1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Ethyl Alcohol

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

Emergency Overview

Form: liquid, clear
Color: colourless
Odor: mild alcohol-like

Hazard Summary: Flammable. In use, may form flammable/explosive vapour-air mixture. May be fatal if swallowed. May be fatal if inhaled. May be harmful if absorbed through skin. Irritating to eyes, respiratory system and skin. May cause blindness. The product may be absorbed through the skin. Repeated exposure may cause skin dryness or cracking. This product may cause adverse reproductive effects. Possible risk of harm to the unborn child. Avoid exposure to pregnant women especially. Cannot be made non-poisonous.

Hazard Symbols:

Potential Health Effects

Skin: Irritating to skin.
Can be absorbed through skin.
May be harmful if absorbed through skin.
May cause systemic poisoning with symptoms paralleling those of inhalation.
Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering.
Eyes : Irritating to eyes.
Causes itching, burning, redness and tearing.
May cause blindness.
May cause irreversible eye damage.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Causes headache, drowsiness or other effects to the central nervous system.
May cause systemic poisoning with symptoms paralleling those of inhalation.

Inhalation : Causes respiratory tract irritation.
Causes headache, drowsiness or other effects to the central nervous system.
Inhalation of high vapour concentrations can cause CNS depression and narcosis.
May cause blindness.

Chronic Exposure : Causes damage to the kidneys/liver/eyes/brain/respiratory system/central nervous system through prolonged or repeated exposure.
Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering.
This product may cause adverse reproductive effects.
Possible risk of harm to the unborn child.

Aggravated Medical Condition 
Liver disorders
Eye disorders
Skin disorders
Neurological disorders
Kidney disorders
Do not use if pregnant.

Target Organs : Eyes
Skin
Liver
Kidney
Blood
Respiratory system
Central nervous system
Gastrointestinal tract

Carcinogenicity
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, IARC, or OSHA.

3. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
<td>99.00~100.00</td>
</tr>
</tbody>
</table>
MATERIAL SAFETY DATA SHEET
Ethyl Alcohol

4. FIRST AID MEASURES

Inhalation: Call a physician immediately. 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.

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: Call a physician immediately. Do NOT induce vomiting. Immediate medical attention is required. Never give anything by mouth to an unconscious person.

Notes to physician

Treatment: Treat symptomatically.

5. FIRE-FIGHTING MEASURES

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

Extinguishing media which shall not be used for safety reasons: Do not use a solid water stream as it may scatter and spread fire.

Specific hazards during fire fighting:
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/flashback to vapor source.
In case of fire hazardous decomposition products may be produced such as:
Carbon monoxide
Carbon dioxide (CO2)
Formaldehyde

Special protective equipment for fire-fighters:
Wear self-contained breathing apparatus and protective suit.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: 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.
Discharge into the environment must be avoided.
Do not flush into surface water or sanitary sewer system.
Prevent product from entering drains.
Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

Methods for cleaning up:
Ventilate the area.
No sparking tools should be used.
Use explosion-proof equipment.
Contain and collect spillage with non-combustible absorbent materials, e.g. sand, earth, vermiculite, diatomaceous earth and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

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:
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:
Requirements for storage areas and containers:
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
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

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

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

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

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

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

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.

Hygiene measures: When using, do not eat, drink or smoke.
   Wash hands before breaks and immediately after handling the product.
   Keep working clothes separately.
   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.
   The current list of ERPG exposure limits can be found at http://www.aiha.org/1documents/Committees/ERPerpglevels.pdf.

Exposure Guidelines

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<tr>
<th>Substance</th>
<th>ACGIH STEL</th>
<th>1,000 ppm</th>
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</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>64-17-5</td>
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</table>

Skin designation:
Can be absorbed through the skin.

<table>
<thead>
<tr>
<th>NIOSH REL</th>
<th>1,000 ppm</th>
<th>1,900 mg/m3</th>
</tr>
</thead>
</table>
MATERIAL SAFETY DATA SHEET

Ethyl Alcohol

Skin designation:
Can be absorbed through the skin.

