

**SECTION 1. CHEMICAL PRODUCT AND COMPANY NAME**

Safety Data Sheet

**Lithium-Ion Rechargeable Battery Pack  
BL1850B**

Symbol  at the bottom of the battery.

Complies with the OSHA Hazard  
Communication Standard :  
29 CFR 1910 1200

Makita U.S.A., Inc. 14930-C Northam Street La Mirada, CA 90638	Prepared By :	Stan Rodrigues
	Date Revised:	01/17/2019

**EMERGENCY CONTACT INFORMATION**

**Telephone Number for Information:** MAKITA: 1-510-657-9881

**Emergency Response**

For Chemical Emergency  
Spills, Leak, Fire, Exposure, or Accident  
Call CHEMTREC Day or Night  
Within USA and Canada 1-800-424-9300

**SECTION 2. HAZARD IDENTIFICATION:**

\* This is a product that fulfills a certain function in solid state with specific shape without discharging any chemical substance in its use and has no obligation to write (M)SDS. Since this document contains the precautions for safe handling related to its materials or chemical substances consisting of this product, please note that this overall information is irrelevant to this product.

**2.1 Classification of the substance or mixture**

**2.1.1 Classification according to Regulation (EC) No. 1272/2008 [CLP] and OSHA 29 CFR 1910.12 00:** Not classified

**2.1.2 Additional information:**

**Classification of the substance or mixture.**

**Preparation Hazards and Classification:** The product is a Lithium ion cell or battery and is therefore classified as an article and is not hazardous when used according to the recommendations of the manufacturer. The hazard is associated with the contents of the cell or battery. Under recommended use conditions, the electrode materials and liquid electrolyte are non-reactive.

**SECTION 3. COMPOSITION, INFORMATION OR INGREDIENTS**

**3.1 Mixture**

CAS No.	EC No.	REACH Registration No.	%[weight]	Name	Common Name (Synonyms)	Classification according to Regulation(EC) No 1278/2008(CLP)
12325-84-7	Not available	-	25~35	Lithium Nickel Oxide	Not available	Not classified
7782-42-5	231-955-3	-	20~30	Graphite	Not available	Not classified
7439-89-6	231-096-4	-	10~20	Iron	Not available	Not classified
7440-50-8	231-159-6	-	5~15	Copper	Not available	Not classified

**CONTINUED: SECTION 3. COMPOSITION, INFORMATION OR INGREDIENTS**

CAS No.	EC No.	REACH Registration No.	%[weight]	Name	Common Name (Synonyms)	Classification according to Regulation(EC) No 1278/2008(CLP)
12190-79-3	235-362-0	-	1~5	Cobalt Lithium Dioxide	Not available	Not classified
554-12-1	209-060-4	-	1~5	Methyl Propanoate	Not available	Flam. Liq. 2, H225 Acute Tox. 4, H332
7429-90-5	231-072-3	-	1~5	Aluminium	Not available	Pyr. Sol. 1, H250 Water-react. 2, H261
21324-40-3	244-334-7	-	1~3	lithium hexafluorophosphate(1-)	Not available	Not classified
114435-02-8	Not available	-	1~3	4-Fluoro-1,3-dioxolan-2-one	Not available	Not classified
616-38-6	210-478-4	-	1~3	Dimethyl Carbonate	Not available	Flam. Liq. 2, H225
9002-88-4	Not available	-	1~3	Polyethylene	Not available	Not classified
1309-37-1	215-168-2	-	0.1~1	Diiron Trioxide	Not available	Not classified
1318-23-6	215-284-3	-	0.1~1	Boehmite (Al(OH)O)	Not available	Not classified
1333-86-4	215-609-9	-	0.1~1	Carbon black	Not available	Not classified
7440-02-0	231-111-4	-	0.1~1	Nickel	Not available	Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Aquatic Chronic 3, H412
872-50-4	212-828-1	-	0.1~1	1-Methyl-2-Pyrrolidinone	Not available	Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 Repr. 1B, H360D
11089-89-7	Not available	-	0.1~1	Aluminum lithium oxide (LiAlO)	Not available	Not classified
7440-47-3	231-157-5	-	0.1~1	Chromium	Not available	Not classified
554-13-2	209-062-5	-	0.1~1	Lithium Carbonate	Not available	Not classified
100-41-4	202-849-4	-	0.1~1	Ethylbenzene	Not available	Flam. Liq. 2, H225 Acute Tox. 4, H332 Asp. Tox. 1, H304 STOT RE 2, H373(hearing organs)

**Further Information**

Because of the cell structure the dangerous ingredients will not be available if used properly. During charge process a lithium graphite intercalation phase is formed.

