1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Tetrahydrofuran

Product Use Description: Solvent

Information of Manufacturer, Supplier:

Company: SK Chemicals Co., Ltd.

Address: 310, Pangyoo-ro, Bundang-gu, Seongnam-si, Gyeonggi-do 463-400, Korea

Emergency call: +82-2-2008-2325
+82-2-2008-2326
+82-52-279-1861

2. HAZARDS IDENTIFICATION

Classification of the substance or mixture:

Classification of the substance or mixture: Flammable liquids, Category 2
Acute toxicity, Category 4, Oral
Skin irritation, Category 2
Eye irritation, Category 2A
Specific target organ toxicity - single exposure, Category 3,
respiratory tract irritation, narcotic effect
Specific target organ toxicity - single exposure, Category 2
Specific target organ toxicity - repeated exposure, Category 1

GHS Label elements, including precautionary statements:

Symbol(s):

Signal word: Danger

Hazard statements:
Highly flammable liquid and vapour.
Harmful if swallowed.
Causes skin irritation.
Causes serious eye irritation.
May cause respiratory irritation.
May cause drowsiness and dizziness.
May cause damage to organs.
Causes damage to organs through prolonged or repeated exposure.

Precautionary statements: Prevention:
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting/ equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ eye protection/ face protection.

Response:
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing.
Rinse skin with water/ shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed or if you feel unwell: Call a POISON CENTER or doctor/ physician.
Get medical advice/ attention if you feel unwell.
Specific treatment (see supplemental first aid instructions on this label).
Rinse mouth.
If skin irritation occurs: Get medical advice/ attention.
If eye irritation persists: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal:
Dispose of contents/ container to an approved waste disposal plant.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical nature</th>
<th>Chemical Name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance</td>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>100.00 %</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

Inhalation : Remove to fresh air.
If not breathing, give artificial respiration.
If breathing is difficult, give oxygen.
Use oxygen as required, provided a qualified operator is present.
Call a physician.

Skin contact : Wash off immediately with plenty of water for at least 15 minutes.
Take off contaminated clothing and shoes immediately.
Wash contaminated clothing before re-use.
Call a physician.

Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Call a physician.

Ingestion:
- Do not induce vomiting without medical advice.
- Never give anything by mouth to an unconscious person.
- Call a physician.

Notes to physician: Treat symptomatically.

5. FIREFIGHTING MEASURES

**Suitable extinguishing media**
- Alcohol-resistant foam
- Carbon dioxide (CO2)
- Dry chemical
- Cool closed containers exposed to fire with water spray.

**Unsuitable extinguishing media**
- Do not use a solid water stream as it may scatter and spread fire.

**Specific hazards during firefighting**
- Extremely flammable.
- Vapours may form explosive mixtures with air.
- Vapours are heavier than air and may spread along floors.
- Vapors may travel to areas away from work site before igniting/flashing back to vapor source.
- May form explosive peroxides.
- In case of fire hazardous decomposition products may be produced such as:
  - Carbon monoxide
  - Carbon dioxide (CO2)

**Protective equipment for firefighters**
- Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

**Personal precautions, protective equipment and emergency procedures**
- Wear personal protective equipment.
- Immediately evacuate personnel to safe areas.
- Keep people away from and upwind of spill/leak.
- Ensure adequate ventilation.
- Remove all sources of ignition.
- Do not swallow.
- Do not breathe vapours or spray mist.
- Avoid contact with skin, eyes and clothing.

**Environmental precautions**
- Prevent further leakage or spillage if safe to do so.
- Prevent product from entering drains.
- Discharge into the environment must be avoided.
- Do not flush into surface water or sanitary sewer system.
- Do not allow run-off from fire fighting to enter drains or water courses.

