

	<b>Material Safety Data Sheet</b>			Doc. No.	MSDS-003
				Initial Issue Date	1996. 6.
				Revision Date	2012. 5.
Substance name	Tetrahydrofuran				
CAS NO	KE NO	UN NO	EC NO		
109-99-9	KE-33454	2056	203-726-8		

## 1. Identification of the substance/mixture and of the company:

1.1 Substance name	Tetrahydrofuran
1.2 Intended Use and Use Limitations	
Intended Use	No Data Available
Use Limitations	No Data Available
1.3 Company identification	
Company	Korea PTG Co., Ltd.
Address	489-3, Yongyeon- Dong, Nam-Ku, Ulsan, Korea
Tel, Number	Tel 82-52-228-7700 Fax 82-52-257-5246
Emergency number	82-52-228-7700
Team	Environment & Safety Team

## 2. Hazard-Risk:

2.1 Hazard-Risk classification	Flammable liquids : cat2 Acute toxicity substance : cat4 Skin corrosion or irritation substance : cat2 Serious eyes damages or irritation substance : cat.2A Specific target organ toxicity substance(single exposure) : cat2 Specific target organ toxicity substance(single exposure) : cat3 - irritating to respiratory system Specific target organ toxicity substance(repeated exposure) : cat1
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### 2.2 Label element, including and precautionary statements

Pictogram



Signal word

Hazard-Risk statement

Danger

H225 High flammable liquids or vapors

H302 Harmful if swallowed

H315 Cause severe skin burns and eye damage

H319 Cause serious eye damage

H371 May cause damage to organs

H335 May cause respiratory irritation

	H372 Cause damage to organs through prolonged or repeated exposure
precautionary statement	
Prevention	<p>P210 Keep away from heat/sparks/open flames/hot surfaces. - No</p> <p>P233 Keep container tightly closed.</p> <p>P240 Ground/bond container and receiving equipment.</p> <p>P241 Use explosion-proof electrical/ventilating/lighting/.../equipment.</p> <p>P242 Use only non-sparking tools.</p> <p>P243 Take precautionary measures against static discharge.</p> <p>P280 Wear protective gloves/protective clothing/eye protection/face</p> <p>P264 Wash ... thoroughly after handling.</p> <p>P270 Do not eat, drink or smoke when using this product.</p> <p>P260 Do not breathe dust/fume/gas/mist/vapours/spray.</p> <p>P271 Use only outdoors or in a well-ventilated area.</p>
Response	<p>P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated</p> <p>P370+P378 In case of fire: Use ... for extinction.</p> <p>P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.</p> <p>P330 Rinse mouth.</p> <p>P302+P352 IF ON SKIN: Wash with plenty of soap and water.</p> <p>P321 Specific treatment (see ... on this label).</p> <p>P332+P313 If skin irritation occurs: Get medical advice/attention..</p> <p>P362 Take off contaminated clothing and wash before reuse.  פסוק+פסוק+פסוק ז' נ' ע'פ: ריניס קאוויוסיג וויט וואר וור סעוורל מינוט. רעמוו קאנטאקט לנסי, יפ פרנסי אד עאסי טו דו. קאנטינוו ריניסיג</p> <p>P337+P313 If eye irritation persists: Get medical advice/attention.</p> <p>P309+P311 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician</p> <p>P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.</p> <p>P312 Call a POISON CENTER or doctor/physician if you feel unwell.</p> <p>P314 Get medical advice/attention if you feel unwell.</p>
Storage	<p>P403+P235 Store in a well-ventilated place. Keep cool.</p> <p>P405 Store locked up.</p> <p>P403+P233 Store in a well-ventilated place. Keep container tightly closed.</p>
Disposal	P501 Dispose of contents/container to ...
2.3 Other hazard-Risk which are not included in the classification(NFPA)	
Health	2
Fire	3
Reactivity	1

### 3. Composition/Information on Ingredients:

Substance name	Trivial name	CAS No	Content(%)
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Tetrahydrofuran	Tetramethylene Oxide	109-99-9	> 99.9%
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#### 4. First aid measures:

4.1 In case of intrusion into eye	Wash eyes for at least 15 minutes with plenty of water. Consult with a doctor.
4.2 In case of skin contamination	Wash eyes for at least 15 minutes with soap and water. If irritation or symptoms occur, consult with a Rinse contaminated clothing before reuse. Remove contaminated clothing and shoes.
4.3 In case of respiratory	Avoid exposure from sources. Do artificial respiration if needed. Get medical attention.
4.4 In case of ingestion	Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.
4.5 Notices to physicians	Medical team are aware this substance and take protective measures.
4.6 The most important acute/delayed symptom.	
Inhale	
Short time exposure.	Irritation, blood pressure, vomit, headache, sleepiness, function loss suffocation, insensibility.
Long time exposure.	Irritation, nosebleed, liner trouble, genital influence, brain trouble, insensibility.
Intake	
Short time exposure.	Irritation, nausea, vomit, diarrhea, stomachache.
Long time exposure.	kidney trouble, liner trouble.
Skin contact	
Short time exposure.	Irritation
Long time exposure.	Irritation
Eyes contact	
Short time exposure.	Irritation, tearjacker.
Long time exposure.	Visual impairment.
4.7 Indication of immediate medical attention and Doctor directions	When person intakes, consider stomach pump and activate carbon slurry inject.

#### 5. Explosion, fire measures:

### 5.1 Suitable(Inappropriate) extinguishing media

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Inappropriate extinguishing media

Major fire

-  
Use alcohol foam or big water sprinke by fine spray.

### 5.2. Specific hazards arising from the chemical

Heat decomposition product

Fire and explosion risk

Carbon oxide

SERIOUS FIRE RISK. The mixture of vapour and air is explosive. Vapour is heavier than air. Vapour or gas can ignite from distant fire source and spread rapidly

### 5.3. Protective equipment and precaution for fire-fighters

Move container from fire area if it can be done without risk. Cool Containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool Containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2

## 6. Accidental release measures:

### 6.1 Personal precautions, protective equipment

Use personal protective equipment.  
Avoid breathing vapors, 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.

### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do

### 6.3 Methods and materials for containment and

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).

## 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.

### 7.2 Conditions for safe storage

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.

## 8 Exposure controls/personal protection:

### 8.1 exposure limits of chemical substance, Biological exposure limits

Domestic regulation

TWA - 50ppm 140mg/m<sup>3</sup>

STEL - 100ppm 280mg/m<sup>3</sup>

ACGIH regulation

TWA - 200 ppm 590 mg/m<sup>3</sup>

STEL - 250 ppm 735 mg/m<sup>3</sup>

Biological exposure limits

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### 8.2 Appropriate engineering controls

Install ventilation equipment.

Ensure compliance with applicable exposure Ventilation equipment should be explosion-resistant type if explosive concentration of

### 8.3 Conditions for safe storage

Respiratory Protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (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).

Tightly fitting safety goggles. Faceshield (8-inch minimum).

Eye protection

Hands protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Provide an emergency eye wash foundation and quick drench shower in the immediate work area.

Body 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.

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.

Hygiene measures

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

## 9. Physical and chemical properties:

9.1 Appearance

Physical state

Liquid.

Colour

Achromatic color.

9.2 Odour

Sweet Smell

9.3 Odour threshold

No Data Available

9.4 pH

No Data Available

9.5 Melting point/freezing point

-108 °C

9.6 Initial boiling point and boiling range

66 °C

9.7 Flash point

-14 °C

9.8 Evaporation rate

No Data Available

9.9 Flammability (solid, gas)

No Data Available

9.10 Upper/lower flammability or explosive limits

11.8/2%

9.11 Vapour pressure

19.3kPa(20°C)

9.12 Solubility

100g/100mℓ(Water)

9.13 Vapour density

2.49

9.14 density

0.8892(20°C/4°C)

9.15 N-octanol/water partition coefficient

0.46( = log Pow (Measurements))

9.16 Auto-ignition temperature

321°C

9.17 Decomposition temperature

No Data Available

9.18 Viscosity

0.53cP(20 °C)

- 9.19 Molecular weight
- 9.20 Molecular formula

72.1  
C4H8O

## 10. Stability and reactivity:

- 10.1 Chemical stability
- 10.2 Possibility of hazardous reactions
- 10.3 Conditions to avoid
- 10.4 Substance to avoid
- 10.5 Hazardous decomposition products

Explosive peroxides can be produced.  
- Avoid with Long-term storage/air and light contact or storage and use above room temperature.  
Polymerization: Polymerizes with exothermic reaction. Avoid contact with heat or acids or amines.  
Avoid contact with heat, flames, sparks and other sources of ignition sparks.  
If container is exposed to heat, containers may rupture or explode.  
Acids, bases, halogens, metals, oxidizing materials, combustible materials, metal oxide  
Hazardous decomposition products formed under fire conditions. - Carbon oxides

## 11. Toxicological information:

### 11.1 Information on the likely route of exposure

Inhalation

May be harmful if inhaled. Causes respiratory tract irritation.

Oral

Vapours may cause drowsiness and dizziness.

