

Safety Data Sheet

SECTION 1 : Identification

A. GHS Product Name: Rectified Fermentation Ethanol

B. Other means of identification : Not available

C. Recommended use of the chemical and restrictions on use

Recommended use : Solvent and extraction agents, Food and food additives, Pharmaceuticals

Restriction on use : Use for recommended use only

D. Supplier's information

Company name : Korea Alcohol Industrial

Address : (Headquater) 14, Tapsil-ro 35beon-gil, Giheung-gu, Yongin-si, Gyeonggi-do
(Ulsan office) 66, Sanggae-ro, Nam-gu, Ulsan

Telephone number : (Headquater)031-881-8100, (Ulsan office)052-259-4761~2

Respondent : Not available

Fax : Not available

E. Emergency phone number

Opening hours : (Headquater)031-881-8100, (Ulsan office)052-259-4761~2

Other comments (e.g. language(s) of the phone service) : www.ka.co.k / Sales or HSE Department

SECTION 2 : Hazard identification

A. Classification of the substance or mixture

Flammable liquids : Category 2

Serious eye Damage/ Irritation : Category 2

Carcinogenicity : Category 1A (Limited to food use)

B. GHS label elements, including precautionary statements

Pictogram and symbol :



Signal word : Danger

Hazard statements :

H225 Highly flammable liquid and vapour

H319 Causes serious eye irritation

H350 May cause cancer

Precautionary statements

Prevention :

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

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.

P264 Wash thoroughly after handling.

P280 Wear protective gloves/protective clothing/eye protection/face protection

Response :

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing.

Rinse skin with water [or shower].

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

P370+P378 In case of fire: Use adequate to extinguish.

P308+P313 IF exposed or concerned: Get medical advice/attention.

Storage :

P405 Store locked up.

P403+P235 Store in a well-ventilated place. Keep cool.

Disposal :

P501 Dispose of contents/container to in accordance with federal, state and local environmental control regulations.

C. Other hazards which do not result in classification

Not available

SECTION 3: Composition/information on ingredients

Chemical Name	Common Name (Synonyms)	CAS No.	EC number	Content (%)
Ethyl alcohol	Ethanol	64-17-5	200-578-6	95.0≤

Water	Water	7732-18-5	231-791-2	1~10
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SECTION 4: First-aid measures

A. Description of necessary first-aid measures

- After eye contact** IF IN EYES: Rinse cautiously with water for several minutes. If possible, remove contact lenses. Keep washing
If eye irritation persists: Get medical advice/attention.
- After skin contact** IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
Call emergency medical service.
Remove and isolate contaminated clothing and shoes.
For minor skin contact, Prevent the spreading material on unaffected skin.
In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
Wash skin with soap and water.
- After inhalation** IF exposed or concerned: Get medical advice/attention.
Move victim to fresh air.
Keep it warm and calm.
- After ingestion** IF exposed or concerned: Get medical advice/attention.
Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

B. Most important symptoms and effects, both acute and delayed

- May cause cancer
- Causes serious eye irritation

C. Indication of immediate medical attention and notes for physician, if necessary

- In case of exposal, contact with doctor and get specialized first aid such as medical follow-up research
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

SECTION 5: Fire-fighting measures

A. Suitable extinguishing media

- Use alcohol foam, carbon dioxide, or water spray when fighting fires involving this material.

- Use dry sand or earth to smother fire.

B. Specific hazards arising from the chemical

- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may cause fire or explosion hazard
- May cause vapor explosion hazard indoors, outdoors or in sewers.
- Some of these materials may burn, but none ignite readily.
- Vapors may form explosive mixtures with air.
- May violently polymerize and result in fire and explosion.
- Vapors may travel to a source of ignition and ignite.
- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning
- May form explosive mixtures at the flashpoint or above.
- Highly flammable liquid and vapour

C. Special protective actions for fire-fighters

- The rescuer should wear appropriate shield.
- Evacuate area and fight fire from a safe distance.
- Some may be transported hot.
- Many liquids are lighter than water.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas
- Substance may be transported hot.
- Substance may be transported in a molten form.
- Dike fire-control water for later disposal; do not scatter the material.
- Move containers from fire area if you can do it without risk.
- In case of the tank fire, extinguish at maximum distance or use unmanned fire extinguishing equipment.
- In case of the tank fire, keep cooling down the tank with plenty of water after fire is extinguished.
- In case of tank fire, if there is a high sound level on the pressure relief device or if the tank is discolored, immediately withdraw it.
- In the case of a tank fire, withdraw from the tank engulfed in flames.
- In the case of a large-scale fire of a tank, use unmanned fire extinguishing equipment and, if not possible, leave it to burn.

