

# SAFETY DATA SHEET

**Date Printed:** January 20, 2020

**Version:** 4

**Revision Date:** January 20, 2020

**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:** I-BuOH

**1.1.2 Other means of identification:** 2-methylpropan-1-ol

### 1.2 Recommended use of the chemical and restrictions on use

**1.2.1 Recommended use:** Manufacture ester for fruit flavoring essences, solvent in paint, varnish removers, a solvent for surface coatings & adhesives

**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: Hanwha Solutions Co, Ltd., Hanwha Building, 85, Cheonggyecheon-ro, Jongno-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 3

#### Health Hazards:

Skin corrosion/irritation: Category 2

Serious eye damage /eye irritation: Category 2A

Specific target organ toxicity (single exposure): Category 3 (respiratory tract irritation)

Aspiration hazard: Category 2

#### Environmental Hazards:

Not classified

### 2.2 Label elements, including precautionary statements

o Pictogram and symbol:



o **Signal word:** Warning

o **Hazard statements:**

- H226 Flammable liquid and vapour
- H315 Causes skin irritation.
- H319 Causes serious eye irritation
- H335 May cause respiratory irritation.
- H305 May be harmful if swallowed and enters airways.

o **Precautionary statements:**

- **Prevention:**

- P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/lighting equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- 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 statements:**

- P302+P352 If on skin: Wash with plenty of soap and water.
- P303+P361+P353 If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- 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 for extinction.
- P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- P331 Do NOT induce vomiting.

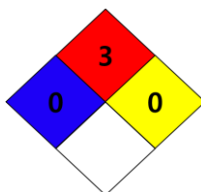
- **Storage statements:**

- 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)



- o **Health:** 0
- o **Flammability:** 3
- o **Reactivity:** 0
- o **Specific hazard:** 0

### 3. Composition/information on ingredients

Component	Common name and synonyms	CAS No.	Conc. / %
2-methylpropan-1-ol	Isobutanol	78-83-1	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 on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If skin irritation occurs: Get medical advice/ attention.
- For hot product, immediately immerse in or flush the affected area with large amounts of cold water to dissipate heat.

##### Inhalation

- If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.

##### Ingestion

- Get immediate medical advice/attention.

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

#### 4.2 Most important symptoms and effects, both acute and delayed: None known

#### 4.3 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 Extinguishing media

##### o 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.

o Unsuitable extinguishing media: Not available

#### 5.2 Specific hazards arising from the chemical

- Flammable liquid and vapour.
- 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 temperatures at or above the flashpoint.

#### 5.3 Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.

### 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.

### 6.2 Environmental precautions

- Prevent entry into water ways: sewers, basements or confined areas.

### 6.3 Methods and materials for containment and cleaning up

- 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.

## 7. Handling and storage

### 7.1 Precautions for safe handling

- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Avoid breathing dust/fume/gas/mist/vapours/spray.
- Wash thoroughly after handling.
- Use only outdoors or in a well-ventilated area.
- 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.
- Loosen closure cautiously before opening.
- Avoid prolonged or repeated contact with skin.

### 7.2 Conditions for safe storage, including any incompatibilities

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

## 8. Exposure controls/personal protection

### 8.1 Occupational Exposure limits

- o **ACGIH regulation:** TWA=50 ppm (152 mg/m<sup>3</sup>)
- o **Biological exposure index:** Not available
- o **OSHA regulation:** TWA=100 ppm (300 mg/m<sup>3</sup>), TWA=50 ppm (150 mg/m<sup>3</sup>)
- o **NIOSH regulation:** TWA=50 ppm (150 mg/m<sup>3</sup>)
- o **EU regulation:**
  - Belgium: TWA=50 ppm (154 mg/m<sup>3</sup>)
  - France: TWA=50 ppm (150 mg/m<sup>3</sup>)
  - Germany: TWA MAK=100 ppm (310 mg/m<sup>3</sup>)
- o **Other:**
  - Argentina: TWA[CMP]=50 ppm
  - Australia: TWA=50 ppm (152 mg/m<sup>3</sup>), STEL=200 ppm
  - Canada: TWA=50 ppm (152 mg/m<sup>3</sup>), STEL=75 ppm (227 mg/m<sup>3</sup>)

## 8.2 Exposure controls

### Appropriate engineering controls

- If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the recommended exposure limit.

