Material Safety Data Sheet

Product name		Butane Gas Cartridge	
1. Product and company identification			
a) Product name	Butane Gas Cartridge		
b) Recommended use of product and lim	itations		
- Recommended Use of product	For use only in portable ga	as appliances	
- Limitations	Extremely flammable		
c) Manufacturer / Supplier Information	·		
- Company	DAE RYUK CAN CO.,LTD		
- Address		Entrepreneurs Asso, Bldg., 221, Yeoksam-ro, Kangnam-Ku,	
	Seoul, KOREA		
- Emergency phone number	+82-2-6003-0600, +82-2-60	003-0700	
2. Hazards identification			
a) Hazard-Risk Classification	Flammable gases : 1		
		quefied gas or Refrigerated liquefied gas	
		ity (single exposure) : 3 (narcosism)	
 b) Label elements including precautionar - Symbol 	y		
- Signal word - Hazard-risk statement	Danger H220 Extremely flamma	able gas	
	H280 Contains gas und	er pressure may explode if heated	
	•	ated gas; may cause cryogenic burns or injury.	
- Precautionary statement	H336 May cause drows	iness or dizziness	
Prevention	P210 Keep away from h	neat/sparks/open flames/hot surfaces No smoking	
		ust/fumes/gas/mist/vapours/spray.	
		s or in a well-ventilated area.	
	P282 Wear cold insulat	ing gloves/face shield/eye protection.	
Response	P304+P340 IF INHALE	D: Remove person to fresh air and keep comfortable for breathing	
	P312 Call a medical ce	nter(doctor) if you feel unwell.	
	P315 Get immediate m	edical advice/attention.	
	P336 Thaw frosted part	s with lukewarm water. Do not rub affected areas.	
	P362+P364 Take off co		
		ntaminated clothing and wash it before reuse.	
	•••	Do not extinguish, unless leak can be stopped safely	
01	P381 Eliminate all igniti	Do not extinguish, unless leak can be stopped safely on sources if safe to do so	
Storage	P381 Eliminate all igniti P403 Store in a well-ve	Do not extinguish, unless leak can be stopped safely on sources if safe to do so ntilated place	
Storage	P381 Eliminate all igniti P403 Store in a well-ve P403+P233 Store in a v	Do not extinguish, unless leak can be stopped safely on sources if safe to do so	
Storage	P381 Eliminate all igniti P403 Store in a well-ve P403+P233 Store in a v P405 Store locked up.	Do not extinguish, unless leak can be stopped safely on sources if safe to do so ntilated place well ventilated place. Keep container tightly closed.	
	P381 Eliminate all igniti P403 Store in a well-ve P403+P233 Store in a v P405 Store locked up. P410+P403 Protect from	Do not extinguish, unless leak can be stopped safely on sources if safe to do so ntilated place well ventilated place. Keep container tightly closed. m sunlight. Store in a well-ventilated place.	
Storage Disposal	P381 Eliminate all igniti P403 Store in a well-ve P403+P233 Store in a v P405 Store locked up. P410+P403 Protect from P501 Dispose of conte	Do not extinguish, unless leak can be stopped safely on sources if safe to do so ntilated place well ventilated place. Keep container tightly closed. n sunlight. Store in a well-ventilated place. nts or container in accordance with	
	P381 Eliminate all igniti P403 Store in a well-ve P403+P233 Store in a v P405 Store locked up. P410+P403 Protect from P501 Dispose of conte	Do not extinguish, unless leak can be stopped safely on sources if safe to do so ntilated place well ventilated place. Keep container tightly closed. m sunlight. Store in a well-ventilated place.	

c) Other Hazard Risk (NFPA)

- Propane	
Health	1 (slightly hazardous)
Flammability	4 (flash points below 22.7 \degree C)
Reactivity	0 (stable)
- n-Butane	
Health	1
Flammability	4
Reactivity	0
- iso-Butane	
Health	1
Flammability	4
Reactivity	0
- n-Pentane	
Health	1
Flammability	4
Reactivity	0
- iso-Pentane	
Health	1
Flammability	4
Reactivity	0

3. composition / information in ingredients			
Chemical name	Other name	CAS 번호	Content (wt%)
Propane	Propane	74-98-6	0 <= x%< 5
Butanes	Butane	68513-65-5	-
- n-Butane	n-Butane	106-97-8	50 <= x%< 70
- iso-Butane	iso-Butane	75-28-5	25 <= x%< 35
1,3-Butadiene	1,3-Butadiene	106-99-0	< 0.1%
Total		100 %	
4. First aid measure			
a) Eye contact	Seek medical attention immediately.		
b) Skin contact	If frostbite has occurred, seek medical attention immediately; Do NOT rub the		

affected areas. In order to prevent further tissue damage, do NOT attempt to remove frozen clothing and cool the frostbite part as long as possible with cold water.

