Safety Data Sheet

1. Identification of the substance/mixture and of the company:

1.1 Substance name
1,4-Butanediol

1.2 Intended Use and Use Limitations

Intended Use
-

Use Limitations
-

1.3 Company identification

Company: Korea PTG Co., Ltd.
Address: 15, Yongyeon-ro, 179beon-gil, Nam-gu, Ulsan Korea
Tel, Number: Tel 82-52-257-5240 Fax 82-52-257-5246
Emergency number: Tel 82-52-257-5240
Team: Safety & Environment Team

2. Hazard-Risk:

2.1 Hazard-Risk classification

Acute toxicity substance -Oral: cat4
Skin corrosion or irritation substance: cat2

2.2 Label element, including and precautionary statements

Pictogram

Signal word
Warning

Hazard-Risk statement
H302 Harmful if swallowed
H315 Cause severe skin burns and eye damage

Precautionary statement

Prevention
P264 Wash ... thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P280 Wear protective gloves/protective clothing/eye protection/face protection

Response
P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P330 Rinse mouth.
P302+P352 IF ON SKIN: Wash with plenty of soap and water.
P321 Specific treatment (see ... on this label).
P332+P313 If skin irritation occurs: Get medical advice/attention.
P362 Take off contaminated clothing and wash before reuse.

Storage
Store and Handle According to current regulations and standards

Disposal
P501 Dispose of contents/container to ...
2.3 Other hazard-Risk which are not included in the classification (NFPA)

| Health | 1 |
| Fire   | 1 |
| Reactivity | 0 |

3. Composition/Information on Ingredients:

<table>
<thead>
<tr>
<th>Substance name</th>
<th>Trivial name</th>
<th>CAS No.</th>
<th>Content(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,4-Butanediol</td>
<td>Butylene Glycol</td>
<td>110-63-4</td>
<td>&gt;99.5%</td>
</tr>
</tbody>
</table>

4. First aid measures:

4.1 In case of intrusion into eye
- Wash eyes for at least 15 minutes with plenty of water.
- Consult with a doctor.
- Remove contaminated clothing and shoes and then wash skins for at least 15 minutes with plenty of water.
- If necessary, Consult with a doctor.
- Rinse contaminated clothing and shoes before reuse.

4.2 In case of skin contamination
- If adverse effects occur, move them to uncontaminated area
- Do artificial respiration if needed.
- Consult with a doctor.

4.3 In case of respiratory
- If large amount is swallowed, Consult with a doctor.

4.4 In case of ingestion
- Wash eyes for at least 15 minutes with plenty of water.
- Consult with a doctor.

4.5 The most important acute/delayed symptoms

Inhale
- Short time exposure
  - Irritation
  - Insensibility. Reduced reflexes. kidney trouble
- Long time exposure

Intake
- Short time exposure
- Long time exposure
  - kidney trouble, liner trouble.

Skin contact
- Short time exposure
  - Irritation
  - Insensibility. Reduced reflexes. kidney trouble
- Long time exposure

Eyes contact
- Short time exposure
  - Irritation
  - Cause visual impairment
- Long time exposure

4.6 Indication of immediate medical attention and Doctor directions

No Data Available

5. Explosion, fire measures:

5.1 Suitable (Inappropriate) extinguishing media

Suitable extinguishing media
- Extinguishing powder. CO2. Water, general foam, Alchol formal.

Inappropriate extinguishing media
- No Data Available

Major fire
- Use general water or big water sprinke by fine spray.

5.2 Specific hazards arising from the chemical

Heat decomposition product
- Carbon oxides
- There is a slight risk of fire.
5.3 Protective equipment and precaution for fire-fighters

If safe to do so, remove containers from area of fire.
Prevent shatter using high-pressure water spray.
Dike for later disposal.
Use suitable extinguishing media
Avoid inhalation of Material or combustion by-products.
Stay up wind and keep out of low areas.

6. Accidental release measures:

6.1 Personal precautions, protective equipment

If worker can stop leak without personal risk, Stop leak

6.2 Environmental precautions

Atmosphere
No Data Available

Soil
No Data Available

Underwater
No Data Available

6.3 Methods and materials for containment and cleaning up

Minor spills

Absorb with sand or other non-combustible materials.
Absorb with Suitable non-combustible materials for disposal.
Collect spilled material in appropriate container for disposal.
Keep unnecessary people away, isolate hazard area and deny entry.