OSHA Z1A             TWA        1,000 ppm   1,900 mg/m³

Skin designation (Final Rule Limit applies):
Can be absorbed through the skin.

9. PHYSICAL AND CHEMICAL PROPERTIES

Form: liquid, clear
Color: colourless
Odor: mil alcohol-like
pH: not applicable
Melting point/range: -114.1 °C
Boiling point/boiling range: 78.5 °C
Flash point: 13 °C (closed cup)
Vapor pressure: 59.3 hPa
at 20 °C (68 °F)
Relative vapour density: 1.59
(Air = 1.0)
Density: 0.79 g/cm³
at 20 °C (68 °F)
Water solubility: completely soluble

10. STABILITY AND REACTIVITY

Conditions to avoid: Heat, flames and sparks.
Keep away from direct sunlight.

Materials to avoid: Strong oxidizing agents
Aluminium
Magnesium
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)
Formaldehyde

Hazardous reactions: Hazardous polymerisation does not occur.
Stable under normal conditions.
11. TOXICOLOGICAL INFORMATION

Acute oral toxicity : LD50: 7,060 mg/kg
Species: rat
Test substance: Ethanol

Acute inhalation toxicity : LC50: 20000 ppm
Exposure time: 10 h
Species: rat
Test substance: Ethanol

Skin irritation : Species: rabbit
Result: irritating
Exposure time: 24 h
Test substance: Ethanol

Eye irritation : rabbit eye
Irritating

12. ECOLOGICAL INFORMATION

Toxicity to fish :
LC0: 8,140 mg/l
Exposure time: 48 h
Species: Leuciscus idus (Golden orfe)
Test substance: Ethanol
LC50: 12,900 mg/l
Exposure time: 96 h
Species: Oncorhynchus mykiss (rainbow trout)
Test substance: Ethanol
LC50: 14,200 mg/l
Exposure time: 96 h
Species: Pimephales promelas (fathead minnow)
Test substance: Ethanol

Toxicity to daphnia and other aquatic invertebrates.
EC50: 9,268 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)
Test substance: Ethanol
EC50: 10,800 mg/l
Exposure time: 24 h
Species: Daphnia magna (Water flea)
Test substance: Ethanol

Toxicity to bacteria :
LC0: 6,500 mg/l
Species: Pseudomonas putida
Test substance: Ethanol
EC50: 35,470 mg/l
Exposure time: 5 min
Species: Photobacterium phosphoreum
Test substance: Ethanol
EC50: 34,634 mg/l
Exposure time: 30 min
Species: Photobacterium phosphoreum
Test substance: Ethanol

Toxicity to algae: LC0: 5,000 mg/l
Species: Scenedesmus quadricauda

Biodegradability: Biochemical Oxygen Demand (BOD)
Biochemical oxygen demand within 5 days
Value: 58%
Test substance: Isopropanol.

13. DISPOSAL CONSIDERATIONS

Waste Information: Observe all Federal, State, and Local Environmental regulations.

14. TRANSPORT INFORMATION

DOT
UN-Number: 1170
Proper shipping name: Ethanol
Class: 3
Packing group: II
Hazard Label: 3

IATA
UN Number: 1170
Description of the goods: Ethanol
Class: 3
Packing group: II
Hazard Label: 3
Packing instruction (cargo aircraft): 364
Packing instruction (passenger aircraft): 353
Packing instruction (passenger aircraft): Y341

IMDG
Substance No.: UN 1170
Description of the goods: Ethanol
Class: 3
Packing group: II
Hazard Label: 3
EmS Number: F-E
Marine pollutant: no

15. REGULATORY INFORMATION

Inventories

US. Toxic Substances Control Act: On TSCA Inventory

Australia. Industrial Chemical (Notification and Assessment) Act: On the inventory, or in compliance with the inventory

Canada. Canadian Environmental Protection Act (CEPA). Domestic Substances List (DSL): All components of this product are on the Canadian DSL list.

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>
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<tr>
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<th>HMIS III</th>
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<tr>
<td>Instability</td>
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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

2010. 07. 10

Revision number and date

Revision number: 1  
Final revision date: 2012. 11. 28.