SECTION 6: Accidental release measures

A. Personal precautions, protective equipment and emergency procedures

- The very fine particles may cause a fire or explosion, eliminate all ignition sources.

- Clean up spills immediately, observing precautions in Protective Equipment section.
- Isolate the contaminated area.
- Keep unnecessary and unprotected personnel from entering.
- Eliminate all ignition sources.
- All equipment used when handling the product must be grounded.
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- A vapor suppressing foam may be used to reduce vapors.
- Cover with plastic sheet to prevent spreading.
- Please note that there are materials and conditions to avoid.

B. Environmental precautions :

- Prevent entry into waterways, sewers, basements or confined areas.

C. Methods and materials for containment and cleaning up

- Dike and collect water used to fight fire.
- Absorb spill with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Absorb the liquid and scrub the contaminated area with detergent and water.
- Large Spill; Dike far ahead of liquid spill for later disposal.
- Use clean non-sparking tools to collect absorbed material.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Do not handle until all safety precautions have been read and understood.
- Use explosion-proof electrical/ventilating/lighting equipment.
- Use non-sparking tools.
- Take action to prevent static discharges.
- Wash thoroughly after handling.
- Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static, electricity, or other sources of ignition.
- Follow all MSDS/label precautions even after container is emptied because they may retain product residues.
- Use care in handling/storage.
- Loosen closure cautiously before opening.
- Avoid breathing vapors from heated material.
- Do not enter storage area unless adequately ventilated.
- All equipment used when handling the product must be grounded.
- Please note that there are materials and conditions to avoid.

- Be careful to heat.
- You need measurement of air concentration and ventilation in low, closed and confined areas due to lack of oxygen.

B. Conditions for safe storage, including any incompatibilities

- Keep away from heat, sparks, flames and high temperature – No smoking
- Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Store locked up.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.

SECTION 8: Exposure controls/personal protection

A. Control parameters

Korea regulation

Ethyl alcohol	TWA=1,000 ppm
Water	Not applicable

ACGIH regulation

Ethyl alcohol	STEL=1,000 ppm
Water	Not applicable

Biological exposure index

Ethyl alcohol	Not applicable
Water	Not applicable

B. Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

C. Individual protection measures, such as personal protective equipment.(PPE)

Respiratory protection

- If exposure concentration of the material exceeds the permitted exposure standards, Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment.

Eye protection

- Wear appropriate protective goggles by considering physical and chemical properties of chemicals.

Hand protection

- Wear appropriate protective gloves by considering physical and chemical properties of chemicals.

Body protection

- Wear appropriate protective clothing by considering physical and chemical properties of chemicals.

SECTION 9: Physical and chemical properties and safety characteristics

A. Appearance

Physical state : liquid

Colour : Colorless

B. Odour : Wine or whiskey smell

C. Odor threshold : 10 ppm

D. Melting point/freezing point : -114.1°C

E. Boiling point or initial boiling point and boiling range : 78.5°C

F. Flash point : 13°C(C.C)

G. Lower and upper explosion limit/ flammability limit : 3.3 / 27.7 %

H. Flammability : Not applicable (Flammable liquids)

I. Auto-ignition temperature : 400°C

J. Decomposition temperature : Not available

K. pH : 7 (10g/L, H₂O, 20°C)

L. Kinematic viscosity : 1.074 cP (20°C, mPa s) (viscosity)

M. Solubility : 789,000 mg/l (20°C)

N. Partition coefficient n-octanol/water (log value) : -0.32 (Log K_{ow})

O. Vapour pressure : 5.8 kPa (20°C)

P. Density and/or relative density : 0.81639 (15°C/15°C)

Q. Relative vapour density : 1.6 (air=1)

R. Particle characteristics : Not available

S. Evaporation rate : Not available

T. Molecular weight : 46.07

SECTION 10: Stability and reactivity

A. Reactivity

- highly flammable liquids and vapors
- Can decompose at high temperatures forming toxic gases.
- May violently polymerize and result in fire and explosion.
- May form explosive mixtures at the flashpoint or above.
- Containers may explode when heated.

- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may cause fire or explosion hazard
- May cause vapor explosion and poison hazard indoors, outdoors or in sewers.
- Some of these materials may burn, but none ignite readily.
- Vapors may form explosive mixtures with air.

B. Chemical stability

- Some of these materials may burn, but none ignite readily.

C. Possibility of hazardous reactions

- Can decompose at high temperatures forming toxic gases.
- May violently polymerize and result in fire and explosion.
- May form explosive mixtures at the flashpoint or above.
- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may cause fire or explosion hazard
- May cause vapor explosion and poison hazard indoors, outdoors or in sewers.
- Vapors may form explosive mixtures with air.

D. Conditions to avoid

- Keep away from heat, sparks, flames and high temperature – No smoking

E. Incompatible materials

- Combustibles, Reducing agents

F. Hazardous decomposition products

- irritating and/or toxic gases
- During burning, irritating and very toxic gases may be produced by pyrolysis or combustion.

SECTION 11: Toxicological information

A. Information on likely routes of exposure

- Causes serious eye irritation
- Suspected of causing cancer

B. Acute toxicity

Oral

Ethyl alcohol	Rat_LD50 = 10,470 mg/kg bw (OECD Guideline 401)
Water	Rat_LD50 > 90,000 mg/kg

Dermal

Ethyl alcohol	Rabbit_LDL0(lowest lethal concentration) = 20,000 mg/kg
Water	Not available

Inhalation

Ethyl alcohol	Rat(male)_LC50=116.9 mg/L/ 4 hr/ vapour (equivalent or similar to OECD Guideline 403) Rat(female)_LC50=133.8 mg/L/ 4 hr/ vapour (equivalent or similar to OECD Guideline 403)
Water	Not available

C. Skin corrosion/irritation

Ethyl alcohol	No irritating as a result of skin irritation test using rabbits. (OECD Guideline 404, GLP)
Water	Not available

D. Serious eye damage/irritation

Ethyl alcohol	Eye irritation tests using rabbits showed conjunctival redness (Grade 1) in two out of three, but Full reversal of all symptoms in animals occurred within 14 days (OECD Guideline 405)
Water	Not available

E. Respiratory or skin sensitization

Respiratory sensitization

Ethyl alcohol	In human, A vapor concentration of 5000 ppm was noted as irritating and uncomfortable to breathe, but tolerable. (Lester, 1951). A much higher concentration will cause tears and cough.
Water	Not available

Skin sensitization

Ethyl alcohol	No significant symptoms were observed as a result of skin sensitization tests using mouse (equivalent or similar to OECD Guideline 429)
Water	Not available

F. Germ cell mutagenicity

Ethyl alcohol	in vivo - No significant symptoms were observed as a result of the rodent dominant leisure assay test using a mouse. (male). (equivalent or similar to OECD Guideline 478) in vitro - Negative results of Bacterial Reverse Automation Assay test using <i>S. typhimurium</i> TA1535, TA97, TA98, TA100, TA104 (equivalent or similar to OECD Guideline 471)
Water	Not available

G. Carcinogenicity

Ethyl alcohol	
- KOSHA	1A(Limited to alcohol drinking)
- IARC	1(Limited to alcohol drinking)
- ACGIH	A3

- NTP Not applicable
- OSHA TLV-A3
- EU CLP Not applicable

Water

- KOSHA Not applicable
- IARC Not applicable
- ACGIH Not applicable
- NTP Not applicable
- OSHA Not applicable
- EU CLP Not applicable

H. Reproductive toxicity

Ethyl alcohol two-Generation reproductive toxicity tests with mouse showed significant weight loss of male epididymides and seminal vesicles in the group of 20.7 g/kg/day of F1, but Ethanol is not considered as reproductive toxicity because it was reversible by diet control. (OECD Guideline 416, NTP Protocol. Fertility assessment by continuous breeding)

Water Not available

I. STOT-single exposure

Ethyl alcohol As a result of oral test using rat moderate decrease in activity and respiratory rate at 8,200 mg/kg, moderate paleness, grip and ataxia, moderate decrease in activity and respiratory rate at 9,840 mg/kg, moderate pupil response, moderate gripping and ataxia at 11,480 mg/kg, extreme decreases in activity and respiratory rate, moderate pupil response, moderate minor gripping and ataxia, and at 16070 mg/kg, moderate decrease in activity and respiratory rate, moderate pupil response slight paleness, abdominal tension and ataxia occurred.

