



Material Safety Data Sheet

Creation	2016.07.29
Revision	2022.04.01
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C4 Raffinate-3

1. Chemical Product & Company Identification

A. Product Name: C4 Raffinate-3

B. Intended Use: middle distillate

Restrictions on use: Used for only recommended uses.

C. Manufacturer/Supplier:

1) Manufacturer:

Hanwha TotalEnergies Petrochemicals Co.,Ltd			
103, Dokgot2-Ro, Daesan-Eup, Seosan-Si, Chungnam, 31900, Korea			
T e l e p h o n e	82-41-660-6421	F a x	82-41-660-6649

2) Supplier: (Product information: 82-41-660-6421)

Hanwha TotalEnergies Petrochemicals Co.,Ltd			
17~20F Hanwha Finance Plaza, 92, Sejong-daero, Jung-gu, Seoul 04525, Korea			
T e l e p h o n e	82-2-3415-9374	F a x	82-2-3415-9390

3) Competitive person

Departments	Safety & Environment Planning Team		
T e l e p h o n e	82-41-660-6390,6382	F a x	82-41-660-6348

2. Hazard Identification

According to UN GHS 4th edition

A. Hazard Category:

1) Physicochemical Hazards

-Flammable gases: Category 1

-Gases under pressure: Liquefied gas

2) Health Hazards: Not Classified

3) Environmental Hazards: Not Classified

B. Precautionary Statement(s) & Warning Label



1) Symbol:



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2) Signal Word: Danger

3) Hazard Statement(s):

H220 Extremely flammable gas

H280 Contains gas under pressure; may explode if heated.

4) Precautionary Statement(s):

■ Prevention

P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

■ Response

P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

P381 Eliminate all ignition sources if safe to do so.

■ Storage

P403 Store in a well-ventilated place.

P401+P403 Protect from sunlight. Store in a well-ventilated place.

■ Disposal: Not applicable

C. Other hazards

NFPA ratings: Health=0, Flammability=4, Instability=0, Special=-

3. Composition / Information on ingredients

Chemical Name	Other Name	CAS No. or EC No.	Content(%)
Isobutylene	1-Propene, 2-methyl	115-11-7 / KE-24902	65~70%
2-Methylpropane	Isobutane	75-28-5 / KE-24865	15~20%
1-Butene	Alpha-butene	106-98-9 / KE-03887	8~12%
Butane	N-Butane	106-97-8 / KE-03751	3~7%

4. First Aid Measures

A. Eye Contact:

- Call emergency medical service.

B. Skin Contact:

- Call emergency medical service.
- Remove and isolate contaminated clothing and shoes.
- In case of contact with liquefied gas, thaw frosted parts with lukewarm water.



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C. Inhalation:

- Move to fresh air.
- Give artificial respiration if victim is not breathing.
- Administer oxygen if breathing is difficult.
- Keep victim warm and quiet.

D. Ingestion:

- Call emergency medical service.

E. Likely Acute or Delayed Symptoms/Effects: Not available

F. Emergency measure / Notes to physician:

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

5. Fire Fighting Measures

A. Extinguishing (and unsuitable) media:

1) 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.

2) Unsuitable extinguishing media

- : Not available

3) Unusual fire (big fire): Do not use direct water jet

B. Unusual fire & Explosion hazard:

1) Fire & Explosion hazard:

- Extremely flammable gas
- Contains gas under pressure; may explode if heated.
- May violently polymerize and result in fire and explosion.
- Containers may explode when heated.
- May form explosive mixtures with air.
- Will be easily ignited by heat, sparks or flames.
- Some of these materials may burn, but none ignite readily.
- Vapors may travel to source of ignition and flash back.
- Some of these materials, if spilled, may leave a flammable residue after evaporation

C. Special firefighting procedure / protection of firefighters:

- Leaking gas fire: Do not extinguish, unless leak can be stopped safely.