Major spills

7. Handling and storage:

7.1 Precautions for safe handling

Rinsing thoroughly after handling.
Please conduct proper ventilation
Avoid contact with skin and clothing
Store in an airtight container.
Do not intake and inhalation.
Store in an airtight container.
Comply with local regulations for storage.
Keep separated from with incompatible materials.
Store in a cool and dry area.
Store at a well-ventilated area.
Separate the product with strong inorganic oxidants such as nitric acid.

7.2 Conditions for safe storage

8. Exposure controls/personal protection:

8.1 Exposure limits of chemical substance, Biological exposure limits

Domestic regulation
No Data Available

ACGIH regulation
Not Applicable

Biological exposure limits
Not Applicable

8.2 Appropriate engineering controls

Install ventilation equipment.
Ensure compliance with applicable exposure limits.
8.3 Individual protective equipment

Respiratory Protection

- Frequent use or heavy exposure, respiratory protection if needed.
- Respiratory protection is ranked in order from minimum to maximum
- Take into account the warning properties before use
- Gas Mask(Organic vapor)
- Air-purifying respirator(Organic vapor)

Eye protection

- Wear splash resistant safety goggles.
- Provide an emergency eye wash foundation and quick drench shower in the immediate work area.
- Wear appropriate chemical resistant gloves.
- Wear appropriate chemical resistant clothes.

Hands protection

Body protection

9. Physical and chemical properties:

9.1 Appearance

- Physical state: Viscous liquid
- Colour: Achromatic color.
- Odour: Very mild odor
- pH: Neutral

9.2 Odour:

9.3 Odour threshold:

9.4 pH:

9.5 Melting point/freezing point

9.6 Initial boiling point and boiling range

9.7 Flash point:

9.8 Evaporation rate

9.9 Flammability (solid, gas)

9.10 Upper/lower flammability or explosive limits

9.11 Vapour pressure

9.12 Solubility

9.13 Vapour density

9.14 density

9.15 N-octanol/water partition coefficient

9.16 Auto-ignition temperature

9.17 Decomposition temperature

9.18 Viscosity

9.19 Molecular weight

9.20 Molecular formula

C4H8(OH)2

9. Physical and chemical properties:

9.20 Molecular formula

C4H8(OH)2

9.18 Viscosity

84.9cP((20 ℃))

9.16 Auto-ignition temperature

350℃

9.15 N-octanol/water partition coefficient

-0.83

9.14 density

1.017

9.13 Vapour density

3.1

9.12 Solubility

Water solubility: Soluble, 1000 g/L at 20 ℃

9.11 Vapour pressure

0.0105㎜Hg((25 ℃))

9.10 Upper/lower flammability or explosive limits

18.3/1.95%

9.9 Flammability (solid, gas)

No Data Available

9.8 Evaporation rate

No Data Available

9.7 Flash point

> 121 ℃ ((o.c.))

9.6 Initial boiling point and boiling range

228 ℃

9.5 Melting point/freezing point

19 ℃ - 20 ℃

9.4 pH

Neutral

9.3 Odour threshold

9.2 Odour

9.1 Appearance

9. Physical and chemical properties:

9.1 Appearance

9.2 Odour:

9.3 Odour threshold:

9.4 pH:

9.5 Melting point/freezing point

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9.19 Molecular weight

9.20 Molecular formula

C4H8(OH)2

10. Stability and reactivity:

10.1 Chemical stability

- Polymerisation will not occur.
- Stable under normal condition.

10.2 Possibility of hazardous reactions

- Avoid heat, flame, spark and ignition source. Avoid contact with incompatible materials.