Before to remove frozen clothing, thaw it

If frostbite has NOT occurred, immediately wash contaminated skin with soap and water.

If skin trouble occurred, get medical attention and advice.

c) Inhalation

Seek medical attention immediately.

Keep the affected person warm and at rest.

If a person breathes large amounts of this chemical, move the exposed person to fresh air place

If breathing is difficult, give oxygen.

If breathing has stopped, perform mouth-to-mouth resuscitation.

d) Ingestion	Seek medical attention immediately.
e) Notes for physician	Keep a doctor to recognize chemical substance and take care of patients.
5. Fire-fighting measures	
a) Suitable (and unsuitable) extinguishing	CO2, dry chemical, water spray or fog for surrounding area
media.	Use dry sand or earth for the smothering extinguishment
b) Specific hazards arising from	Extreme flammable gas
the chemical	A leakage of material may present a fire / explosion risk.
	There is a risk of steam explosion in indoor, outdoor and sewer.
	It will ignite easily by heat, spark and flame.
	Vapors may ignite and explode.
	Shut off source of propane, if possible, dilute leakage of water.
	Easily ignited by heat, sparks and flames.
	Steam can move back to the ignition source and flash back Vapor
	may cause dizziness or asphyxiant without awareness
	Some constituents may be irritating when inhaled at high concentrations.
	Cylinders exposed to fire may release flammable gas.
	Note that some part can leave flammable residue after evaporation
c) Special protective equipment and	Keep away from contact with clothing and other combustible materials to avoid
precautions for fire-fighters	Avoid friction or rough handling because of fire hazard.
	Allow gas to burn if flow cannot be shut off.
	Eliminate sources of ignition.
	Evacuate area and fight fire from a safe distance.
	Leaking gas fire : do not stop extinguish unless leak can be stopped safely. Move container from fire area if it is not dangerous.
	Be careful that broken cylinders may fly over.
	Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Do
	not touch the exposure source or safety device directly, as it may freeze in the In case of
	a tank fire, use fire extinguisher at enough distance or use unmanned After fire has extinguished, flush with plenty of water for a long time to cool In case of a tank fire,
	immediately leave the fire area if there is treble sound or discoloration of the tank.
	In case of a tank fire, get out of the area If the tank is in flames
	Evacuate in accordance of accident situation. (Evacuation radius : 0.8 km, The
	spread range varies depending on the location of the accident and the fire
	fighting way to be taken.) Rapidly excess heating or fire will be caused burst or rupture of a container. (In case at elevated temperatures(over $54^{\circ}C/130^{\circ}F$) CRV
	of containers will be operated.
6. Accidental release measures	
a) Personal precautions, protective	Use non-sparking equipment when cleaning up flammable spill.
equipment and emergency procedures	In closed spaces, wear a self-contained breathing apparatus and ventilate.
	Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
	Avoid inhalation and skin contact, contaminated clothing should be changed.
	Contain spilled liquid with sand or earth. do NOT use combustible materials.
	Dust can be a fire or explosion hazard.
	Immediately wipe the spill, follow precautions for protective equipment.
a) Personal precautions, protective	If possible, turn the leak valve of container to be released as gas rather than Ventilate
equipment and emergency procedures	the contaminated area.
(Continued)	Do not touch the leak source directly.
	Using water spray to reduce the vapor or vapor clouds of gas and do not allow Always
	ground all equipment when handling material.