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- Eliminate all ignition sources if safe to do so.
- Evacuate area and fight fire from a safe distance.
- Vapors from liquefied gas are initially heavier than air and spread along ground.
- Ruptured cylinders may rocket.
- Stop leak if you can do it without risk.
- Move containers from fire area if you can do it without risk.
- Fire involving Tanks; Do not direct water at source of leak or safety devices; icing may occur.
- 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.
- Damaged cylinders should be handled only by specialists.
- Use extinguishing agent suitable for type of surrounding fire.

6. Accidental Release Measures

A. Personal precautions:

- The very fine particles may cause a fire or explosion, eliminate all ignition sources.
- If possible, turn leaking containers so that gas escapes rather than liquid.
- Isolate area until gas has dispersed
- Do not touch or walk through spilled material.
- Do not direct water at spill or source of leak.
- Eliminate all ignition sources.
- Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material.
- All equipment used when handling the product must be grounded.
- Allow substance to disperse
- Ventilate the area.
- Stop leak if you can do it without risk.
- Some of these materials, if spilled, may leave a flammable residue after evaporation



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B. Environmental precautions:

- Prevent entry into waterways, sewers, basements or confined areas.
- Prevent spreading of vapors through sewers, ventilation systems and confined areas.

C. Spill cleanup methods:

- Dike and collect water used to fight fire.

7. Handling and Storage

A. 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.
- All equipment used when handling the product must be grounded.
- Please work with reference to engineering controls and personal protective equipment.

B. Storage:

- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Protect from sunlight. Store in a well-ventilated place.
- Containers can build up pressure if exposed to heat (fire).
- Store in a closed container.

8. Exposure Controls / Personal Protection

A. Exposure limit value:

<Isobutylene>

- 1) ACGIH regulation: TWA = 250ppm
- 2) EU regulation:
 - Bulgaria: TWA = 100mg/m³
 - Belgium: TWA = 250ppm(583mg/m³)
 - Italy: TWA = 250ppm(574mg/m³) (listed under Butenes, all isomers)
- 3) Other
 - Canada: TWA = 250ppm (listed under Butenes, all isomers)
 - Israel: TWA = 250ppm (listed under Butenes, all isomers)
 - Dominican Republic: TWA = 250ppm (listed under Butenes, all isomers)

<2-Methylpropane>

- 1) ACGIH regulation: STEL: 1,000ppm
- 2) NIOSH regulation: TWA: 1,900mg/m³

- 3) EU regulation.



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- Germany: TWA = 1000ppm
- Belgium: TWA = 1,000ppm(가스, Aliphatic hydrocarbons [alkanes C1-4])
- Italy: TWA = 1,000ppm(가스, Aliphatic hydrocarbons [alkanes C1-4])

4) Other

- Austria: TWA = 1,900mg/m³
- Canada: TWA = 1,000ppm, STEL: 1,250ppm (listed under Butenes, all isomers)
- Slovenia: TWA = 1,000ppm, STEL: 4,000ppm

<1-Butene>

1) ACGIH regulation: TWA = 250ppm

2) EU regulation:

- Italy: TWA = 250ppm(574mg/m³) (listed under Butenes, all isomers)
- Belgium: TWA = 250ppm(583mg/m³)

3) Other

- Canada: TWA = 250ppm (listed under Butenes, all isomers)
- Colombia: TWA = 250ppm (listed under Butenes, all isomers)
- Dominican Republic: TWA = 250ppm (listed under Butenes, all isomers)

<Butane>

1) ACGIH regulation: STEL = 1,000ppm

2) OSHA regulation: TWA = 800ppm (1,900mg/m³)

3) NIOSH regulation: TWA = 800ppm (1,900mg/m³)

4) EU regulation:

- Austria: TWA = 800ppm(1,900mg/m³), STEL = 1,600ppm(3,800mg/m³)
- Belgium: TWA = 1,000ppm (4.5mg/m³)
- Denmark: TWA = 500ppm (1,200mg/m³)

6) Other

- Argentina: TWA = 800ppm
- Australia: TWA = 800ppm (1,900mg/m³)
- Brazil: TWA = 470ppm (1,090mg/m³)

B. Engineering control:

- Adequate ventilation (localize ventilation) should be provided in workplaces.
- A system of local and/or general exhaust is recommended to keep employee exposures above the Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. The use of local exhaust ventilation is recommended to control emissions near the source.