**SECTION 4. FIRST AID MEASURE**

**4.1 Description of first aid measures**

**Following eye contact :**

- Rinse eyes with plenty of water for at least 15 minutes and seek medical attention.

**Following skin contact :**

- Remove contaminated clothing and wash before reuse.
- Immediately rinse contact area with plenty of clean water.
- Provide first aid to contacted area to prevent infection.
- Get medical attention.

## CONTINUED: SECTION 4. FIRST AID MEASURE

### Following inhalation :

- In case of inhalation of organic electrolyte mist, remove from exposure to fresh air.
- If necessary give oxygen. Get medical attention.

### Following ingestion :

- In case of ingestion of electrolyte don't induce vomiting.
- If patient is conscious and alert give 2~4 cupful's of milk or water.
- Never give anything by mouth to an unconscious person.
- Get medical attention immediately.

### Further Information :

- The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing.
- Undamaged, closed cells do not represent a danger to the health.

## 4.2 Most important symptoms and effects, both acute and delayed

**Acute effects :** Not available

**Delayed effects :** Not available

## 4.3 Indication of immediate medical attention and special treatment needed

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

## SECTION 5. FIRE FIGHTING MEASURES

### 5.1 Extinguishing media

- When the scale of the fire is small, use a HFC (hydrofluorocarbon) clean-agent fire extinguisher or alcohol resistant foam fire extinguishers. (In case of battery overheating, wear protective gear and immerse heated battery in water)
- In case of large fire, use large amount of water to extinguish.

### 5.2 Special hazards arising from the substance or mixture

- Flammable gas leaks before ignition and then the product ignites.

### 5.3 Advice for firefighters

- The ignited battery has a high temperature, so there is a risk of additional ignition even if the fire is extinguished at early stage. Sprinkle a large amount of water until the battery temperature drops to normal temperature.
- If the battery is ignited in multi-stacked condition, multi-stack should be disassembled and then extinguished so that heat is not transferred between batteries
- In the event of a battery fire, cool it by spraying water directly on the battery.
- When handling a overheated battery, wear heat-resistant protective equipment.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

**Protective equipment:** Use personal protective equipment, see Section 8

**Emergency procedures :**

- In case of cell damage, possible release of dangerous substances and a flammable gas mixture.
- Eliminate all ignition sources.
- Please note that materials and conditions to avoid.
- Battery may emit electrolyte if charging or discharging rates exceed manufacturer's recommendations or if pack has been breached.
- Move battery to well ventilated area to prevent gas accumulation.

**CONTINUED: SECTION 6. ACCIDENTAL RELEASE MEASURES**

**For emergency responders**

- Eliminate all ignition sources.
- Please note that materials and conditions to avoid.
- Move battery to well ventilated area to prevent gas accumulation.

**6.2 Environmental precautions :**

- Avoid release to the environment.
- Prevent entry into waterways, sewers, basements or confined areas.

**6.3 Methods and material for containment and cleaning up**

**For containment:** Not available

**For cleaning up:**

- Cover with Dry earth, DRY sand or other non-combustible material and put on the plastic sheet to minimize spreading or contact with rain.
- Move battery to well ventilated area to prevent gas accumulation.
- Dispose in accordance with applicable local, state and federal regulations.

**Other information:** Not available

**6.4 Reference to other sections**

- See also Sections 8 and 13 of the Safety Data Sheet.

**SECTION 7. HANDLING AND STORAGE**

**7.1 Precautions for safe handling**

- In case of cell damage, possible release of dangerous substances and a flammable gas mixture.
- The battery stores electrical energy and is capable of rapid energy discharge.
- Battery cell contents are under pressure.
- Handle battery carefully to avoid puncturing case or electrically shorting terminals.

