Liquid
Color: Colorless
B. Odor: Ether-like
C. Odor Threshold: No data available.
D. pH: No data available.
E. Melting point/freezing point: -108.3 °C
F. Boiling point, initial boiling point, and boiling range: 65 °C
G. Flash Point: -14 °C (Closed Cup)
H. Evaporation Rate: 8 (butyl acetate=1)
I. Flammability (solid, gas): Class IB Flammable Liquid
J. Upper/lower limit on flammability or explosive limits:
Flammability Limit - Upper (%): 11.8 %(V)
Flammability Limit - Lower (%): 1.8 %(V)
Dust Explosion Limit, Upper: No data available.
Dust Explosion Limit, Lower: No data available.
K. Vapor pressure: 21.60 kPa (25 °C)
L. Solubility(ies):
Solubility in Water: Miscible
Solubility (other): No data available.
M. Vapor density (air=1): 2.56 (Air=1)
N. Specific Gravity: 0.88 (25 °C)
O. Partition coefficient (n-octanol/water): 0.46
P. Autoignition Temperature: 321 °C

Q. Decomposition Temperature:	No data available.
R. Viscosity:	No data available.
S. Molecular weight:	72.11 g/mol (C4H8O)

Other information:

Minimum ignition energy:	0.54 mJ

10. STABILITY AND REACTIVITY

A.Stability and hazardous reaction potential

Stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
B. Conditions to avoid:	Heat, sparks, flames. Protect against direct sunlight.
C. Incompatible Materials:	Strong oxidizing agents. Strong oxidizing agents. Acids. Bases, alkalies (organic). Air. May attack some plastics, rubber and coatings.
D. Hazardous Decomposition Products:	Thermal decomposition may release oxides of carbon.

11. TOXICOLOGICAL INFORMATION

A. Information on likely routes of exposure:

Inhalation:	May cause respiratory irritation.
Skin Contact:	Causes skin irritation.
Eye contact:	Causes serious eye irritation.
Ingestion:	Harmful if swallowed. May cause irritation of the gastrointestinal tract.

B. Information on health hazards:
Acute toxicity (list all possible routes of exposure)

Oral

Product:	LD 50 (Rat): 1,650 mg/kg

Dermal

Product:	LD 50 (Rat): > 2,000 mg/kg

Inhalation

Product:	LC 50 (Rat): 80975 ppm LC 50 (Rat): 18000 - 22000 ppm NOAEL (Rat): 15.9 - 16.8 mg/l

Repeated dose toxicity

Product:	None known.

Skin Corrosion/Irritation

Product:	Causes skin irritation.

Serious Eye Damage/Eye Irritation

Product:	Causes serious eye irritation.

Respiratory or Skin Sensitization
Product: Not a skin nor a respiratory sensitizer.

Carcinogenicity
Product: Suspected of causing cancer.

ACGIH Carcinogens
No carcinogenic components identified

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

Germ Cell Mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity
Product: No components toxic to reproduction

Specific Target Organ Toxicity - Single Exposure
Product: Narcotic effect. Respiratory tract irritation.

Specific Target Organ Toxicity - Repeated Exposure
Product: None known.

Target Organs
Specific Target Organ Toxicity - Single Exposure: Respiratory tract irritation.

Aspiration Hazard
Product: Not classified

Other effects: None known.

12. ECOLOGICAL INFORMATION

A. Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Specified substance(s):
Tetrahydrofuran — LC 50 (Fathead minnow (Pimephales promelas), 96 h): 1,970 - 2,360 mg/l
EC 50 (Fathead minnow (Pimephales promelas), 96 h): 1,930 mg/l

Aquatic Invertebrates
Product: No data available.

Specified substance(s):
Tetrahydrofuran — LC 50 (Water flea (Daphnia magna), 24 h): > 10,000 mg/l
EC 50 (Daphnia magna, 24 h): 5,930 mg/l

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic Invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

B. Persistence and Degradability

Biodegradation
Product: The product is moderately biodegradable.

BOD/COD Ratio
Product: No data available.

