SAFETY DATA SHEET

Date Printed: January 20th, 2020
Version: 4
Regulation: According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

1. Identification

1.1 Product identifier
1.1.1 Product name: 2-ETHYL-HEXANOL
1.1.2 Other means of identification: 2-Ethyl hexyl alcohol

1.2 Recommended use of the chemical and restrictions on use
1.2.1 Recommended use: It is also used for processing of silk fabric; dyes, resins, oil solvent; antidetonante; PVC resins plasticizer; wetting agent; organic synthesis; nitrocellulose, paint, lacquer, solvent mixture for baking finishes; ink; rubber; paper; lubricant; picture; dry cleaning
1.2.2. Restrictions on use: Do not use for purposes other than those recommended.

1.3 Details of the supplier of the safety data sheet
1.3.1 Manufacturer
Company name: Hanwha Solutions Co, Ltd.
Address: Yeosu plant, Hanwha Solutions Co, Ltd., 117, Yeosusandan 3-ro, Yeosu-si, Jeollanam-do, Korea
Prepared by: OA Production Team
Contact Telephone (Yeosu plant) +82-61-689-4124
1.3.2 Supplier & Distributor
Company name: Hanwha Solutions Co, Ltd.
Address: 18F, Hanwha Bldg., Janggyo-dong, Jung-gu, Seoul, Korea
Prepared by: PLS Sales Team
Contact Telephone: +82-2-729-1074

1.4 Emergency phone number
Emergency phone: +82-2-729-1074 (Sales) / +82-61-689-4124 (Plant)

2. Hazard(s) identification

2.1 Classification of the substance or mixture
According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Physical / Chemical Hazards:
Flammable Liquids: Category 4

Health Hazards:
Acute toxicity (inhalation): Category 4
Skin corrosion/irritation: Category 2
Serious eye damage /eye irritation: Category 2A
Specific target organ toxicity (single exposure): Category 3 (narcotic effects)

Environmental Hazards:
Not classified

2.2 Label elements, including precautionary statements

- **Pictogram and symbol**:

- **Signal word**: Warning
- **Hazard statements**:

H227 Combustible liquid
H315 Causes skin irritation.
H319 Causes serious eye irritation
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.

- **Precautionary statements:**

- Prevention:

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 Wash thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

- Treatment:

P302+P352 If on skin: Wash with plenty of soap and water.
P304+P340 If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312 Call a poison center or doctor/physician you feel unwell.
P321 Specific treatment (see information on this label).
P332+P313 If skin irritation occurs: Get medical advice/ attention.
P337+P313 If eye irritation persists: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.
P370+P378 In case of fire: Use powder for extinction.

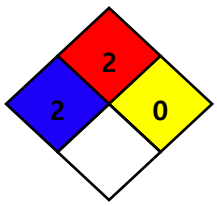
- Storage:

P403+P233: Store in a well-ventilated place. Keep container tightly closed.
P403+P235: Store in a well-ventilated place. Keep cool.
P405: Store locked up.

- Disposal:

P501: Dispose the contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazard information not included in hazard classification (NFPA)



- **Health:** 2
- **Flammability:** 2
- **Reactivity:** 0
- **Specific hazard:** -

3. Composition/information on ingredients

Component	Common name and synonyms	CAS No.	Conc. / %
2-ETHYL-HEXANOL	2-Ethyl hexyl alcohol	104-76-7	100

4. First aid measures

4.1 Description of first aid measures

Eye contact

- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If eye irritation persists: Get medical advice/attention.

Skin contact

- If skin irritation occurs: Get medical advice/ attention.
- Take off contaminated clothing and wash before reuse.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin
- In case of skin contact: may be toxic, Call emergency medical service.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
- For minor skin contact, avoid spreading material on unaffected skin.

Inhalation

- In case of Inhalation: may be toxic, Call emergency medical service.
- If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.

Ingestion

- In case of ingestion: may be toxic, Call emergency medical service.
- 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.
- If swallowed: Rinse mouth. Do not induce vomiting.

Indication of immediate medical attention and notes for physician

- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. Fire-fighting measures

5.1 Suitable (and unsuitable) Extinguishing media

- Suitable extinguisher: Carbon dioxide, alcohol resistance foam, water, dry chemical powder, aqueous film forming foam(AFFF), halogenide extinguisher
- Unsuitable extinguisher: Straight streams prohibition
- Use dry sand or earth to smother fire.