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

**Technical measures and storage conditions:** Not available

**Packaging materials:** Not available

**Requirements for storage rooms and vessels :**

- Storage at room temperature (approx. 20°C) at approx. 40% of the nominal capacity
- Keep in closed original container

**7.3 Specific end use(s)**

**Recommendations:** Not available

**Industrial sector specific solutions:** Not available

**SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION**

**8.1 Control parameters**

**Occupational Exposure limits**

Name	ACGIH regulation	Biological exposure index	OSHA Regulation	NIOSH regulation	EU Regulation
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**CONTINUED: SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION**

Lithium Nickel Oxide	TWA = 1.5 mg/m <sup>3</sup> (inhalable particulate matter) (Nickel CAS. No7440-02-0)	Not available	TWA = 1 mg/m <sup>3</sup> (metal and insoluble compounds (as Ni)) TWA = 1 mg/m <sup>3</sup> (soluble compounds (as Ni)) (Nickel CAS.no 7440-02-0)	Ca TWA = 0.015 mg/m <sup>3</sup> (metal and insoluble compounds (as Ni)) Ca TWA =0.015 mg/m <sup>3</sup> (soluble compounds (as Ni)) (Nickel CAS.No 7440-02-0)	Not applicable
Graphite	TWA = 2mg/m <sup>3</sup>	Not available	Not applicable	Not applicable	Not applicable
Iron	Not applicable	Not available	Not applicable	Not applicable	Not applicable
Copper	TWA = 0.2 mg/m <sup>3</sup> (fume)	Not available	Not applicable	Not applicable	Not applicable
Cobalt Lithium Dioxide	TWA = 0.2 mg/m <sup>3</sup> (Cobalt and cobalt compounds, CAS. No. 7440-48-4)	Not available	TWA = 0.1 mg/m <sup>3</sup> (Cobalt metal, dust, and fume (as Co), CAS. No7440-48-4)	TWA = 0.05 mg/m <sup>3</sup> (Cobalt metal, dust, and fume (as Co), CAS. No.7440-48-4)	Not applicable
Cobalt, Co	TWA = 0.02 mg/m <sup>3</sup>	Not available	Not available	TWA 0.05 mg/m <sup>3</sup>	Not available
Methyl Propanoate	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Aluminium	TWA = 1 mg/m <sup>3</sup> (respirable particulate matter)	Not available	TWA = 15 mg/m <sup>3</sup> (Aluminum Metal (as Al) Total dust) TWA = 5 mg/m <sup>3</sup> (Aluminum Metal (as Al) Respirable fraction)	TWA = 1 mg/m <sup>3</sup> (Aluminum Metal (as Al),Respirable fraction)	Not applicable
Lithium Hexafluorophosphate(1-)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
4-Fluoro-1,3-Dioxolan-2-one	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Dimethyl carbonate	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Polyethylene	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Diiron Trioxide	TWA = 5 mg/m <sup>3</sup>	Not available	TWA = 10 mg/m <sup>3</sup> (fume)	TWA = 5 mg/m <sup>3</sup> (dust and fume)	Not applicable
Boehmite (Al(OH)O)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Carbon black	TWA = 3 mg/m <sup>3</sup> (inhalable particulate matter)	Not available	TWA = 3.5 mg/m <sup>3</sup>	TWA = 3.5 mg/m <sup>3</sup> Ca TWA = 0.1 mg PAHs/m <sup>3</sup> [Carbon black in presence of polycyclic aromatic hydrocarbons (PAHs)]	Not applicable
Nickel	TWA = 1.5 mg/m <sup>3</sup> (inhalable particulate matter)	Not available	TWA = 1 mg/m <sup>3</sup> (metal and insoluble compounds (as Ni)) TWA = 1 mg/m <sup>3</sup> (soluble compounds (as Ni))	TWA = 1 mg/m <sup>3</sup> (metal and insoluble compounds (as Ni)) TWA = 1 mg/m <sup>3</sup> (soluble compounds (as Ni))	Not applicable

