1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Ethyl ether
CAS-No. : 60-29-7
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: +82-2-2008-2236
+82-2-2008-2453
+82-52-279-1861

2. HAZARDS IDENTIFICATION

Emergency Overview

Classification of the substance or mixture
Classification of the substance or mixture : Flammable liquids, Category 1
Acute toxicity, Category 4, Oral
Reproductive toxicity, Category 2
Specific target organ toxicity - single exposure, Category 3
Aspiration hazard, Category 2
Form : liquid, clear

GHS Label elements, including precautionary statements
Symbol(s) :

Signal word : Danger

Hazard statements : Extremely flammable liquid and vapour.
Harmful if swallowed.
May be harmful if swallowed and enters airways.
May cause respiratory irritation.
May cause drowsiness and dizziness.
Suspected of damaging fertility or the unborn child.

Precautionary statements: Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
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.
Avoid breathing 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 eye/face protection.

Response:
IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
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 exposed or concerned: Get medical advice/ attention.
Rinse mouth.
Do NOT induce vomiting.
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

Chemical nature : Substance

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diethyl ether</td>
<td>60-29-7</td>
<td>100.00 %</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td></td>
<td></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 if irritation develops or persists.

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.
5. FIRE-FIGHTING MEASURES

Suitable extinguishing media: Carbon dioxide (CO2)
Dry chemical
Foam

Unsuitable extinguishing media: Water may be ineffectual.
Do not use a solid water stream as it may scatter and spread fire.

Specific hazards during fire fighting: 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.
Cool closed containers exposed to fire with water spray.
Do not allow run-off from fire fighting to enter drains or water courses.
In case of fire hazardous decomposition products may be produced such as:
Carbon monoxide
Carbon dioxide (CO2)
May form explosive peroxides.

Special protective equipment for fire-fighters: In the event of fire and/or explosion do not breathe fumes.
Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Immediately evacuate personnel to safe areas.
Keep people away from and upwind of spill/leak.
Wear personal protective equipment.
Unprotected persons must be kept away.
Ensure adequate ventilation.
Remove all sources of ignition.
Vapors may travel to areas away from work site before igniting/flashing back to vapor source.
Do not swallow.
Avoid breathing vapors, mist or gas.
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, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in 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.
- Avoid breathing vapors, mist or gas.
- Avoid contact with skin, eyes and clothing.

Advice on protection against fire and explosion:
- 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.
- 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>Diethyl ether</td>
<td>60-29-7</td>
<td>Short term exposure limit</td>
<td>1,500 mg/m³ (500 ppm)</td>
<td>06 2007</td>
<td>KR OEL</td>
</tr>
<tr>
<td>Diethyl ether</td>
<td></td>
<td>Time Weighted average</td>
<td>1,200 mg/m³ (400 ppm)</td>
<td>06 2007</td>
<td>KR OEL</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 and boots
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.
Avoid breathing vapors, mist or gas.
Avoid contact with skin, eyes and clothing.

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

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state: liquid, clear
Colour: colourless
Odour: sweet
pH: Note: not applicable
Melting point/freezing point: -117.4 °C
Boiling point/boiling range: 35 °C
Flash point: -49 °F (-45 °C)
Lower explosion limit: 1 %(V)
Upper explosion limit: 36 %(V)
Vapour pressure: 589 hPa at 20 °C (68 °F)
717 hPa at 25 °C (77 °F)
Vapour density : 2.6
    Note: (Air = 1.0)
Density : 0.713 g/cm³ at 20 °C
Water solubility : 68.9 g/l
Ignition temperature : 160 °C
Molecular Weight : 74.12 g/mol

10. STABILITY AND REACTIVITY

Chemical stability : Stable under recommended storage conditions.
Possibility of hazardous reactions : Hazardous polymerisation does not 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 : Oxidizing agents
    Strong acids
    Halogens
    Sulphur compounds
    May attack many plastics, rubbers and coatings.
Hazardous decomposition products : In case of fire hazardous decomposition products may be produced such as:
    Carbon monoxide
    Carbon dioxide (CO2)
    May form explosive peroxides.

11. TOXICOLOGICAL INFORMATION

Acute oral toxicity : LD50: 1,215 mg/kg
    Species: rat
Acute inhalation toxicity : LC50: 73000 ppm
    Exposure time: 2 h
    Species: rat
Acute dermal toxicity : LD50: > 14.26 g/kg
    Species: rabbit
Skin corrosion/irritation : Species: rabbit
    Result: slight irritation
Serious eye damage/ eye irritation : Species: rabbit
    Result: Moderate eye irritation
Germ cell mutagenicity : Test Method: Ames test
Further information
Note: Solvent removes skin oil from the skin. Solvent vapours have a narcotic effect if inhaled in high concentrations.

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish: flow-through test
LC50: 2,560 mg/l
Exposure time: 96 h
Species: Pimephales promelas (fathead minnow)

Toxicity to fish: semi-static test
LC50: 2,138 mg/l
Exposure time: 14 d
Species: Poecilia reticulata (guppy)

13. DISPOSAL CONSIDERATIONS

Disposal methods: In accordance with local and national regulations.

14. TRANSPORT INFORMATION

IATA
UN/ID No.: UN 1155
Description of the goods: Diethyl ether
Class: 3
Packing group: I
Labels: 3
Packing instruction: 361
(cargo aircraft)
Packing instruction: 351
(passenger aircraft)

IMDG
UN/ID No.: UN1155
Description of the goods: DIETHYL ETHER
Class: 3
Packing group: I
Labels: 3
EmS Number 1: F-E
EmS Number 2: S-D
Marine pollutant: no

15. REGULATORY INFORMATION

National regulatory information
MATERIAL SAFETY DATA SHEET

Ethyl Ether

Dangerous Substances: FSL Special flammables
Safety Management Act: Flammable liquids

Other international regulations

Notification status

1907/2006 (EU): This mixture contains only ingredients which have been subject to a pre-registration according to Regulation (EC) No.1907/2006 (REACH).
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
NZIOC - New Zealand: On the inventory, or in compliance with the inventory

16. OTHER INFORMATION

<table>
<thead>
<tr>
<th>HMIS III</th>
<th>NFPA</th>
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<tr>
<td>Physical Hazard</td>
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<tr>
<td>Instability</td>
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</tr>
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</table>

Further information
none

Originated Date
2011. 02. 10

Revision number and date