b) Environmental precautions and	Keep out of drains, sewers, ditches and waterways.
protective procedures	Use appropriate container to avoid environmental contamination.
F F	Cover with absorbent or contain, Collect and dispose.
d) Methods and materials for containment	If possible, release in vapor by turning over leaking container.
	Clean the contaminated zone using cleanser and water.
	Use water spray/fog for prevent spread.
7. Handling and storage	
a) Precautions for safe handling	To avoid sudden release of pressure, loosen closure cautiously before opening.
	Avoid inhalation, skin and eyes.
	Use only clean, dry utensils in handling.
	Minimize dust generation and accumulation.
	Do not smoke or use matches or lighters during use and until vapors are gone.
	To dissipate static electricity during transfer, ground drum and connect to receiving
	container with bonding strap.
	Avoid prolonged or repeated skin contact.
	Wash thoroughly after handling.
	Avoid breathing gas or vapor.
b) Conditions for safe storage	Keep away from heat, spark and flame – No Smoking.
(including any incompatibilities)	Avoid direct sunlight and store in a well-ventilated place.
	The empty cylinder should be completely drained, properly blocked and
	immediately returned to the cylinder regulator. Place it properly.
	Stored containers should be periodically checked for general conditions and
	leakage.
	Keep container tightly closed.
	Store in a cool, well-ventilated area.
8. Exposure controls and personal protection	n
a) Control parameter and Biological Exposure I	Indices
Domestic regulation	
Propane	TWA - 1,000ppm 1,800mg/m3
n-Butane	TWA - 800ppm 1,900mg/m3
iso-Butane	TWA - 800ppm 1,900mg/m3
n-Pentane	No Data Available
iso-Pentane	No Data Available
ACGIH TLV-TWA (Threshold Limit Value	- Time Weighted Average)
Propane	TWA 1,000 ppm 8hours (3/2012)
n-Butane	TWA 1,000 ppm 8hours (3/2012)
iso-Butane	TWA 1,000 ppm 8hours (3/2012)
n-Pentane	TWA 600 ppm 8hours (3/2012)
iso-Pentane	TWA 600 ppm 8hours (3/2012)
Biological Exposure Indices (BEI)	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available

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No Data Available

No Data Available

n-Pentane

iso-Pentane

b) Appropriate engineering controls	Adequate ventilation should be provided so that exposure limits are not exceeded. In case of risk explosion, use explosion-proof ventilation equipment.
c) Personal protective equipment	
- Respiratory protection	Use NIOSH approved positive-pressure, supplied air respirator with escape bottle.
- Eye protection	Where there is a possibility of liquid contact, wear splash-proof safety goggles and face- shield.
- Hands protection	Use cold-impervious, insulating gloves where contact with liquid may occur.
- Body protection	Where contact with liquid may occur, wear apron and face-shield.

 Color Physical state Odor Odor threshold pH Melting /freezing point Propane n-Butane iso-Butane iso-Pentane Initial boiling point and boiling range Propane n-Butane iso-Butane iso-Pentane iso-Butane iso-Butane n-Pentane iso-Pentane iso-Butane iso-Butane iso-Butane iso-Butane iso-Butane iso-Butane iso-Butane iso-Pentane iso-Pentane iso-Pentane iso-Pentane iso-Pentane iso-Pentane iso-Pentane iso-Pentane iso-Butane iso-Butane iso-Butane iso-Butane iso-Pentane iso-Pentane iso-Pentane iso-Pentane 	Colorless Gas, liquid at low temperature, high pressure Odorless (before injecting an odorizer), Characteristic odor (after injecting an odorizer) The odor of gas shall be detected when the gas/air compound ratio reaches 1/1000. (after injecting an odorizer) Not applicable About $-155 \sim -138$ °C -187.68°C -138.29°C -159.61°C -159.61°C -159.9°C About $-10 \sim 0$ °C -42.11°C -0.49°C -11.75°C
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 n-Pentane iso-Pentane Initial boiling point and boiling range Propane n-Butane iso-Butane iso-Pentane iso-Pentane Flash point Propane n-Butane iso-Butane n-Butane n-Pentane n-Pentane 	-129.8℃ -159.9℃ About -10 ~ 0℃ -42.11℃ -0.49℃
 iso-Pentane Initial boiling point and boiling range Propane n-Butane iso-Butane n-Pentane iso-Pentane Flash point Propane n-Butane iso-Butane n-Butane n-Butane n-Butane n-Butane n-Pentane 	-159.9°C About -10 ~ 0°C -42.11°C -0.49°C
Initial boiling point and boiling range - Propane - n-Butane - iso-Butane - n-Pentane - iso-Pentane) Flash point - Propane - n-Butane - iso-Butane - iso-Butane - n-Pentane	About -10 ~ 0 °C -42.11 °C -0.49 °C
 Propane n-Butane iso-Butane n-Pentane iso-Pentane Flash point Propane n-Butane iso-Butane n-Pentane 	-42.11 ິC -0.49 ິC
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 n-Pentane iso-Pentane Flash point Propane n-Butane iso-Butane n-Pentane 	14 75 m
 iso-Pentane Flash point Propane n-Butane iso-Butane n-Pentane 	-11.75 C
) Flash point - Propane - n-Butane - iso-Butane - n-Pentane	36.1 ℃
 Propane n-Butane iso-Butane n-Pentane 	27.85 ℃
- n-Butane - iso-Butane - n-Pentane	About -75 ~ -60 ℃
- iso-Butane - n-Pentane	-104℃
- n-Pentane	℃ °C
	-83 °C
- iso-Pentane	-49 °C
	-51 °C
) Evaporation rate	No Data Available
Flammability (liquid, gas)	Flammable gas
Upper / lower flammability	About 8.4 % / 1.6 %
- Propane	9.5% / 2.1%
- n-Butane	8.4% / 1.6%
- iso-Butane	
 n-Pentane iso-Pentane 	9.6% / 1.8%