**CONTINUED: SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION**

1-Methyl-2-pyrrolidinone	Not applicable	Not applicable	Not applicable	Not applicable	TWA = 40 mg/m <sup>3</sup> , TWA= 10 ppm, STEL = 80 mg/m <sup>3</sup> , STEL = 20 ppm
Aluminum Lithium Oxide (LiAlO)	TWA = 1 mg/m <sup>3</sup> (respirable particulate matter)(Aluminum CAS.no 7429-90-5)	Not available	TWA = 15 mg/m <sup>3</sup> (Aluminum Metal (as Al) Total dust) TWA = 5 mg/m <sup>3</sup> (Aluminum Metal (as Al) Respirable fraction) (Aluminum CAS. No 7429-90-5)	TWA = 1 mg/m <sup>3</sup> (Aluminum Metal (as Al), Respirable fraction) (Aluminum CAS. No 7429-90-5)	Not applicable
Chromium	TWA = 0.5 mg/m <sup>3</sup> (inhalable particulate matter); TLV basis: respiratory tract irritation, TWA = 0.5 mg/m <sup>3</sup>	Not available	TWA = 0.5 mg/m <sup>3</sup> (Chromium (II) compounds (as Cr), Chromium (III) compounds (as Cr)) TWA = 1 mg/m <sup>3</sup> (Chromium metal and insol. salts(as Cr))	TWA = 0.5 mg/m <sup>3</sup> (Chromium (II) compounds (as Cr), Chromium (III) compounds (as Cr)) TWA = 0.5 mg/m <sup>3</sup> (Chromium metal and insol. salts(as Cr))	TWA = 2 mg/m <sup>3</sup>
Lithium Carbonate	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Ethylbenzene	TWA = 20 ppm	Not available	TWA = 100 ppm TWA = 435 mg/m <sup>3</sup>	TWA = 100 ppm (ST) 125 ppm	TWA = 442 mg/m <sup>3</sup> TWA = 100 ppm STEL = 884 mg/m <sup>3</sup> STEL = 200 ppm

**8.2 Exposure controls**

**8.2.1 Appropriate engineering controls :**

**Substance/mixture related measures to prevent exposure during identified uses:**

- Avoid charging batteries in areas where hydrogen gas accumulate.
- Use local exhaust ventilation to maintain concentrations of hydrogen below the Lower Explosive collect and transport flammable gases in ventilation systems.
- Insure proper ventilation is present and electrolyte mist and vapours.

**Structural measures to prevent exposure:**

- Avoid charging batteries in areas where hydrogen gas accumulate.
- Use local exhaust ventilation to maintain concentrations of hydrogen below the Lower Explosive collect and transport flammable gases in ventilation systems.
- Insure proper ventilation is present and electrolyte mist and vapours.

**Organizational measures to prevent exposure:** Not available

**Technical measures to prevent exposure:**

- Insure proper ventilation is present and electrolyte mist and vapours.

**8.2.2 Individual protection measures, such as personal protective equipment:**

**Eye and face protection**

- Wear ANSI approved safety glasses with side shield during normal use.
- Wear NIOSH approved face shield with safety glasses and H.V protection during intentional disassembly.

**Skin protection**

**Hand protection**

- Wear nitrile butyl rubber, neoprene, or PVC glove during battery component disassembly.
- Discard contaminated work clothing after one work day.

**Other skin protection**

- Wear protective clothing during battery component disassembly.
- Discard contaminated work clothing after one work day.

## CONTINUED: SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.
- In case exposed to particulate material, the respiratory protective equipments as follow are recommended; facepiece filtering respirator or air-purifying respirator, high-efficiency particulate air(HEPA) filter media or respirator equipped with powered fan, filter media of use (dust, mist, fume)

### Respiratory protection :

- None required during normal use.
- Wear NIOSH or European Standard EN 149 approved full or half face piece (with goggles) respiratory protective equipment when necessary.
- In lack of oxygen(< 19.5%), wear the supplied-air respirator or self-contained oxygen breathing apparatus.
- In case exposed to particulate material, the respiratory protective equipments as follow are recommended; facepiece filtering respirator or air-purifying respirator, high-efficiency particulate air(HEPA) filter media or respirator equipped with powered fan, filter media of use (dust, mist, fume)