Skin Contact

Harmful if swallowed.

Eye contact

Harmful if absorbed through skin. Causes skin irritation.

Causes eye irritation.

### 11.2 Delayed and immediate effects and also chronic effects from short and long term exposure

Acute toxicity

Oral

LD<sub>50</sub> rat - 1,650 mg/kg

LD<sub>50</sub> guinea pig - 2,300 mg/kg

Dermal

LD<sub>50</sub> rat - > 2,000 mg/kg

Inhalation

LC<sub>50</sub> Inhalation - rat - 3 h - 21000 ppm

Remarks: Drowsiness Lungs, Thorax, or Respiration:Respiratory stimulation.

Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Skin corrosion or irritation

rabbit - Mild skin irritation - Draize Test

Serious eyes damages or irritation

rabbit - Risk of serious damage to eyes. - Draize

Respiratory sensitization

mouse - Did not cause sensitization on laboratory animals.

Germ cell mutagenicity

In vivo tests did not show mutagenic effects

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.
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.
ACGIH	A3
Reproductive toxicity	The effect on reproductive function and reproductive capacity by rats is not reported. Coma, cramps and shortness of breath in rats appear.
Specific target organ toxicity - single exposure	The mucous membranes in humans make Kidney failure, liver failure and central Nervous Convulsion in humans is reported.
Specific target organ toxicity - repeated exposure	

11.3 Numerical Scale of toxicity (Acute toxicity Estimates)

No Data Available

## 12. Ecological information:

### 12.1 Aquatic-terrestrial ecotoxicity

Fish

LC<sub>50</sub> - Pimephales promelas (fathead minnow) - 2,160 mg/l - 96 h

Algae

Growth inhibition NOEC - Algae - 3,700 mg/l - 192 h

Bird

No Data Available

### 12.2 Persistence and degradability

Persistence

No Data Available

degradability

No Data Available

### 12.3 Bioaccumulative potential

Accumulation

No Data Available

Biodegradation

No Data Available

### 12.4 Mobility in soil

No Data Available

### 12.5 Other hazardous effects

No Data Available

## 13. Disposal considerations:

Dispose in accordance with all applicable regulations.

### 13.1 Disposal methods

Waste disposal regulation in the United States : U.S.EPA 40 CFR 262.

Hazardous waste number(s): U213.

13.2 Disposal attention

Consider notices of regulations in case that it is indicated in waste disposal regulation.

#### 14. Transport information:

14.1 UN Number	2056
14.2 Proper shipping name	Tetrahydrofuran
14.3 Transport hazard class	3
14.4 Packing group	II
14.5 Marine pollutant	No Data Available
14.6 Special precautions for user	
Emergency measures in case of fire	F-E
Emergency measures in the effluent	S-D

#### 15. Regulatory information:

15.1 Industrial Safety and Health Act	Follow the laws of your country
15.2 Toxic Chemicals Control Act	No Data Available
15.3 Safety Control of Dangerous Substances Act	Follow the laws of your country
15.4 Waste management Act.	No Data Available
15.5 Other requirements in domestic and other	
Domestic regulation	
Persistent Organic Pollutants Management Act	Not Applicable
Foreign regulation	
American Management Information (OSHA Regulation)	Not Applicable
American Management Information (CERCLA Regulation)	453.599 kg 1000 lb
American Management Information (EPCRA 302 Regulation)	Specify Quantity
American Management Information (EPCRA 304 Regulation)	Not Applicable
American Management Information (EPCRA 313 Regulation)	Not Applicable
American Management Information (Rotterdam Convention material)	Not Applicable
American Management Information (Stockholm Convention material)	Not Applicable
American Management Information (Montreal Protocol material)	Not Applicable
EU classification Information (Final classification results)	F; R11-19 Xi; R36/37
EU classification Information (Risk statement)	R11, R19, R36/37
EU classification Information (Safety statement)	S2, S16, S29, S33

## 16. Other information:

### 16.1 Reference

(1) SAX (8th, 1992) (2) NFPA (12th, 1997) p.49-126 (3) Howard (1997) (4) Merck (Access on May 2005) (5) Renso (3rd, 1986)(6) ACGIH (7th; 2001) (8) ACGIH (2006) (9) NTP (1998) (10) ACGHI (7th; 2001) (11) IUCLID (2000) (12) ACGIH (7th; 2005) (13) SITTIG (47th; 2002) (14) ICSC (1997) (15) HSDB(2005) (16) HSFS (1997) (17) PHYSPROP Database (2005)

### 16.2 Initial Issue Date

2009-07-20

### 16.3 Revision number and date

2012-05-15

### 16.4 Others

No Data Available