k) Vapor pressure	About 2.5 Bar (at 21 ℃)
- Propane	8.587 Bar (at 21 ℃)
- n-Butane	2.148 Bar (at 21 ℃)
- iso-Butane	3.126 Bar (at 21 ℃)
- n-Pentane	0.5790 Bar (at 20 ℃)
- iso-Pentane	0.795 Bar (at 21 ℃)
I) Solubility	About 60mg/L (at 25℃)
- Propane	62.5mg/L (at 25℃)
- n-Butane	61mg/100mL (at 20℃)
- iso-Butane	48.9mg/L (at 25℃)
- n-Pentane	40.2mg/L (at 20℃)
- iso-Pentane	48 mg/L (at 25 ℃)
m) Vapor density	About 2 (air=1)
- Propane	1.55
- n-Butane	2.07
- iso-Butane	2.01
- n-Pentane	2.48
- iso-Pentane	2.5
n) Specific gravity	About 0.58 (at 15℃)
- Propane	0.58088 kg/L (at boiling point, 1.013bar)
- n-Butane	0.60126 kg/L (at boiling point, 1.013bar)
- iso-Butane	0.59382 kg/L (at boiling point, 1.013bar)
- n-Pentane	0.626 kg/L
- iso-Pentane	0.616 kg/L (at boiling point, 1.013bar)
o) Partition coefficient (n-octanol / water)	About 2.85 (log Kow)
- Propane	2.36
- n-Butane	2.89
- iso-Butane	2.76
- n-Pentane	3.39
- iso-Pentane	2.3
p) Autoignition temperature	About 260 $^\circ C$ (The Lowest temperature of all substance)
- Propane	470℃
- n-Butane	430 ℃
- iso-Butane	460 °C
- n-Pentane	260 ℃
- iso-Pentane	420 ℃
q) Decomposition temperature	No Data Available
r) Viscosity	No Data Available
s) Molecular weight	About 58.4
- Propane	44.0965
- n-Butane	58.1234
- iso-Butane	58.1234
- n-Pentane	72.1503
- iso-Pentane	72.1503

10. Stability and reactivity	
a) Chemical stability and possibility of	Extreme Flammable gas.
hazardous reactions	A leakage of material may present a fire / explosion risk.
	There is a risk of steam explosion in indoor, outdoor and sewer. It will ignite easily by
	heat, spark and flame.
	Vapors may ignite and explode.
	Vapor can move to the ignition source and flash back.
	Vapors may cause dizziness or asphyxiant without awareness
	Cylinders exposed to fire may release flammable gas.
b) Conditions to avoid	Keep away from strong oxidizers, ignition sources and heat – no smoking.
c) Incompatible materials	No Data Available
d) Hazardous decomposition products	Carbon monoxide, carbon dioxide and non-combusted hydrocarbons(smoke).