C. Personal protective equipment



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1) Respiratory protection:

- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.

2) Eye protection:

- In a gas state, protect eyes if possible.
- 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.
- Do not wear contact lenses.

3) Hand protection:

- Wear insulated gloves. (Neoprene)

4) Skin / Body protection

- In a gas state, do not need protective clothes.
- Wear suitable protective clothes and artic clothes in a liquid state.

9. Physical and Chemical Properties

A. Appearance (physical state, color etc.): Colorless Liquefied gas

B. Odor: Unpleasant Odor

C. Odor Threshold: Not available

D. pH: Not applicable

E. Melting point/Freezing point: butane (-138°C), isobutane (-160°C), 1-butene (-185°C),
Isobutene (-140.3°C)

F. Boiling point/range: butane (-0.5°C), isobutane (-12°C), 1-butene (-6°C), isobutene (6.9°C)

G. Flash point: butane (-60°C)

H. Evaporation rate: Not available

I. Flammability (solid, gas): Flammable gas

J. Flammability Limit (lower/upper): Not available

K. Vapor pressure: butane (213.7mmHg (21.1°C)), isobutane (304kPa (20°C)),
1-butene(464mmHg(21°C)), isobutene(257kPa(20°C))

L. Solubility in water: butane (0.006 g/100mL (25°C), isobutane(0.00489g/100m(25°C)),
1-butene (464mmHg (21°C)), isobutene (non soluble)

M. Vapor density(Air=1): butane (2.1), isobutane (2), 1-butene (1.93), isobutene(1.94, Air=1)

N. Specific gravity: 0.594(15.54°C)

O. Partition Coefficient(n-Octanol/water): Not available

P. Auto-ignition temperature: Not available

Q. Thermal decomposition: Not available

R. Viscosity: Not available

S. Molecular weight: Not available



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10. Stability and Reactivity

A. Chemical stability and Possibility of hazardous reactions:

- 1-butene may occur polymerization with the release of heats
- Cylinders exposed to fire may release flammable gas.
- Fire will produce irritating, corrosive and/or toxic gases.

C. Conditions to avoid:

- Keep away from heat/sparks/open flames/hot surfaces. No smoking.

D. Incompatible material: oxidizer, halogen

E. Hazardous decomposition products: Carbon oxides

11. Toxicological Information

A. Route of exposure

- 1) Inhalation: Not available
- 2) Ingestion: Not available
- 3) Skin/Eye contact: Not available

B. Delayed and immediate effects and also chronic effects from short and long term exposure

1) Acute toxicity: Not classified

- Oral: Not available
- Dermal: Not available
- Inhalation: Not classified (ATEmix > 10,000 ppm)
 - [Isobutylene]: LC₅₀ (4h) > 10,000 ppm (OECD Guideline 403, GLP)
 - [2-Methylpropane]: Rat, LC₅₀(4h) = 367,978 ppm
 - [1-Butene]: Rat, LC₅₀ (4h) ≥ 10,000 ppm (OECD TG 403, GLP)
 - [Butane]: Rat, LC₅₀ (4h) > 20,000 ppm (Read-across CAS No. 74-98-6)

2) Skin corrosion/irritation: Not classified

- [Isobutylene]: There are no data to evaluate the dermal or ocular irritation potential of isobutylene. However, should skin or eye contact occur to this chemical in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result.
- [1-Butene]: Skin or eye contact with this chemical in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result. This is likely to be a function of the temperature as the boiling point is around 0°C.
- [Butane]: Butane appears to be mildly to moderately irritating to the rabbit skin.