### 8.2.3 Environmental exposure controls

**Substance/mixture related measures to prevent exposure:** Not available

**Instruction measures to prevent exposure:** Not available

**Organizational measures to prevent exposure:** Not available

**Technical measures to prevent exposure:** Not available

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

#### Appearance

<b>Description :</b>	Solid
<b>Color:</b>	Not available
<b>Odor:</b>	Odorless
<b>Odor threshold :</b>	Not available
<b>pH :</b>	Not available
<b>Melting point/freezing point :</b>	Not available
<b>Initial boiling point and boiling range :</b>	Not available
<b>Flash point :</b>	Not available
<b>Evaporation rate :</b>	Not available
<b>Flammability (solid, gas) :</b>	Not available
<b>Upper/lower flammability or explosive limits :</b>	Not available
<b>Vapor pressure :</b>	Insoluble.
<b>Solubility (ies) :</b>	Not available
<b>Vapor density :</b>	Not available
<b>Relative density :</b>	Not available
<b>Partition coefficient: n-octanol/water :</b>	Not available
<b>Auto ignition temperature :</b>	Not available
<b>Decomposition temperature :</b>	Not available
<b>Viscosity :</b>	Not available
<b>Explosive properties :</b>	Not available

## CONTINUED: SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

<b>Oxidizing properties :</b>	Not available
<b>Molecular weight :</b>	Not available
<b>9.2 Other information</b>	Not available

## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

- Stable at ambient temperature.

### 10.2 Chemical stability

- There is no hazard when the measures for handling and storage are followed.
- Stable under normal temperatures and pressures.

### 10.3 Possibility of hazardous reactions

- Will not occur under normal conditions.
- In case of cell damage, possible release of dangerous substances and a flammable gas mixture.
- Containers may explode when heated.
- Fire may produce irritating and/or toxic gases.
- Some liquids produce vapors that may cause dizziness or suffocation.
- Inhalation of material may be harmful.

### 10.4 Conditions to avoid

- Keep away from heat/sparks/open flames/hot surfaces. No smoking.
- Friction, heat, sparks or flames
- Dusts or shavings from borings, turnings, cuttings, etc.
- Do not exceed manufacturer's recommendation for charging or use battery for an application for which it was not specifically designed.
- Do not electrically short.

### 10.5 Incompatible materials

- Avoid contact with acids and oxidizers.
- Keep away from any possible contact with water, because of violent reaction and possible flash fire.
- Handle under inert gas. Protect from moisture.
- Combustibles, reducing agents

### 10.6 Hazardous decomposition products

- None under normal conditions.
- Corrosive and/or toxic fume
- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning.
- Irritating and/or toxic gases

## SECTION 11. TOXICOLOGICAL INFORMATION

\* This is a product that fulfills a certain function in solid state with specific shape without discharging any chemical substance in its use and has no obligation to write (M)SDS. Since this document contains the precautions for safe handling related to its materials or chemical substances consisting of this product, please note that these overall information is irrelevant to this product.