11. Toxicological information

iso-Pentane

a) Information on the likely routes of exposure - Propane nausea, vomiting, irregular heart rate, headaches, drowsiness, dizziness, disorientation, emotional lability, inebriation, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy, shortness of breath, central nervous system (CNS) depression. Ingestion of a hazardous amount is unlikely to occur. may cause freeze burns and frostbite. It can cause stimulus, nausea, vomiting, shortness of breath, irregular heart rate, - n-Butane headaches, drowsiness, fatigue, dizziness, disorientation, emotional lability, inebriation, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy. It can cause stimulus, nausea, vomiting, headaches, drowsiness, fatigue, dizziness, - iso-Butane emotional lability, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy. may cause freeze burns and frostbite It can cause stimulus, nausea, vomiting, stomach ache, shortness of breath, - n-Pentane headaches, drowsiness, dizziness, adjustment (feature) loss, asphyxiant. Ingestion of a hazardous amount is unlikely to occur. - iso-Pentane It can cause stimulus, nausea, vomiting, stomach ache, shortness of breath, headaches, drowsiness, dizziness, adjustment (feature) loss, asphyxiant. Ingestion of a hazardous amount is unlikely to occur. b) Health hazards information - Acute toxic No Data Available Oral Dermal No Data Available Propane No Data Available n-Butane No Data Available iso-Butane No Data Available n-Pentane LC50 > 2,000 mg/kg Rat iso-Pentane Inhalation LD50 570,000 ppm 15 min Rat Propane LC50 277,374 ppm 4 hr Rat n-Butane LC50 658,000mg/ m3 4 hr Rat iso-Butane LC50 364,000mg/ m3 4 hr Rat n-Pentane

LC50 280,000mg/ m3 4 hr Rat

- Skin corrosive / irritant	
Propane	No Data Available (EU Directive 67/548) rabbit /irritating (IUCLID)
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	Non-stimulated (rabbit)
- Serious eye damage / eye irritation	
Propane	No Data Available (EU Directive 67/548/EEC) Rabbit/ not irritating (IUCLID)
n-Butane	Non-stimulated (rabbit)
iso-Butane	Non-stimulated (rabbit)
n-Pentane	No Data Available
iso-Pentane	High-concentrated vapor can stimulate eye.
- Respiratory sensitization	No Data Available
- Skin sensitization	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
	No Data Available
n-Pentane iso-Pentane	Negative (from the result of Maximization test using a guinea pig)
	Not applicable
- Carcinogenicity	No Data Available
The occupational safety and	
health act (domestic)	
Labor Ministry Notice	Not Listed
propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
IARC	Not Listed
OSHA	Not Listed
ACGIH	No Data Available
NTP	Not Listed
- EU CLP	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Germ cell mutagenicity	
Propane	No Data Available
n-Butane	Back mutation test using microorganism – negative
iso-Butane	Back mutation test using microorganism – negative
n-Pentane	No Data Available
iso-Pentane	Mammal bone marrow micronucleus test – negative
	Maninai sone manow micronacicas test – negative

 Reproductive toxicity 	0
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	First generation reproductive toxicity test result : No reproductive toxicity was
- Specific target organ toxicity	Not applicable (EU Directive 67/548/EEC)
(single exposure)	
Propane	No Data Available
n-Butane	In high concentration, causing narcosism and depressing-central nervous system.
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	Narcotization was reported for inhalation exposure : Rat
- Specific target organ toxicity	
(repeated exposure)	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Aspiration hazard	No Data Available

12. Ecological information

a) Aquatic and terrestrial ecotoxicity

a) riquallo ana terrestital coolexiony	
- fish	
Propane	LC50 > 100 mg/L 96 hr ((Species : Fish TLm))
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Crustacean	
Propane	LC50 52.157 mg /L 48 hr
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	EC50 2.3 mg/L 48 hr
- Algae	
Propane	LC50 32.252 mg /ł 96 hr
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
b) Persistence and degradability	
- Persistence	
Propane	log Kow 2.36
n-Butane	log Kow 2.89
iso-Butane	log Kow 2.76
n-Pentane	No Data Available
iso-Pentane	log Kow 2.30
- Degradability	No Data Available

c) Bioaccumulative potential

- Accumulative	
Propane	BCF 13
n-Butane	No Data Available
iso-Butane	BCF 1.57~1.97
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Biodegradability	
Propane	65.7% 35day
n-Butane	65.7% 35day (aerobic, microbes, well-decomposed)
iso-Butane	65.7% 36day (aerobic, microbes, well-decomposed)
n-Pentane	No Data Available
iso-Pentane	No Data Available
d) Mobility in soil	No Data Available
e) Other adverse effects	No Data Available (the components ratio of pentanes is less than 2.5 %)

13. Disposal considerations

- a) Disposal method
- b) Disposal precaution

All disposal practices must be in compliance with all laws and regulations with elimination of the risk of explosion.