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(It cannot apply to classification due to low reliability)

3) Serious eye damage/irritation: Not classified

- [Isobutylene]: There are no data to evaluate the dermal or ocular irritation potential of isobutylene. However, should skin or eye contact occur to this chemical in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result.
- [1-Butene]: Skin or eye contact with this chemical in its liquid state, tissue freezing, severe cold burn, and/or frostbite may result. This is likely to be a function of the temperature as the boiling point is around 0°C.
- [Butane]: Vapor not irritating to eyes, nose, or throat.

4) Respiratory sensitization: Not available

5) Skin sensitization: Not available

6) Carcinogenicity: Not classified

•ACGIH:

- [Isobutylene]: A4

•EU CLP: Not listed

- [2-Methylpropane]: Category 1A (Known to have carcinogenic potential for humans) (containing $\geq 0.1\%$ w/w Butadiene)
- [Butane]: Category 1A (Known to have carcinogenic potential for humans) (containing $\geq 0.1\%$ w/w Butadiene)

7) Germ cell mutagenicity: Not classified

- [Isobutylene]:

- In vitro*: Mammalian Cell Gene Mutation Test (OECD TG 476), Bacterial Reverse Mutation Assay with/without metabolic activation: Negative,
- In vivo*: Mammalian Erythrocyte Micronucleus Test: Negative (OECD TG 474, GLP)

- [2-Methylpropane]:

- In vitro*: Mammalian Chromosome Aberration Test (OECD TG 473, GLP), Bacterial Reverse Mutation Assay (OECD TG 471), with/without metabolic activation: Negative,
- In vivo*: Drosophila sex linked recessive lethal assay: Negative

- [1-Butene]:

- In vitro*: Mammalian Chromosome Aberration Test (OECD TG 473, GLP), Bacterial Reverse Mutation Assay, with/without metabolic activation: Negative
- In vivo*: Not available

- [Butane]:

- In vitro*: Mammalian Chromosome Aberration Test (OECD TG 473, GLP), Bacterial Reverse Mutation Assay (OECD TG 471), 포유류 배양세포를 이용한 염색체이상시험 결과 with/without metabolic activation: Negative
- In vivo*: Mammalian Erythrocyte Micronucleus Test: Negative (read-across)

8) Reproductive toxicity: Not classified

- [Isobutylene]: In reproduction/developmental toxicity test with rats(M/F), adverse effects

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- were not observed (NOAEC=18,359 mg/m³) (OECD TG 414, GLP), (OECD TG 422, GLP)
- [2-Methylpropane]: In Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test, adverse effects were not observed (NOAEC=9,000 ppm).
 - [1-Butene]: In a non-guideline study conducted in mice and dogs, inhalation of 1-butene for 10 minutes produced anesthesia at a concentration of 22.7% (624,209 mg/m³) and respiratory arrest at a concentration of 27.2%
 - [Butane]: The authors examined lethality in male mice exposed for 2 hours to isobutane in air. Signs of central nervous system depression, rapid and shallow respiration, loss of posture and apnea were observed. (LC₅₀(4h) = 874mg/kg) (read-across CAS No. 75-28-5)
- 9) STOT-single exposure: Not classified
- [Isobutylene]: Inhalation of isobutylene can produce central nervous system depression, anesthesia and/or asphyxiation.
 - [1-Butene]: Exposure to 1-butene at target concentrations of 500, 2000, 8000 ppm (approximately 1147, 4589, 18359 mg/m³) did not induce systemic toxicity in male and female rats exposed for 28 days. (NOAEL P, F1=8,000ppm) (OECD TG 422, GLP)
 - [Butane], [2-Methylpropane]: The authors examined lethality in male mice exposed for 2 hours to isobutane in air. Signs of central nervous system depression, rapid and shallow respiration, loss of posture and apnea were observed. (LC₅₀(4h) = 874mg/kg) (read-across CAS No. 75-28-5)
- 10) STOT-repeated exposure: Not classified
- [Isobutylene]: In clinic oral toxicity test(2years) with rat, higher incidences of hyaline degeneration of respiratory and olfactory epithelium were seen in the treated groups. Male rats given 8000 ppm developed thyroid follicular cell tumours (NOAEC=2,000 ppm) (OECD TG 453, GLP).
 - [2-Methylpropane]: In Combined Repeated Dose Toxicity Study with the Reproduction / Developmental Toxicity Screening Test, adverse effects were not observed (NOAEC=9,000 ppm).
 - [1-Butene]: Rats were exposed to isobutane by inhalation combined repeated-exposure toxicity study. No systemic toxicity (e.g., no affect on survival, haematological or clinical chemistry parameters, feed consumption, body weight, organ weight, and histopathology) or neurological effects (as measured by clinical observations, functional observational battery, and motor activity) were observed at the highest concentration. (NOAEC_{systemic toxicity}=9,000 ppm)(OECD TG 422, GLP)
 - [Butane]: Rats were exposed to isobutane by inhalation combined repeated-exposure toxicity study. No systemic toxicity (e.g., no effect on survival, hematological or