### Individual protection measures, such as personal protective equipment

#### Respiratory protection

- If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), and approved respirator must be worn.
- In the United States of America, if respirators are used, a program should be instituted to assure compliance with OSHA Standard 63 FR 1152, January 8, 1998.
- Respirator type: Air-purifying respirator with an appropriate, government approved (where applicable), air-purifying filter, cartridge or canister. Contact health and safety professional or manufacturer for specific information.

#### Eye protection

- Wear safety glasses with side shields (or goggles) and a face shield.

#### Hand protection

- Wear chemical-resistant gloves for the risk of exposure.
- Contact health and safety professional or manufacturer for specific information.

#### Body protection

- Wear chemical-resistant footwear and protective clothing appropriate for the risk of exposure.
- Contact health and safety professional or manufacturer for specific information.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

#### Appearance

<b>Description:</b>	Liquid
<b>Color:</b>	Clear and colourless
<b>Odor:</b>	Sweet, musty smell
<b>Odor threshold:</b>	40ppm
<b>pH:</b>	7
<b>Melting point/freezing point:</b>	-108°C
<b>Initial boiling point and boiling range:</b>	108°C
<b>Flash point:</b>	31°C(1013hPa)
<b>Evaporation rate:</b>	0.82(butyl acetate = 1)
<b>Flammability (liquid):</b>	Flammable
<b>Upper/lower flammability or explosive limits:</b>	UEL: 10.9%, LEL: 1.2%
<b>Vapor pressure:</b>	10.4mmHg(25°C)
<b>Vapor density:</b>	2.56(Air = 1)
<b>Relative density:</b>	0.8018(24°C)
<b>Solubility:</b>	8.5 × 10 <sup>4</sup> mg/L(25°C)
<b>Partition coefficient: n-octanol/water:</b>	log K <sub>ow</sub> = 0.76
<b>Auto-ignition temperature:</b>	415°C
<b>Decomposition temperature:</b>	Not available
<b>Viscosity:</b>	4.703Cp(15°C)

“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 under normal temperatures and pressures.

### 10.2 Conditions to avoid

- Avoid heat, flames, sparks and other sources of ignition.

### 10.3 Incompatible materials

- Metal, strong oxidizing agents, combustible materials, metal salts

### 10.4 Hazardous decomposition products:

- Thermal decomposition products: Gas(carbon monoxide), irritating, corrosive and/or toxic vapour

## 11. Toxicological information

Information on toxicological effects	
(a) Acute toxicity	
Oral	Not classified
	Rat, LD <sub>50</sub> =3,350 mg/kg(GLP)
Dermal	Not classified
	Rabbit, LD <sub>50</sub> =2,460 mg/kg(GLP)
Inhalation	Not classified
	Rat, LC <sub>50</sub> =ca. 24.6 mg/L, 4h
(b) Skin Corrosion/ Irritation	Category 2
	In skin irritation test with rabbits, moderately irritating was observed.(OECD TG 404, GLP)
(c) Serious Eye Damage/ Irritation	Category 2A
	In Serious Eye Damage/ Irritation test with rabbits, Corneal opacity grade 3 and conjunctival redness grade 1 was observed in 1/3 rabbits at the end of the observation period (day 14). The other two rabbits were free of any signs of irritation. (OECD TG 405, GLP)
(d) Respiratory sensitization	Not available
(e) Skin Sensitization	Not classified
	In Skin Sensitization test with Guinea pig, sensitizing was no observed (OECD TG 406)
(f) Carcinogenicity	Not Classified
	IARC, ACGIH, NTP, OSHA, EU CLP 1272/2008, US EPA: Not listed
(g) Mutagenicity	Not classified
	<i>In vitro</i> : Bacterial reverse mutation assay with/without metabolic activation: Negative (OECD TG 471) <i>In vivo</i> : Mammalian Erythrocyte Micronucleus Test showed negative. (OECD TG 474, GLP)