C. Bioaccumulative potential
Bioconcentration Factor (BCF)
Product: No data available on bioaccumulation.

Partition Coefficient n-octanol / water (log Kow)
Product: Log Kow: 0.46

D. Mobility in soil: The product is water soluble and may spread in water systems.

E. Other adverse effects: The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

13. DISPOSAL CONSIDERATIONS

A. Method of disposal: Discharge, treatment, or disposal may be subject to national, state, or local laws.

B. Disposal considerations (including disposal of contaminated containers or packaging): No data available.

14. TRANSPORT INFORMATION

IMDG

A.: UN Number:	UN 2056
B.: UN Proper Shipping Name:	TETRAHYDROFURAN
C.: Transport Hazard Class(es)	
Class:	3
Label(s):	3
EmS No.:	F-E, S-D
D.: Packing Group:	II
E.: Marine Pollutant:	No
F.: Special precautions, which a user needs to be aware of, or needs for transportation and transport methods:	None.

IATA

A.: UN Number:	UN 2056
B.: Proper Shipping Name:	Tetrahydrofuran
C.: Transport Hazard Class(es):	
Class:	3

Label(s):	3
D.: Packing Group:	II
E.: Marine Pollutant:	No
F.: Special precautions, which a user needs to be aware of, or needs for transportation and transport methods:	None.

15. REGULATORY INFORMATION

A. Restriction under the Industrial Safety and Health Law:

Harmful Substances Prohibited from Manufacturing
None present or none present in regulated quantities.

Harmful Substances Requiring Permission for Manufacture or Use
None present or none present in regulated quantities.

Controlled Hazardous Substances

Chemical name	
Tetrahydrofuran (109-99-9)	Listed

Harmful Substances Requiring Special Medical Examination

Chemical name	
Tetrahydrofuran (109-99-9)	Listed

Harmful Substances Requiring Workplace Environment Monitoring

Chemical name	
Tetrahydrofuran (109-99-9)	Listed

B. Restrictions under the Chemicals Control Law:

Accidental Release Prevention Substances
None present or none present in regulated quantities.

C. Restrictions under the Dangerous Substances Safety Management Act:

Dangerous Substances Safety Management Act

Chemical name	Class	Threshold limit value
Tetrahydrofuran (109-99-9)	Class 4: Flammable liquid.	400 liters

D. Restrictions under the Wastes Control Act:

Halogenated Materials in Waste Organic Solvents
Not Regulated

E. Restrictions under other foreign or domestic laws:

Clean Air Conservation Act

Air Pollutants
Not Regulated

Specific Air Pollutants
Not Regulated

Act on the Registration and Evaluation of Chemicals
Banned Toxic Chemicals
None present or none present in regulated quantities.

Designated Existing Chemicals Subject to Registration (PEC) (MoE No. 2015-92)
Not Regulated

Restricted Chemical Substances
None present or none present in regulated quantities.

Toxic Chemicals
None present or none present in regulated quantities.

Inventory Status

AICS	On or in compliance with the inventory
DSL	On or in compliance with the inventory
IECSC	On or in compliance with the inventory
ENCS (JP)	On or in compliance with the inventory
ISHL (JP)	On or in compliance with the inventory
KECI (KR)	On or in compliance with the inventory
INSQ	On or in compliance with the inventory
NZIOC	On or in compliance with the inventory
PICCS (PH)	On or in compliance with the inventory
TCSI	On or in compliance with the inventory
TSCA	On or in compliance with the inventory
EU INV	On or in compliance with the inventory

16. OTHER INFORMATION

A. Source of information: Sources of information used in preparing this SDS included one or more of the following: results from in house or supplier toxicology studies, information from the Toxicology Data Network (TOXNET), European Chemical Agency (ECHA) substance dossiers, IARC Monographs, US National Toxicology Program data, the Agency for Toxic Substances and Disease Registry, other manufacturer's SDSs and other sources, as appropriate.

B. Issue Date: 05/16/2014

C. Number of revisions and date of most recent revision: 3
03/01/2021

D. Other: No data available.

Disclaimer:

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