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clinical chemistry parameters, feed consumption, body weight, organ weight, and histopathology) or neurological effects (as measured by clinical observations, functional observational battery, and motor activity) were observed at the highest concentration. (NOAEC_{systemic toxicity}=9,000 ppm) (OECD TG 422, GLP)

11) Aspiration hazard: Not available

12. Ecological Information

A. Ecotoxicity: Not available

- Acute toxicity: Not available
- Chronic toxicity: Not available
- 1) Fishes: Not available
- 2) Crustacea: Not available
- 3) Seaweeds: Not available

B. Persistence and Degradability:

1) Persistence:

- [Isobutylene]: Low persistency (log Kow is less than 4 estimated.) (log Kow=2.34)
- [2-Methylpropane]: Low persistency (log Kow is less than 4 estimated.) (Log Kow = 1.09)
- [1-Butene]: Low persistency (log Kow is less than 4 estimated.) (log Kow=2.4)
- [Butane]: Low persistency (log Kow is less than 4 estimated.) (log Kow=2.31)

2) Degradability:

- [Isobutylene]: Isobutylene air half-lives of 7.5 have been reported based on reactions with OH- (calculated)
- [1-Butene]: 0.5 days (calculated)
- [Butane]: 1,906 days (read-across CAS No.74-82-8)

C. Bioaccumulation potential:

1) Biodegradation:

- [Isobutylene]: As well-biodegraded, it is expected to have low accumulation potential in living organisms (50% biodegradation was observed after 2 day) (QSAR)
- [2-Methylpropane]: As well-biodegraded, it is expected to have low accumulation potential in living organisms (100% biodegradation was observed after 385.5h)
- [1-Butene]: As but-1-ene is a gas at standard temperature and pressure conducting a standard ready biodegradability test is technically difficult, The results of the BioHCwin predictions for but-1-ene indicate that it will degrade rapidly, with an estimated half-life of 2.8 days. (estimated)
- [Butane]: As well-biodegraded, it is expected to have low accumulation potential in living organisms (100% biodegradation was observed after 16day)



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(Read-across, CAS No. 74-84-0)

2) Bioaccumulation:

- [Isobutylene]: Bioaccumulation is expected to be low according to the BCF < 500 (BCF=19)
- [2-Methylpropane]: Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 30.8)
- [1-Butene]: Bioaccumulation is expected to be low according to the BCF < 500 (BCF=17.8)
- [Butane]: Bioaccumulation is expected to be low according to the BCF < 500 (BCF=37.48) (estimated)

D. Mobility in soil:

- [Isobutylene]: No potency of mobility to soil. (Koc=117.5)(estimated)
- [2-Methylpropane]: No potency of mobility to soil (Koc = 248.3)
- [1-Butene]: No potency of mobility to soil (Koc=120.9) (estimated)
- [Butane]: No potency of mobility to soil (Koc=322) (estimated)