(h) Reproductive toxicity	Not classified
	The prenatal development toxicity with rabbit, maternal toxicity based on a slight impairment of body weight gain in the higher dose. No relevant effects are observed in teratogenicity. NOAEL=2.5mg/L(maternal toxicity), NOAEL $\geq$ 10mg/L (teratogenicity) (OECD TG 414, GLP)
(i) Specific target organ toxicity (single exposure)	Category 3 (respiratory irritation)
	In acute inhalation toxicity test with rats at concentrations of 0, 1500, 3000, 6000 ppm, 6 hours a day, there was clear evidence of generalized depression of the central nervous system (animals were non-responsive to tapping on side of inhalation chambers) and labored respiration in rats during the 6 hours of exposure to 6000 and 3000 ppm. LC <sub>50</sub> >22.27mg/L · 4h (GLP)
(j) Specific target organ toxicity (repeat exposure)	Not classified
	In Repeated Dose 90-Day Oral Toxicity in Rodents with Rat at concentrations of 0, 1000, 4000, or 16,000 pp. Only one animal (4000 ppm) showed reddish smear on one eye and another animal (16000 ppm) were found to have an increased urine section, an increased drinking water consumption and at palpation apparently enlarged kidneys. These effects were assessed as being not substance-induced, i.e. incidental and spontaneous in nature. After 42 days of the study one animal (0 ppm, male) was found dead in the cage. (NOAEL>1450mg/kg bw/day) (OECD TG 408, GLP)
(k) Aspiration Hazard	Category 2
	3.103 mPa s (dynamic)(20°C), primary alcohol consisting of C3~13

## 12. Ecological information

12.1 Toxicity	
Acute toxicity	Not available
	Fish: 96hr LC <sub>50</sub> ( <i>Pimephales promelas</i> ) = 1,430 mg/L Invertebrate: 48hr EC <sub>50</sub> ( <i>Daphnia magna</i> ) = 1,100 mg/L Algae: 72hr EC <sub>50</sub> ( <i>Pseudokirchnerella subcapitata</i> ) = 593 mg/L
Chronic toxicity	Not available
	Invertebrate: 21d NOEC( <i>Daphnia magna</i> ) =20mg/L Algae: 72hr NOEC( <i>Pseudokirchnerella subcapitata</i> ) < 53 mg/L
12.2 Persistence and degradability	Persistence: Low persistency (log Kow is more than 4 estimated.) Log Kow =0.79(estimated) Degradability: Half lifecycle: 1.55 days
12.3 Bioaccumulative potential	Bioaccumulation: Bioaccumulation is expected to be low according to the BCF <500. (BCF = 3.162L/kg(estimated)) Biodegradation: As well-biodegraded, it is expected to have low accumulation potential in living organisms (70-80% biodegradation was observed after 28 day)
12.4 Mobility in soil	Low potency of mobility to soil. (Koc = 2.1(estimated))
12.5 Hazardous to the ozone layer	Not classified
12.6 Other adverse effects	Not available

**13. Disposal considerations****Disposal method**

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

**Disposal precaution**

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

**14. Transport information**

**14.1 UN No.:** UN 1212

**14.2 UN Proper shipping name:** ISOBUTANOL (ISOBUTYL ALCOHOL)

**14.3 Transport Hazard classes:** 3

**14.4 Packing group:** III

**14.5 Environmental hazards:** Not applicable

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

**14.7 Special precautions for user**

**in case of fire:** F-E

**in case of leakage:** S-D

**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:** 5000 lb final RQ; 2270 kg final RQ

**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-24894)
- European List of Notified Chemical Substances (ELINCS): Present (201-148-0)
- Japan management information: Existing and New Chemical Substances (ENCS): Present ((2)-3049)
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (40452)
- 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: HSR001097)
- Philippines management information: Philippines Inventory of Chemicals and Chemical Substances (PICCS): Present



**16. Other information, including date of preparation or last revision****16.1 Indication of changes**

Preparation date: Jun 20, 2016  
Version: 4  
Revision date: January 20, 2020

**16.2 Key literature reference and sources for data**

- National chemicals information systems ; <http://ncis.nier.go.kr>
- Pubchem; <http://pubchem.ncbi.nlm.nih.gov/>
- AKRON; <http://ull.chemistry.uakron.edu/erd/>
- IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
- ECHA; <http://echa.europa.eu/registration-dossier/-/registered-dossier/15859>
- OECD SIDS; [http://webnet.oecd.org/Hpv/UI/SIDS\\_Details.aspx?id=6E6AED5E-C43C-4930-A5FD-F3B4F5F558FF](http://webnet.oecd.org/Hpv/UI/SIDS_Details.aspx?id=6E6AED5E-C43C-4930-A5FD-F3B4F5F558FF)
- HSDB; <http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/r?dbs+hsdb:@term+@na+HYDROGEN%20CHLORIDE>
- NIOSH (The National Institute for Occupational Safety and Health)
- ACGIH (American Conference of Governmental Industrial Hygienists)
- TOMES-LOLI@ ; <http://www.rightanswerknowledge.com/loginRA.asp>
- National Emergency Management Agency-Korea dangerous material inventory management system; <http://www.nema.go.kr/hazmat/main/main.jsp>
- Waste Control Act enforcement regulation attached [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

**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.