5.2 Specific hazards arising from the chemical

- Thermal decomposition products: Carbon oxides, irritating, corrosive or toxic gases
- Material itself is not burned, generate toxic and corrosive vapors by heat.
- Containers may explode when heated.
- Some of these materials may burn, but none ignite readily.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.

5.3 Special protective equipment and precautions for fire-fighters

- Wear self-contained breathing apparatus (SCBA) and adaptive chemical protective clothing.
- Evacuate area and fight fire from a safe distance.
- 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.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.

- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.
- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Avoid breathing dust/fume/gas/mist/vapours/spray.
- The very fine particles may 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.
- Please note that there are materials and conditions to avoid.

6.2 Environmental precautions and protective procedures

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

6.3 The methods of purification and removal

- Dike and collect water used to fight fire.
- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Absorb the liquid and scrub the 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.
- With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.
- Powder Spill; Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
- Small Spill; Take up with sand or other non-combustible absorbent material and place into containers for later disposal.

7. Handling and storage

7.1 Precautions for safe handling

- Avoid breathing vapours/mist/spray.
- Wash thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- 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 prolonged or repeated contact with skin.
- Please note that there are materials and conditions to avoid.
- Please work with reference to engineering controls and personal protective equipment.

7.2 Conditions for safe storage, including any incompatibilities

- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioning, or properly disposed of.
- Store in a well-ventilated place. Keep container tightly closed.

8. Exposure controls/personal protection

8.1 Occupational Exposure limits

- **Korea regulation :** Not available
- **ACGIH**: Not available
- **Biological exposure index**: Not available
- **OSHA**: Not available
- **NIOSH**: Not available
- **Biological exposure index :** Not available
- **EU regulation**:
  - Austria: TWA=50ppm(270mg/m^3)
  - Germany: TWA=10ppm(54mg/m^3)
  - Finland: TWA=1ppm(5.4mg/m^3)
- **Others**: Not available

8.2 Exposure controls

Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the recommended exposure limit.
- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a shower booth.

Individual protection measures, such as personal protective equipment

Respiratory protection

- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.
- In case exposured to gaseous/liquid material, the respiratory protective equipments as follow are recommended. escape full facepiece gas mask (for organic compounds) or escape half facepiece gas mask (for organic compounds) or direct full facepiece gas mask (for organic compounds) half facepiece gas mask (for organic compounds) or powered air-purifying gas mask.
- In lack of oxygen(< 19.5%), wear the supplied-air respiratior or self-contained breathing apparatus.oxygen

Eye protection

- Wear enclosed safety goggles to protect from gaseous state organic material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.

Hand protection

- Wear appropriate protective gloves by considering physical and chemical properties of chemicals.(nitrile rubber)
- Contact health and safety professional or manufacturer for specific information.
- Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.
- Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product.
- Gloves must be inspected prior to use

Body protection

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

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Description :	liquid
Color :	Colorless
Odor :	Mild, oily, sweet, slightly floral odor reminiscent of rose
Odor threshold :	0.138ppm
pH :	7
Melting point/freezing point :	-89°C
Initial boiling point and boiling range :	186°C(101.3kPa)
Flash point :	73 ℃
Evaporation rate :	Not available
Flammability (solid, gas) :	Not available
Upper/lower flammability or explosive limits :	0.88 % ~ 9.7 % in air
Vapor pressure :	120 Pa (25 °C)
Vapor density :	4.49(Air=1)
Solubility :	0.9 g/L (20 °C , PH 5.8)
Solubility in organic solvents :	Not available
Specific gravity :	0.833 g/cm³
Partition coefficient: n-octanol/water :	Log Pow=2.9 (25 °C, pH7)
Auto ignition temperature :	231 °C
Decomposition temperature :	Not available
Viscosity :	9.7 mPa-s (dynamic) at 20 °C
Molecular weight :	130.23

"NOTE: The physical data presented above are typical values and should not be construed as a specification"

10. Stability and reactivity

10.1 Reactivity/Chemical stability/Possibility of hazardous reactions:

- Stable at normal temperature and pressure.
- May decompose at high temperatures into forming toxic gases.
- Containers may explode when heated.
- Some of these materials may burn, but none ignite readily.
- Non-combustible, substance itself does not burn but may decompose upon heating, then produce corrosive and/or toxic fumes.