As a result of inhalation test using rat moist and congested eyes, nasal discharge, eyelid closure, intermittent breathing, pain reflexes, anesthesia effect, and bent posture were found at the 4 high dose of group (155.0, 115.4, 93.4, 79.1 mg/l). As gross pathological findings relevance, acute dilation and congestion of the heart and moderate partial acute flatulence were observed in the lungs. Also, the lungs had a partial rash, infarction, and finally full of blood and swelling.

Water Not available

J. STOT-repeated exposure

Ethyl alcohol No significant symptoms were observed as a result of repeated oral toxicity tests for 14 weeks using rats, NOAEL = 1,730 mg/kg bw (equivalent or similar to OECD Guideline 408, GLP)

Results of repeated 6-week inhalation toxicity tests using rats showed a significantly decrease in testosterone at a concentration of 2,000 ppm. (Read-Across (methanol:200-659-6))

Water Not available

K. Aspiration hazard

Ethyl alcohol Not available

Water Not available

12. ECOLOGICAL INFORMATION

A. Toxicity

Fish

Ethyl alcohol 96hr_{LC50}(Pimephales promelas) = 15.3 g/L (US EPA method E03-05)
120hr_{NOEC} (Danio rerio) = 250m g/L (equivalent or similar to OECD Guideline 212)

Water Not available

Crustaceans

Ethyl alcohol 48hr_{LC50}(Ceriodaphnia dubia) = 5,012 mg/L (ASTM E729-80)
10d_{NOEC}(Ceriodaphnia dubia) = 9.6 mg/L(reproduction)

Water Not available

Algae

Ethyl alcohol 3d_{EC50}(Chlorella vulgaris) = 275mg/L (equivalent or similar to OECD Guideline 201)
4d_{EC50}(Chlorella vulgaris) = 675mg/L (equivalent or similar to OECD Guideline 201)

Water Not available

B. Persistence and degradability

Persistence

Ethyl alcohol -0.32 (Log Kow)

Water Not available

Degradability

Ethyl alcohol 15d_{BOD}=95%

Water Not available

C. Bioaccumulative potential

Bioaccumulation

Ethyl alcohol As a result of exposure test of Cyprinus carpio at 72 hour, the value of BCF is 1 in blood and tissues (gills, muscle, liver, kidney, intestine) (Read-

Water

Across cas no. 67-56-1)

Not available

Biodegradation

Not available

D. Mobility in soil

Ethyl alcohol

Log koc=0.2 ((Q)SAR)

Water

Not available

E. Other adverse effects

- Not available

SECTION 13: Disposal considerations

A. Disposal methods

- Waste must be disposed of in accordance with federal, state and local environmental control regulations.

B. Disposal considerations

- Waste must be disposed of in accordance with federal, state and local environmental control regulations.

SECTION 14: Transport information

A. UN number : 1170

B. UN Proper shipping name : ETHANOL(ETHYL ALCOHOL) or ETHANOL SOLUTION(ETHYL ALCOHOL SOLUTION)

C. Transport hazard class(es) : 3

D. Packing group, if applicable : II

E. Environmental hazards : Not applicable

F. Special precautions for user

In case of fire : F-E

In case of leakage : S-D

G. Transport in bulk according to IMO instruments : Not applicable

15. REGULATORY INFORMATION

A. Regulation Information

U.S.A management information (OSHA Regulation)	Not applicable
U.S.A management information (CERCLA Regulation)	Not applicable
U.S.A management information (EPCRA 302 Regulation)	Not applicable
U.S.A management information (EPCRA 304 Regulation)	Not applicable
U.S.A management information (EPCRA 313 Regulation)	Not applicable
Substance of Rotterdam Convention	Not applicable
Substance of Stockholm Convention	Not applicable
Substance of Montreal Protocol	Not applicable
EU classification (classification)	
Ethyl alcohol	Flammable liquids Category 2
Water	Not applicable
EU classification (risk phrases)	Not applicable
EU SVHC list	Not applicable
EU Authorisation List	Not applicable
EU Restriction list	Not applicable

B. KOREA Regulatory information

Occupational Safety and Health Act

Ethyl alcohol	Control parameters inventory substance
Water	Not applicable

Chemicals Control Act

Not applicable

Safety Control of Dangerous Substances Act

Ethyl alcohol	4 th class (Flammable liquid) Alcohol substances (Designated quantity 400 L)
Water	Not applicable

