Safety Data Sheet

SECTION 1 : Identification

A. GHS Product Name: Denatured Ethanol

B. Other means of identification : Not available

C. Recommended use of the chemical and restrictions on use

Recommended use : Adhesives, sealants, Anti-Freeze and de-icing products, Washing and cleaning products, Metal surface treatment products (Electroplating agents), (Flame retardants and Fire preventing agents), Fuels and additives, Feed materials, Intermediates, Laboratory chemicals, Solvent and extraction agents, Stabilizers, Viscosity adjusters, Cosmetics, personal care products, Perfumes, fragrances, Pharmaceuticals, Fertilizers, Air care products, Biocidal products, Others

Restriction on use : Use for recommended use only

D. Supplier's information

Company name : Korea Alcohol Industrial Co., LTD.

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 : (Headquarter)031-881-8100, (Ulsan office)052-259-4761~2

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

SECTION 2 : Hazard identification

A. Classification of the substance or mixture

Flammable liquids : Category 2

Serious eye damage /eye irritation: Category 2

발암성 : Category 2

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

H351 Suspected of causing cancer

Precautionary statements

Precaution :

P201 Obtain, read and follow all safety instructions before use.

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 :

P308+P316 IF exposed or concerned: Get emergency medical help immediately.

P337+P313 If eye irritation persists: Get medical advice/attention.

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

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.

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	89.98≤
Isopropyl alcohol	2-Propanol	67-63-0	200-661-7	9.0
Isobutyl methyl ketone	4-Methyl-2-pentanone	108-10-1	203-550-1	1.0
Water	Water	7732-18-5*	231-791-2	<0.1
Acetaldehyde	Ethanal	75-07-0*	200-836-8	<0.1
Methyl alcohol	Methanol	67-56-1*	200-659-6	<0.1
n-Propyl alcohol	1-Propanol	71-23-8*	200-746-9	<0.1
1,1-Ethyl Acetal	1,1-Diethoxyethane	105-57-7*	203-310-6	<0.1

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, avoid 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 victim warm and quiet.

After ingestion

IF exposed or concerned: Get medical advice/attention.

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

- Causes serious eye irritation

- May cause cancer

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

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

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 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.
- 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 by pyrolysis 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

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- 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 can cause a fire or explosion, eliminate all ignition sources.
- Clean up spills immediately, observing precautions in protective equipment section.
- 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 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 carefully 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 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 drained completely and properly blocked and immediately returned to a drum control or placed properly.

SECTION 8: Exposure controls/personal protection

A. Control parameters

Korea regulation

Ethyl alcohol	TWA = 1,000 ppm
Isopropyl alcohol	TWA = 200 ppm, STEL = 400 ppm
Isobutyl methyl ketone	TWA = 50 ppm, STEL = 75 ppm

ACGIH regulation

Ethyl alcohol	STEL = 1,000 ppm
Isopropyl alcohol	TWA = 200 ppm, STEL = 400 ppm
Isobutyl methyl ketone	TWA = 20 ppm, STEL = 75 ppm

Biological exposure index

Ethyl alcohol	Not available

Isopropyl alcohol	40 mg/L
Isobutyl methyl ketone	1 mg/L

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

※ **If there is no information on the product, information on each component was added.**

A. Appearance

Physical state : liquid

Colour : Colorless

B. Odour : Alcohol smell

C. Odor threshold : Not available

Ethyl alcohol	10 ppm
Isopropyl alcohol	90 mg/m3
Isobutyl methyl ketone	0.1 ppm

D. Melting point/freezing point : -117℃ ~ -90℃

E. Boiling point or initial boiling point and boiling range : 79℃ ~ 83℃

F. Flash point : 9℃

G. Lower and upper explosion limit/ flammability limit : 1.4 / 19%

H. Flammability : Not applicable

I. Auto-ignition temperature : 430℃

J. Decomposition temperature : Not available

Ethyl alcohol	Not available
Isopropyl alcohol	Not available
Isobutyl methyl ketone	3740 KJ/mol

K. pH : Not available

Ethyl alcohol	7 (10g/L, H2O, 20℃)
Isopropyl alcohol	Not available
Isobutyl methyl ketone	Not available