10.2 Conditions to avoid:

- Heat, sparks or flames
- Containers may rupture or explode if exposed to heat.

10.3 Incompatible materials:

- oxidizing agents, combustible materials, acids, metallic salts.

10.4 Hazardous decomposition products:

- carbon oxide, corrosive and poisonous vapors, irritant toxic gas

11. Toxicological information

Information on toxicological effects	
(a) Acute toxicity	
Oral	Not classified
	Rat(male), LD_{50}=ca.2,047 mg/kg bw (OECD TG 401)
Dermal	Not classified
	Rabbit, LD_{50}>2,000mg/kg bw
Inhalation	Category 4
	Rat, LC_{50} 0.89 ~ 5.3 mg/L 4hr (OECD TG 403, GLP)
(b) Skin Corrosion/ Irritation	Category 2
	2-EH was highly irritating, as severe irreversible skin reactions were noted in all treated animals during 24 through 72 hours after patch removal which developed into formation of new skin and scars within 2 weeks after patch removal.(stimulation index=6.75/8, erythema=3.3, edema=4.00) (OECD TG 404).
(c) Serious Eye Damage/ Irritation	Category 2A
	2-EH was markedly irritant to the rabbit's eye in a valid OECD 405 test. The effects were fully reversible within 21 days.(stimulation index=28.6/110, cornea=1.44, iris=0.89, conjunctiva erythema=2.56, chemosis=0.78) (OECD TG 405, GLP)
(d) Respiratory sensitization	Not available
(e) Skin Sensitization	Not available
(f) Carcinogenicity	Not classified
	IARC, ACGIH, NTP, OSHA, EU CLP 1272/2008, US EPA: Not listed
(g) Mutagenicity	Not classified
	- *In vitro*: In vitro Mammalian Cell Gene Mutation Test (*mouse lymphoma L5178Y cells*) (with or without metabolic activation): negative - *In vivo*: Mammalian Erythrocyte Micronucleus Test,GLP (*Mouse*): Negative (OECD TG 474, GLP)
(h) Reproductive toxicity	Not classified
	The developmental toxicity of 2 -EH following dermal absorption was examined in a OECD TG 414 rat study that was conducted under GLP. 2 -EH was applied to the skin of 25 females at 252, 840, and 2520 mg/kg bw/day under an occlusive dressing during gestational days 6 -15 for 6 hours per day. The dose levels were selected based on the results of a preliminary study (Tyletal, 1992). The maternal toxicity was mild. There were no deaths or severe clinical signs of toxicity. A reduced body weight gain in high-dose rats was noted, and local skin irritation in rats at the intermediate and the high dose level. 2 -EH had no adverse effect on the maternal gestational parameters, or maternal organ weights, or on the fetal weight, sex ratio, viability, or the incidence of malformations and variations. Therefore, the NOAEL for maternal systemic toxicity was 840 mg/kg bw/day, based on the effects on body weight gain; the NOAEL for skin irritation was 252 mg/kg bw/day. The NOAEL for developmental toxicity and teratogenicity was 2520 mg/kg bw/day.(OECD TG 414, GLP)
(i) Specific target	Category 3 (narcotic effects)

organ toxicity (single exposure)	Rat, 1h, 0.032~10.0 ml/kg, a major pathology is gastric mucosa irritation. decline of activity, Righting Reflex Reaction decline, exhaustion, fatigue, coma, etc. were observed. These symptoms usually appear in early and got recovered completely within 3~4days. Death occurred within 24hr after injection. (LD_{50}=3,730mg/kg bw) (OECD TG 401, GLP)
(j) Specific target organ toxicity (repeat exposure)	Not classified
	Rat, 90 days, 0, 25, 125, 250, 500mg/kg bw /day, Target organs were the liver, forestomach, and the kidneys; based on significantly increased relative organ weights at termination. 2-EH induces peroxisome proliferation in rats; observed at 500 mg/kg bw/day in rats of both sexes (NOEL=125mg/kg bw/day, NOAEL=250mg/kg bw/day)(OECD TG 408,GLP)
(k) Aspiration Hazard	Not available