**Methods and materials for containment and cleaning up**
- Ventilate the area.
- No sparking tools should be used.
- Use explosion-proof equipment.
- Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local/national regulations (see section 13).
7. HANDLING AND STORAGE

Handling

Precautions for safe handling: Wear personal protective equipment. Use only in well-ventilated areas. Keep container tightly closed. Do not smoke. Do not swallow. Do not breathe vapours or spray mist. Avoid contact with skin, eyes and clothing.

Advice on protection against fire and explosion: May form explosive peroxides. Keep away from fire, sparks and heated surfaces. Take precautionary measures against static discharges. Ensure all equipment is electrically grounded before beginning transfer operations. Use explosion-proof equipment. Keep product and empty container away from heat and sources of ignition. No sparking tools should be used. No smoking.

Storage

Conditions for safe storage, including any incompatibilities: Store in area designed for storage of flammable liquids. Protect from physical damage. Keep containers tightly closed in a dry, cool and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep away from heat and sources of ignition. Keep away from direct sunlight. Protect from exposure to air/oxygen (peroxide formation). Protect against light. Store away from incompatible substances. Container hazardous when empty. Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters:

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS No</th>
<th>Value</th>
<th>Control parameters</th>
<th>Update</th>
<th>Basis</th>
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</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>STEL : Short term exposure limit</td>
<td>280 mg/m³ (100 ppm)</td>
<td>06 2007</td>
<td>KR OEL:Occupational Exposure Limits Korea</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TWA : time weighted average</td>
<td>140 mg/m³ (50 ppm)</td>
<td>06 2007</td>
<td>KR OEL:Occupational Exposure Limits Korea</td>
</tr>
</tbody>
</table>
Appropriate engineering controls

Use with local exhaust ventilation.
Prevent vapor buildup by providing adequate ventilation during and after use.

Individual protection measures, such as personal protective equipment

Respiratory protection : In case of insufficient ventilation, wear suitable respiratory equipment.
For rescue and maintenance work in storage tanks use self contained breathing apparatus.
Use NIOSH approved respiratory protection.

Hand protection : Solvent-resistant gloves
Gloves must be inspected prior to use.
Replace when worn.

Eye protection : Do not wear contact lenses.
Wear as appropriate:
Safety glasses with side-shields
If splashes are likely to occur, wear:
Goggles or face shield, giving complete protection to eyes

Skin and body protection : Wear as appropriate:
Solvent-resistant apron
Flame retardant antistatic protective clothing
If splashes are likely to occur, wear:
Protective suit

Hygiene measures : When using, do not eat, drink or smoke.
Wash hands before breaks and immediately after handling the product.
Keep working clothes separately.
Remove and wash contaminated clothing before re-use.
Do not swallow.
Do not breathe vapours or spray mist.
Avoid contact with skin, eyes and clothing.
This material has an established AIHA ERPG exposure limit.

Protective measures : Ensure that eyewash stations and safety showers are close to the workstation location.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state : liquid
Colour : colourless
Odour : ether-like
pH : Note: not applicable
Melting point/freezing point : -108.5 °C
Boiling point/boiling range : 66 °C
Flash point : 7 °F (-14 °C)
   Method: closed cup
Evaporation rate : 14.5
   Method: Compared to Butyl acetate.
Lower explosion limit : 2 %(V)
Upper explosion limit : 11.8 %(V)
Vapour pressure : 189 hPa
   at 20 °C (68 °F)
Vapour density : 2.5
   Note: (Air = 1.0)
Density : 0.8892 g/cm³ at 20 °C
Water solubility : Note: completely soluble
Ignition temperature : 321 °C
Molecular Weight : 72.11 g/mol

10. STABILITY AND REACTIVITY

Chemical stability : Stable under recommended storage conditions.
Possibility of hazardous reactions : Hazardous polymerisation may occur.
Conditions to avoid : Heat, flames and sparks.
   Keep away from direct sunlight.
   Protect from exposure to air/oxygen (peroxide formation).
   Protect against light.
Incompatible materials to avoid : Strong oxidizing agents
   Strong acids and strong bases
   May form explosive peroxides.
   May attack many plastics, rubbers and coatings.
Hazardous decomposition products : Peroxides
   In case of fire hazardous decomposition products may be produced such as:
   Carbon monoxide
   Carbon dioxide (CO₂)