Beware of fire and explosion hazards due to residual gas in the container like cylinder or tank.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

14. Transport information	
a) UN number	2037
Propane	1978
n-Butane	1969
iso-Butane	1011
b) UN proper shipping name	RECEPTACLES, SMALL, CONTAINING GAS (GAS CARTRIDGES) without a release
	device, non-refillable
c) Transport harzad class(es)	2.1
d) Packing group, if applicable	No Data Available
e) Environmental harzards	No Data Available
f) Special precaution for user	
- emergency procedures in a fire	F-D
- emergency procedures with the gas	S-U

15. Regulatory information

a) Regulations by the	occupational safety	and health agency
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Propane	Not applicable
n-Butane	Substance with exposure limits
iso-Butane	Not applicable
n-Pentane	Not applicable
iso-Pentane	Not applicable

b) Act on registration, evaluation, etc of chem	· · · ·
Propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
c) Chemicals control act (domestic)	
Propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
d) Regulation by the act on the safety control	of hazardous substances (domestic)
	Not applicable
e) Regulation by wastes control act (domestic)	
Propane	Designated waste material
n-Butane	Designated waste material
iso-Butane	Designated waste material
n-Pentane	No Data Available
iso-Pentane	No Data Available
f) The other regulation by domestic and foreig	n act
- Domestic regulation	
Persistent organic pollutans control act	Not applicable
High-pressure gas safety control act	Flammable, Liquefied gas
Safety control and business of	Liquefied petroleum gas
•	
liquefied petroleum gas act	
- Foreign regulation	Not regulated
OSHA regulation	Not regulated
CERCLA103 (40CFR302.4)	Not regulated
SARA302 (40CFR355.30)	Not regulated
SARA304 (40CFR355.40)	Not regulated
SARA311/312 (40CFR370.21)	Not regulated
SARA313 (40CFR372.65)	Not regulated
EPCRA (section 302)	Not regulated
EPCRA (section 304)	Not regulated
EPCRA (section 313)	Not regulated
Rotterdam Convention	Not regulated
Stockholm Convention	Not regulated
Montreal protocol	Not regulated
EU REACH (classification result)	F+; R12
iso-Pentane	F+; R12 Xn; R65, R66, R67 N; R51/53
EU REACH (risk statement)	R12
Propane	R12
n-Butane	R12,R67
iso-Butane	R12
n-Pentane	R12, R51/53, R65, R66, R67

EU REACH(safety statement)	S2, S9, S16
Propane	S2, S9, S16
n-Butane	S2, S9, S16
iso-Butane	S2, S9, S16
n-Pentane	S2, S9, S16, S33, S61, S62
iso-Pentane	S2, S9, S16, S33, S61, S62

16. Other information

a) Information source and references

ECB-ESIS(European chemical Substances Information System)(http://ecb.jrc.it/esis) ECOTOX Database, EPA(http://cfpub.epa.gov/ecotox) **IUCLID** Chemical Data Sheet, EC-ECB International Chemical Safety Cards(ICSC)(http://www.nihs.go.jp/ICSC) TOXNET, U.S. National Library of Medicine(http://toxnet.nlm.nih.gov) The Chemical Database, The Department of Chemistry at the University of Akron(http://ull.chemistry.uakron.edu/erd) Transport of Dangerous Goods - UN Chemical Information System, National Environmental Science Institute(http://ncis.nier.go.kr) Korea Occupational Safety and Health Agency MSDS Database Corporate Solution From Thomson Micromedex(http://csi.micromedex.com) Industrial poisoning handbook, Shin Kwang Publishing Co. Dangerous Material Information Management System, National Emergency Management Agency (http://hazmat.nema.go.kr) UN RTDG ICSC PATTY(4th, 1994) ACGIH (7th, 2001) Air liquide (http://encyclopedia.airliquide.com) Airgas (http://www.airgas.com) Wikipedia (http://en.wikipedia.org) GHS (Rev.7) (2017) 7th Ed b) First Date Created c) Number of revisions and date of last revision Number of revisions Date of last revision To the best of our knowledge, the information contained herein is accurate. However, d) The other information

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