Wastes Control Act

The waste which is produced in the facility is designated wastes and industrial wastes under Wastes Control Act Enforcement Ordinance [Annex1]

C. Other regulation

Persistent Organic Pollutants Act	Not applicable
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SECTION 16: Other information

A. Information sources and references

- Korean SDS of RFA provided by Korea Alcohol Industrial Co., LTD.
- ACGIH; <https://www.acgih.org/>
- IARC; http://monographs.iarc.fr/ENG/Classification/latest_classif.php
- NTP; <http://ntp.niehs.nih.gov/index.cfm>
- OSHA; <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.119App>
- UN Recommendations on the Transport of Dangerous Goods-Model Regulations Twenty-first edition; https://www.unece.org/trans/danger/publi/unrec/rev21/21files_e.html
- (KOMDI); <https://www.komdi.or.kr/ukiwi/biz/info/ukiwiBizInfoMDGCodeList.do>
- Rules on the Occupational Safety and Health Act [Attached Table12]
- Enforcement rules of the Occupational Safety and Health Act [Attached Table21, 22, 23]
- Exposure criteria for chemicals and physical factors; Ministry of Employment and Labor (2020-48)
- Enforcement rules of the Occupational Safety and Health Act [Attached Table19]
- Enforcement decree of the Occupational Safety and Health Act [Attached Table13]
- substances under observation and restricted substances which are designated and announced[Attached Table2,]
- substances under observation and restricted substances which are designated and announced[Attached Table4]
- poisonous substances which are designated and announced [Attached Table] (Article 3 of the Enforcement Decree of the Hwapyeong Act and Article 2 of the Enforcement Decree of the Hwapyeong Act)
- Enforcement rules of the Chemicals Control Act [Attached Table10]
- WastesControlAct; <http://www.law.go.kr/LSW//lsInfoP.do?lsiSeq=212975&ancYd=20191231&ancNo=00843&efYd=20200701&nwJoYnInfo=N&efGubun=Y&chrClsCd=010202&ancYnChk=0#AJAX>
- (KFI); <http://hazmat.mpss.kfi.or.kr/material.do>
- Montreal Protocol ; <https://www.epa.gov/ozone-layer-protection/ozone-depleting-substances>
- Rotterdam Convention ; <http://www.pic.int/TheConvention/Chemicals/>
- Persistent Organic Pollutants Act; [Attached Table1]
- (OSHA); <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.119AppA>
- (CERCLA, EPCRA 302, EPCRA 304, EPCRA 313); https://www.epa.gov/sites/production/files/2015-03/documents/list_of_lists.pdf
- EU SVHC list; <https://echa.europa.eu/authorisation-list>
- EU Authorisation List; <https://echa.europa.eu/substances-restricted-under-reach>
- EU Restriction list; https://echa.europa.eu/information-on-chemicals/biocidal-active-substances?p_p_id=dissactivesubstances_WAR_dissactivesubstancesportlet&p_p_lifecycle=1&p

_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=2&p_p_col_count=3&
dissactivesubstances_WAR_dissactivesubstancesportlet_javax.portlet.action=dissActive
Substances Action

- KOSHA Guidance; Development of Guidelines for Selection of Respirators for Workers Exposed to Chemical Substances
- NCIS; <http://ncis.nier.go.kr/>
- ECHA; <https://echa.europa.eu/information-on-chemicals/registered-substances>
- HSDB; <https://pubchem.ncbi.nlm.nih.gov/>
- Epa; <https://comptox.epa.gov/dashboard/>
- EU SVHC list : https://echa.europa.eu/de/candidate-list-table?p_p_id=disslists_WAR_disslistsportlet&p_p_lifecycle=1&p_p_state=normal&p_p_mode=view&p_p_col_id=column-1&p_p_col_pos=2&p_p_col_count=3&disslists_WAR_disslistsportlet_javax.portlet.action=searchDissLists

B. Issuing date

- June 03th 2021

C. Revision number and date

Revision number : 0

Date of the latest revision Others : Not applicable

D. Others

- This SDS is prepared based on GHS classification in accordance with 29 CFR 1910.1200.
- The information and recommendations in this safety data sheet are, to the best of our knowledge, accurate as of the date of issue. Nothing herein shall be deemed to create warranty, expressed or implied, and shall not establish a legally valid contractual relationship. It is the responsibility of the user to determine applicability of this information and the suitability of the material or product for any particular purpose
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