L. Kinematic viscosity : 1.13cP(25℃) (viscosity)

M. Solubility : Soluble in water or solvent

N. Partition coefficient n-octanol/water (log value) : Not available

Ethyl alcohol	-0.32 (Log Kow)
Isopropyl alcohol	0.05 (Log Kow)
Isobutyl methyl ketone	1.38 (Log Kow)

O. Vapour pressure : 5.8 kPa (20℃)

Ethyl alcohol	5.8 kPa (20℃)
Isopropyl alcohol	45.4 mmHg (25℃)
Isobutyl methyl ketone	2.1 kPa (20℃)

P. Density and/or relative density : 0.79~0.80

Q. Relative vapour density : Not available

Ethyl alcohol	1.6 (air=1)
Isopropyl alcohol	2.1
Isobutyl methyl ketone	3.45 (air=1)

R. Particle characteristics : Not available

S. Evaporation rate : Not available

T. Molecular weight : 51.872 (Mixture average molecular weight)

SECTION 10: Stability and reactivity

A. Reactivity

- Highly flammable liquid and vapour
- May violently polymerize and result in fire and explosion.
- May form explosive mixtures at the flashpoint or above.
- Can decompose at high temperatures forming toxic gases.

- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- May cause vapor explosion and poison hazard indoors, outdoors or in sewers.
- Some of the liquid may release vapors causing dizziness and suffocation.
- Spilled material may cause fire or explosion hazard

B. Chemical stability

- Some of the liquid may release vapors causing dizziness and suffocation.

C. Possibility of hazardous reactions

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

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

- Material may produce irritating and highly toxic gases by pyrolysis and combustion during burning
- Corrosive and/or toxic gases

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)
Isopropyl alcohol	Rat_LD50 = 5.8g/kg bw (equivalent or similar to OECD Guideline 401)
Isobutyl methyl ketone	Rat_LD50 = 2.08 g/kg bw (equivalent or similar to OECD Guideline 401)

Dermal

Ethyl alcohol	Rabbit_LDL0(lowest lethal concentration) = 20,000 mg/kg
Isopropyl alcohol	Rabbit_LD50=16.4 ml/kg bw (equivalent or similar to OECD Guideline 402)
Isobutyl methyl ketone	Rat_LD0>=2,000 mg/kg bw (OECD Guideline 402, GLP) (No death)

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)
Isopropyl alcohol	Rat_LC50>10,000ppm/6 hr/vapour (equivalent or similar to OECD Guideline 402, GLP)
Isobutyl methyl ketone	Rat(male)_LC50 = 11.6 mg/L/4hr/vapour (equivalent or similar to OECD Guideline 403)

C. Skin corrosion/irritation

Ethyl alcohol	No irritating as a result of skin irritation test using rabbit. (OECD Guideline 404, GLP)
Isopropyl alcohol	No significant result as a result of skin irritation test using rabbit.
Isobutyl methyl ketone	No significant symptoms were observed as a result of skin irritation test using rabbit. (OECD Guideline 404, GLP)

D. Serious eye damage/irritation

Ethyl alcohol	Eye irritation tests using rabbit 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)
Isopropyl alcohol	As a result of eye irritation test using rabbit, conjunctival, corneal and iris reactions were induced in all animals. Conjunctival reactions included redness, chemosis, clear/white discharge and conjunctival ulceration, and redness was observed in all animals for 10 days. At the 14th observation, 3 animals showed redness, which means that it is not completely reversible. Iris reaction, corneal opacity, and corneal ulcer were not observed after 7 days. (equivalent or similar to OECD Guideline 405)
Isobutyl methyl ketone	The result of human exposure studies 200ppm was irritating to the most volunteer.