E. Hazardous to the ozone layer: Not classified

F. Other adverse effects: Not available

13. Disposal Consideration

A. Disposal method:

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

B. Disposal instruction:

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

14. Transportation Information

A. UN classification: 3161

B. Proper shipping name: LIQUEFIED GAS, FLAMMABLE, N.O.S.

C. Class/division: 2.1

D. Packing group: Not applicable

E. Marine pollutant: Not applicable



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F. Special precautions for user related to transport or transportation measures

- FIRE SCHEDULE: F-D
- SPILLAGE SCHEDULE: S-U

15. Regulatory Information

A. Additional national and/or international regulatory information

1) Information of EU Classification:

- EC 1272/2008(CLP) Classification
 - [Isobutylene]: Flam. Gas 1, Press. Gas
 - [2-Methylpropane]: Flam. Gas 1, Press. Gas
 - [1-Butene]: Flam. Gas 1, Press. Gas
 - [Butane]: Flam. Gas 1, Press. Gas
- EC 1272/2008(CLP) Risk Phrases
 - [Isobutylene]: H220
 - [2-Methylpropane]: H220
 - [1-Butene]: H220
 - [Butane]: H220
- EC 1272/2008(CLP) Safety Phrase
 - [Isobutylene]: P210, P377, P381, P403, P301
 - [2-Methylpropane]: P210, P377, P381, P403, P301
 - [1-Butene]: P210, P377, P381, P403, P301
 - [Butane]: P210, P377, P381, P403, P301
- EU SVHC list: Not regulated
- EU Authorization list: Not regulated
- EU Restriction list: Not Regulated

2) U.S. Federal regulations:

- OSHA PROCESS SAFETY (29CFR1910.119): Not regulated
- CERCLA Section 103 (40CFR302.4): Not regulated
- EPCRA Section 302 (40CFR355.30): Not regulated
- EPCRA Section 304 (40CFR355.40): Not regulated
- EPCRA Section 313 (40CFR372.65): Not regulated

3) Rotterdam Convention listed ingredients: Not regulated

4) Stockholm Convention listed ingredients: Not regulated

5) Montreal Protocol listed ingredients: Not regulated

16. Other Information

A. Key literature reference and sources for data:

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IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
 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
 ECHA CHEM; <http://echa.europa.eu/web/guest/information-on-chemicals/registered-substances>
 Management Agency-Korea dangerous material inventory management system;
<http://www.nema.go.kr/hazmat/main/main.jsp>
 OECD SIDS; <http://webnet.oecd.org/Hpv/UI/Search.aspx>
 Waste Control Act enforcement regulation attached [1]
 National chemicals information systems; <http://ncis.nier.go.kr>

B. Key to abbreviations and acronyms

ACGIH - American Conference of Governmental Industrial Hygienists
 ECHA - The European Chemicals Agency
 OECD - The Organisation for Economic Co-operation and Development
 CERCLA - Comprehensive Environmental Response, Compensation, and Liability Act
 IARC - International Agency for Research on Cancer
 NIOSH - National Institute for Occupational Safety and Health
 OSHA - Occupational Safety and Health Administration
 NTP - National Toxicology Program
 TSCA - Toxic Substances Control Act
 NFPA - National Fire Protection Association
 LC₅₀ - The concentration of a material expected to kill 50% of an animal test group.
 LD₅₀ - The dose of a material expected to kill 50% of an animal test group.
 EC₅₀ - median effective concentration
 STEL - Short Term Exposure Limit
 TWA - Time weight Average
 TLV - Threshold Limit Value (recommended by ACGIH)

C. Issue date: 2016.07.29

D. Revision number and date:

- Revision number: 4
- Revision data: 2022.04.01
 - Rev.4 : Change company name and logo

E. Other:

This information relates to the specific material designated and may not be valid for such material



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used in combination with any other materials or in any process. Such information is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty or guarantee is made as to its accuracy, reliability or completeness. It is the user's responsibility to satisfy himself as to the suitability and completeness of such information for his own particular use. We do not accept liability for any loss or damage that may occur from the use of this information nor do we offer warranty against patent infringement.