11. TOXICOLOGICAL INFORMATION

Acute oral toxicity : LD₅₀: 1,650 mg/kg
   Species: rat
Acute inhalation toxicity : LC₅₀: 53.1 mg/l
   Exposure time: 4 h
Species: rat

: LC50: 21000 ppm
Exposure time: 3 h
Species: rat

Skin corrosion/irritation

: Species: rabbit
Tetrahydrofuran
Result: Irritating to skin.

Serious eye damage/eye irritation

: Result: Irritating to eyes.

Further information

Note: Confirmed animal carcinogen with unknown relevance to humans.

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish

: LC50: 2,160 mg/l
Exposure time: 96 h
Species: Pimephales promelas (fathead minnow)

: LC50: 2,820 mg/l
Species: Leuciscus idus (Golden orfe)

Toxicity to bacteria

: LC50: > 580 mg/l
Exposure time: 16 h
Species: Bacteria

Other adverse effects

Additional ecological information: Bioaccumulation is unlikely.

13. DISPOSAL CONSIDERATIONS

Disposal methods: In accordance with local and national regulations.

14. TRANSPORT INFORMATION

IATA

UN/ID No.: UN 2056
Description of the goods: Tetrahydrofuran
Class: 3
Packing group: II
Labels: 3
Packing instruction (cargo aircraft): 364
Packing instruction (passenger aircraft): 353
Packing instruction (passenger aircraft): Y341
MATERIAL SAFETY DATA SHEET

Tetrahydrofuran

IMDG
UN/ID No.: UN2056
Description of the goods: TETRAHYDROFURAN
Class: 3
Packing group: II
Labels: 3
EmS Number 1: F-E
EmS Number 2: S-D
Marine pollutant: no

15. REGULATORY INFORMATION

National regulatory information

Dangerous Substances: Type 1 petroleums
Safety Management Act: Flammable liquids

Other international regulations

Notification status
US. Toxic Substances Control Act: On TSCA Inventory
Australia. Industrial Chemical (Notification and Assessment) Act: On the inventory, or in compliance with the inventory
Japan. Kashin-Hou Law List: On the inventory, or in compliance with the inventory
Korea. Existing Chemicals Inventory (KECI): On the inventory, or in compliance with the inventory
Philippines. The Toxic Substances and Hazardous and Nuclear Waste Control Act: On the inventory, or in compliance with the inventory
China. Inventory of Existing Chemical Substances: On the inventory, or in compliance with the inventory
New Zealand. Inventory of Chemicals (NZIoC), as published by ERMA New Zealand: On the inventory, or in compliance with the inventory
16. OTHER INFORMATION

<table>
<thead>
<tr>
<th></th>
<th>HMIS III</th>
<th>NFPA</th>
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<tbody>
<tr>
<td>Health hazard</td>
<td>2*</td>
<td>2</td>
</tr>
<tr>
<td>Flammability</td>
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<tr>
<td>Physical Hazard</td>
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<td></td>
</tr>
<tr>
<td>Instability</td>
<td>1</td>
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</tr>
</tbody>
</table>

* - Chronic health hazard

Hazard rating and rating systems (e.g. HMIS® III, NFPA): This information is intended solely for the use of individuals trained in the particular system.

Further information

References and Sources for Data

SK Chemicals R&D Center
Globally Harmonized System of classification and labelling of chemicals(GHS), First revised edition, United Nations.
United States National Library of Medicine.
EINECS (European Inventory of Existing Commercial chemical Substances)
Honeywell International Inc.

Originated Date

2012. 04. 11.

Revision number and date

Revision number: 0
Final revision date: 2012. 04. 11.