E. Respiratory or skin sensitization

Respiratory sensitization

Ethyl alcohol	In humans, a vapor concentration of 5000 ppm is irritating and

	uncomfortable to breathe, but recorded as tolerable (Lester, 1951). In practice, much higher concentrations will cause tears and cough.
Isopropyl alcohol	Not available
Isobutyl methyl ketone	Not available
Skin sensitization	
Ethyl alcohol	No significant symptoms were observed as a result of skin sensitization test using mouse. (equivalent or similar to OECD Guideline 429)
Isopropyl alcohol	No significant symptoms were observed as a result of skin sensitization test using guinea pig. (OECD Guideline 406, GLP)
Isobutyl methyl ketone	No significant symptoms were observed as a result of skin sensitization test using guinea pig. (OECD Guideline 406)
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 S. typimurium TA1535, TA97, TA98, TA100, TA104 (equivalent or similar to OECD Guideline 471)
Isopropyl alcohol	in vitro - Negative result of mammalian cell gene mutation assay using Chinese hamster Ovary (CHO) (equivalent or similar to OECD Guideline 476, GLP) in vivo - Negative result of micronucleus assay test result using mouse (equivalent or similar to OECD Guideline 474, GLP)
Isobutyl methyl ketone	in vitro - Negative result in vitro mammalian cell gene mutation using mouse (equivalent or similar to OECD Guideline 476, GLP)
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
Isopropyl alcohol	
- KOSHA	Not applicable
- IARC	3
- ACGIH	Not applicable

- NTP	Not applicable
- OSHA	IARC-3, TLV-A4
- EU CLP	Not applicable
Isobutyl methyl ketone	
- KOSHA	2
- IARC	2B
- ACGIH	A3
- NTP	Not applicable
- OSHA	EPA-1, TLV-A3
- 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)
Isopropyl alcohol	As a result of the two-Generation reproductive toxicity tests using rat, an increase in liver weight of generation P0 generation was observed at 1,000 mg/kg bw/day. In addition, the body weight of high-dose F1 males was significantly lower on day 0 and day 1 of birth than in the control group. No other effects were observed. (equivalent or similar to OECD Guideline 416, GLP) (WOE) As a result of the developmental toxicity test using rat, maternal toxic effects were found mortality 2 of female (8%) in the 1200mg/kg bw/day group and 1 female (4%) in the 800mg/kg bw/day group. Fetal toxicity/teratogenic effects were significantly reduced in body weight at 800 and 1,200 mg/kg bw/day, whereas no teratogenic effects were observed. (equivalent or similar to OECD Guideline 414, GLP)(WOE)
Isobutyl methyl ketone	As a result of the two-generation reproductive toxicity test using rat, the reproductive/developmental parameters were not affected at the maximum concentration of 2000 ppm. Reproductive toxicity is regarded as NOAEL=2000ppm (equivalent or similar to OECD guideline 416, GLP) As a result of developmental toxicity testing in rat, it was observed that the incidence of any type of anomaly was not related to exposure. The delay in skeletal formation was significantly increased only at 12,292 mg/m3. (equivalent or similar to OECD guideline 414, GLP)

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.
Isopropyl alcohol	As a result of human exposure, the effect shows within a few hours (30-60 minutes), and severe poisoning results in coma, depression, and low blood pressure. Central nervous system: dizziness, headache, etc. In severe cases, thyroid gland, coma, and reflex loss progress. In severe cases, often lasts 24 hours.
Isobutyl methyl ketone	As a result of acute toxicity test using guinea pig, the level of 1000 ppm did not cause irritation to the eyes and nose. Respiration rate decreases in the first 6 hours after exposure. Irritating to the eyes and nose and causing ataxia and mortality at 16,800 ppm. 9 out of 10 died within 6 hours of exposure. At the highest concentration of 28,000 ppm, 50% died within 45 minutes. Congestion is observed in fatty liver, brain, lung, and spleen.

J. STOT-repeated exposure

Ethyl alcohol	No significant symptoms were observed as a result of repeated oral toxicity tests for 14 weeks using rat, NOAEL = 1,730 mg/kg bw (equivalent or similar to OECD Guideline 408, GLP) Results of repeated 6-week inhalation toxicity tests using rat showed a significantly decrease in testosterone at a concentration of 2,000 ppm. (Read-Across (methanol:200-659-6))

Isopropyl alcohol	As a result of repeated inhalation toxicity tests for 104 weeks using rat, clinical signs such as decreased activity, decreased reflexes, anesthesia effect, weight change, and kidney weight gain were found, and a significant increase in the number of testicular stromal cell tumors was observed in male rat. Since this is associated with an abnormally low number of testicular tumors in the control group, the effect of the test substance cannot be considered as significant. As a result, a value of NOAEL=5,000 ppm was derived. (OECD Guideline 405, GLP)
Isobutyl methyl ketone	As a result of the 90-day oral repeated toxicity test using rat, clinical signs such as kidney changes and hepatic hypertrophy were observed in the high-dose group, but no significant symptoms were observed in the medium and low-dose groups, NOAEL=250 mg/kg bw/day. (equivalent or similar to OECD Guideline 408, GLP) Two-year repeated inhalation toxicity test with rat showed tumors in males' kidneys, but no significant symptoms of a human-independent type. (equivalent or similar to OECD Guideline 451)