12. Ecological information

12.1 Toxicity	
Acute toxicity	Not classified
	Fish: 96 hr LC50 (*Pimephales promelas*) 28.2 mg/L (OECD TG 203) 96 hr LC50 (*Golden Orfe*) 17.1 mg/L (EU Method C.1, GLP) Invertebrate: Not available Algae: 72 hr EC50 (*Scenedesmus subspicatus*) 11.5 mg/L (EU Method C.3) 48 hr EC50 (*Daphnia magna*) 39 mg/L (EU Method C.2, GLP)
Chronic toxicity	Not classified
12.2 Persistence and degradability	Persistence: Low persistency (log Kow is less than 4 estimated.) (Log Kow = 2.9, 25 °C, pH7)(estimated) Degradability: Not available
12.3 Bioaccumulative potential	Bioaccumulation: Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 29.48) (estimated) Biodegradation: As well-biodegraded, it is expected to have low accumulation potential in living organisms (79% ~ 99% biodegradation was observed after 2 week)
12.4 Mobility in soil	No potency of mobility to soil. (Koc = 105.6) (estimated)
12.5 Hazardous to ozone layer	Not classified
12.6 Other adverse effects	Not available

13. Disposal considerations

13.1 Disposal method

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

13.2 Disposal precaution

Consider the required attentions in accordance with waste treatment management regulation.

14. Transport information

14.1 UN No.: Not applicable

14.2 UN Proper shipping name: Not applicable

14.3 Transport Hazard classes:

ADR: Not applicable

IMDG: Not applicable

ICAO/IATA: Not applicable

RID: Not applicable

14.4 Packing group: Not applicable

14.5 Environmental hazards: Not applicable

14.6 Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not applicable

14.7 Special precautions for user : Not applicable

15. Regulatory information

15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture USA Regulatory Information

TSCA (Toxic Substances Control Act): Section 8(b) inventory (Present)

Proposition 65: Not regulated

OSHA Regulation: Not regulated

CERCLA Regulation: Not regulated

SARA 311/312 Hazard classes: Regulated

SARA 302 Regulation: Not regulated

SARA 304 Regulation: Not regulated

SARA 313 Regulation: Not regulated

Foreign Regulatory Information

Substance of Rotterdam Protocol: Not regulated

Substance of Stockholm Protocol: Not regulated

Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Existing Chemical Substance (KE-13766),
- European management information: European Inventory of Existing Commercial chemical Substances(EINECS) : Present (203-234-3)
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (38562)
- Australia management information: Australia Inventory of Chemical Substances (AICS): Present
- Canada management information: Domestic Substances List (DSL): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): HSNO Approval: HSR001386
- Philippines management information: Philippines Inventory of Chemicals and Chemical Substances (PICCS): Present

16. OTHER INFORMATION

16.1 Indication of changes:

Preparation date: March 6, 2018
Version: 4
Revision date: January 20th, 2020

16.2 Key literature reference and sources for data

- ○ TSCA; http://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/searchbylist/search.do
- ○ EU Regulation 1272/2008
- ○ TOMES;LOLI ; http://csi.micromedex.com/fraMain.asp?Mnu=0
- ○ UN Recommendations on the transport of dangerous goods 17th
- ○ IARC Monographs on the Evaluation of Carcinogenic Risks to Humans;http://monographs.iarc.fr
- ○ ECHA CHEM; http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances
- ○ OECD SIDS; http://webnet.oecd.org/
- ○ HSDB; http://toxnet.nlm.nih.gov/
- ○ EPA; http://www.epa.gov/iris
- ○ NIOSH; NIOSH.cdc.gov/niosh/npg/npgd0018.html
- ○ EPISUITE Program ver.4.1

16.3 Abbreviations

ACGIH: American Conference of Governmental Industrial hygienists
NIOSH: The National Institute for Occupational Safety and Health
OSHA: Occupational Safety & Health Administration
IARC: International Agency for Research on Cancer
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Dangerous Goods
ICAO/IATA: International Civil Aviation Organization/ International Air Transport Association
RID: Regulations Concerning the International Transport of Dangerous Goods by Rail

16.4 Other

- Product should be handled, stored, and used in accordance with the generally accepted industrial hygiene practices and in conformity with all the applicable legal regulations.
- The information provided herein is based on the knowledge possessed at this present time from the view point of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.