10.3 Conditions to avoid

- Metals, Acids, oxidizing materials, Peroxide

10.4 Substance to avoid

- Thermal decomposition products, Carbon oxides, Various organic tissue

10.5 Hazardous decomposition products
11. Toxicological information:

11.1 Information on the likely route of exposure

**Inhalation**
- Short term exposure causes irritation

**Oral**
- Short term exposure may cause nausea, vomiting, headache, drowsiness, kidney trouble, convulsions, coma

**Skin Contact**
- Short term exposure causes irritation

**Eye contact**
- Short term exposure causes irritation

11.2 Delayed and immediate effects and also chronic effects from short and long term exposure

**Acute toxicity**

**Oral**
- LD50 1500 mg/kg rat

**Dermal**
- LD50 > 5000 mg/kg rat

**Inhalation**
- Dust LC50 > 5100 mg/m³ 4hr rat

**Skin corrosion or irritation**
- Slight irritating (rabbit)
- SIDS

**Serious eyes damages or irritation**
- Slight irritating (rabbit)
- SIDS, IUCLID

**Respiratory sensitization**
- No Data Available

**Skin sensitization**
- Not sensitizing (guinea pig)
- SIDS, IUCLID

**Carcinogenicity**

**IARC**
- No Data Available

**NTP**
- No Data Available

**OSHA**
- No Data Available

**WISHA**
- No Data Available

**ACGIH**
- No Data Available

**Germ cell mutagenicity**
- In-vitro/negative, In-vivo/negative

**Reproductive toxicity**
- IUCLID

**Target organ systemic toxicity substance (single exposure)**
- No Data Available

**Target organ systemic toxicity substance (repeated exposure)**
- Rat/No major symptoms

**Aspiration hazard**
- No Data Available

11.3 Numerical Scale of toxicity (Acute toxicity Estimates)
- No Data Available

12. Ecological information:

12.1 Aquatic-terrestrial ecotoxicity

**Fish**
- LC50 > 1240 mg/l 96hr Cyprinus carpio

**Crustacean**
- EC50 > 1000 mg/l 48hr Daphnia magna

**Bird**
- ErC50 > 1000 mg/l 48hr Selenastrum capricornutum

12.2 Persistence and degradability

**Persistence**
- log Kow -0.88

**degradability**
- No Data Available
12.3 Bioaccumulative potential
   Accumulation
   Biodegradation
12.4 Mobility in soil
12.5 Other hazardous effects

13. Disposal considerations:
13.1 Disposal methods
13.2 Disposal attention

14. Transport information:
14.1 UN Number
14.2 Proper shipping name
14.3 Transport hazard class
14.4 Container class
14.5 Marine pollutant
14.6 Special precautions for user
   Emergency measures in case of fire
   Emergency measures in the effluent

15. Regulatory information:
15.1 Industrial Safety and Health Act
15.2 Toxic Chemicals Control Act
15.3 Safety Control of Dangerous Substances Act
15.4 Waste management Act.
15.5 Other requirements in domestic and other countries
   Domestic regulation
   Persistent Organic Pollutants Management Act
   Foreign regulation
   American Management Information(OSHA Regulation)
   American Management Information(CERCLA Regulation)
   American Management Information(EPCRA 302 Regulation)
   American Management Information(EPCRA 304 Regulation)
   American Management Information(EPCRA 313 Regulation)
   American Management Information(Rotterdam Convention material)
   American Management Information(Stockholm Convention material)
   American Management Information(Montreal Protocol material)
   EU classification Information(Final classification results)
   EU classification Information(Risk statement)
   EU classification Information(Safety statement)
16. Other information:

16.1 Reference

SIDS (Oral)
SIDS (Dermal)
SIDS (Inhalation)
SIDS (Skin corrosion or irritation)
SIDS, IUCLID (Serious eyes damages or irritation)
SIDS, IUCLID (Skin sensitization)
IUCLID (Germ cell mutagenicity)
IUCLID (Target organ systemic toxicity substance (repeated exposure))
Directive 92/69/EEC, C.1, GLP, IUCLID (Fish)
OECD TG 202, GLP, NITE (Crustacean)
OECD TG 201, GLP, NITE (Bird)
OECD TG 107, IUCLID (Persistence)
IUCLID (Accumulation)
IUCLID (Biodegradation)

16.2 Initial Issue Date

Jun. 1996.

16.3 Revision number and date

Aug. 2015.

16.4 Others

No Data Available