K. Aspiration hazard

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)
Isopropyl alcohol	96hr_LC50(Pimephales promelas) = 9,640 mg/L (equivalent or similar to OECD Guideline 203)
Isobutyl methyl ketone	96hr_LC50(Danio rerio) > 179 mg/L (OECD Guideline 203,GLP)

Crustaceans

Ethyl alcohol	48hr_LC50(Ceriodaphnia dubia) = 5,012 mg/L (ASTM E729-80) 10d_NOEC(Ceriodaphnia dubia) = 9.6 mg/L(reproduction)
Isopropyl alcohol	24hr_LC50(Daphnia magna) >10,000 mg/L (equivalent or similar to OECD Guideline 202)

Isobutyl methyl ketone	48hr_EC50(Daphnia magna) >200 mg/L (OECD Guideline 202, GLP)

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)
Isopropyl alcohol	7d_Toxic threshold (average extinction value of all test cultures with nontoxic and non-polar test substance concentrations is used as a starting indicator for growth inhibition by 3% difference) = 1,800 mg/L
Isobutyl methyl ketone	48hr_EC50(Scenedesmus subspicatus) = 980mg/L

B. Persistence and degradability

Persistence

Ethyl alcohol	Log pow = -0.35 (24°C and pH7.4)
Isopropyl alcohol	Log pow = 0.25(WOE)
Isobutyl methyl ketone	Log pow = 1.9(equivalent or similar to OECD Guideline 117)

Degradability

Ethyl alcohol	15d_BOD=95%
Isopropyl alcohol	5d_BOD=53% (equivalent or similar to EU Method C.5, EU Method C.6)
Isobutyl methyl ketone	28d_BOD = 83% (OECD Guideline 301 F, GLP)

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-Across cas no. 67-56-1)
Isopropyl alcohol	BCF=3(SRC)
Isobutyl methyl ketone	Not available

Biodegradation

Not available

D. Mobility in soil

Polymer	Log koc=0.2((Q)SAR)
Isopropyl alcohol	koc = 1.5
Isobutyl methyl ketone	Log koc = 2.008(WOE)

E. Other adverse effects

- Hazardous to the ozone layer: Not applicable

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 : 1987

B. UN Proper shipping name : AHCOHOLS, N.O.S.

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
Isopropyl alcohol	Flammable liquids category 2 serious eye damage/irritation category 2 Specific target organ toxicity(single exposure) Category 3 (narcotic effects)
Isobutyl methyl ketone	Flammable liquids category 2 Eye irritation category 2 Acute toxicity inhalation category 4 Specific target organ toxicity(single exposure) Category 3 (respiratory irritation)
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 Working environment measurement substance (Measurement : every 6 months)
Isopropyl alcohol	Controlled chemical substances Special epidemiological inspections substance (Measurement : every 12 months) Control parameters inventory substance
Isobutyl methyl ketone	Working environment measurement substance substance (Measurement : every 6 months) Controlled chemical substances Special epidemiological inspections substance (Measurement : every 12 months) Control parameters inventory substance
Chemicals Control Act	Not applicable
Safety Control of Dangerous Substances Act	
Ethyl alcohol	4th class (Flammable liquid) Alcohol substances (Designated

	quantity 400L)
Isopropyl alcohol	4th class (Flammable liquid) Alcohol substances (Designated quantity 400L)
Isobutyl methyl ketone	4th class (Flammable liquids) 1st Petroleum crude oils insoluble liquid (Designated quantity 200L)
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

SECTION 16: Other information

A. Information sources and references

- Korean SDS of Denatured Ethanol 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-firstedition; https://www.unece.org/trans
- /danger/publi/ unrec/rev21/21files_e.html
- (KOMDI); https://www.komdi.or.kr/ukiwi/biz/info/ukiwiBizInfoIMDGCodeList.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.
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