### 11.1 Information on toxicological effects

#### Acute toxicity

**Oral :** ATEmix = 5,082.4 mg/kg bw

## CONTINUED: SECTION 11. TOXICOLOGICAL INFORMATION

- **Graphite** : Rat LD50 > 2,000 mg/kg (female)(OECD Guideline 401)
- **Fe** : Rat LD50 = 98,600 mg/kg (Reduced iron, OECD TG 401)
- **Copper** : Rat LD50 > 2,500 mg/kg (Cupric oxide; read across)(OECD TG 423, GLP)
- **Aluminum** : Rat LD50 > 15,900 mg/kg (OECD TG 401)(Fumed alumina; read across)
- **Lithium hexafluorophosphate(1-)** : Rat LD50 = 50 ~ 300 mg/kg (Female)(OECD Guideline 423, GLP)
- **4-fluoro-1,3-dioxolan-2-one** : Rat LD50 = 500 mg/kg (male)(OECD Guideline 423)
- **Dimethyl carbonate** : Rat LD50 > 5,000 mg/kg (male/female) (OECD Guideline 401)
- **Polyethylene** : Rat LD50 > 2,000 mg/kg
- **Diiron trioxide** : Rat LD50 > 5,000 mg/kg (male/female)(EU Method B.1)
- **Boehmite (Al(OH)O)** : Rat LD50 > 2,000 mg/kg (OECD Guideline 423, GLP)
- **Carbon black** : Rat LD50 > 8,000 mg/kg (OECD TG 401)
- **Nickel; Raney nickel** : Rat LD50 > 9,000 mg/kg (male/female) (OECD Guideline 401, GLP)
- **1-Methyl-2-pyrrolidinone** : Rat LD50 = 4,150 mg/kg (male/female)(OECD Guideline 401)
- **Chromium** : Rat LD50 > 5,000 mg/kg (Read across; chromium(III) oxide)(OECD TG 420, GLP)
- **Lithium carbonate;Lithane** : Rat LD50 = 525 mg/kg
- **Ethylbenzene** : Rat LD50 = 3,500 mg/kg (male or female)
- Dermal** : ATEmix = 1,651,224 mg/kg bw
  - **Copper** : Rat LD50 > 2,000 mg/kg (OECD TG 402, GLP)
  - **4-fluoro-1,3-dioxolan-2-one** : Rat LD50 > 2,000 mg/kg (male/female) (OECD Guideline 402)
  - **Dimethyl carbonate** : Rabbit LD50 > 2,000 mg/kg (male/female)
  - **1-Methyl-2-pyrrolidinone** : Rat LD50 > 5,000 mg/kg (male/female) (OECD Guideline 402)
  - **Lithium carbonate;Lithane** : Rabbit LD50 > 3,000 mg/kg (male/female) (OECD Guideline 402)
  - **Ethylbenzene** : Rabbit LD50 = 15,432 mg/kg
- Inhalation** : ATEmix = 226.04 mg/L
  - **Graphite** : Rat LD50 > 2 mg/L/4hr (male/female) (OECD Guideline 403)
  - **Fe** : Rat LC50 > 100 mg/m<sup>3</sup>/6hr
  - **Aluminum** : Rat LC50 > 0.888 mg/L/4hr (analytical) (OECD TG 403)
  - **Dimethyl carbonate** : Rat LD50 > 5.36 mg/L/4hr (male/female) (OECD Guideline 403)
  - **Diiron trioxide** : Rat LC50 = 5.05 mg/L/4hr (male/female) (OECD Guideline 403, GLP)
  - **Boehmite (Al(OH)O)** : Rat LD50 > ~ 0.888 mg/kg/4hr (OECD Guideline 403, GLP)
  - **Carbon black** : Rat LC50 > 0.005 mg/L/4hr
  - **1-Methyl-2-pyrrolidinone** : Rat LC50 > 5.1 mg/L/4hr (male/female) (OECD Guideline 403)
  - **Chromium** : Rat LD50 > 5.41 mg/L/4hr (Read across; chromium(III) oxide)(OECD TG 403, GLP)
  - **Lithium carbonate;Lithane** : Rat LC50 > 2 mg/L/4hr (male/female) (OECD Guideline 403)
  - **Ethylbenzene** : Rat LC50 = 17.8 mg/L/4hr
- Skin corrosion/ irritation** :
  - **Graphite** : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
  - **Fe** : In test on skin irritation with rabbits, skin irritations were not observed.(Read across; Fe<sub>3</sub>O<sub>4</sub>)(OECD TG 404, GLP)
  - **Copper** : In test on skin irritation with rabbits, skin irritations were not observed. (OECD TG 404, GLP)
  - **Aluminum** : Aluminium oxide caused slight erythema in 2/12 rabbits. The observed effects do not lead to a classification. Aluminium oxide is, therefore, not considered to be a primary skin irritant.(OECD TG 404)(Read across; aluminum oxide)
  - **Lithium hexafluorophosphate (1-)** : In the skin irritation test using human, the test material was corrosive. (EU Method B.40, GLP)
  - **4-fluoro-1,3-dioxolan-2-one** : In the skin irritation test using human skin model, the test material was non-corrosive. (OECD Guideline 431, GLP)
  - **Dimethyl carbonate** : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404)
  - **Polyethylene** : No irritation was observed at the other two treated sites and no corrosive effects were noted during the study using rabbits. The primary irritation index was calculated as 0.2 and polyethylene was classified as a mild irritant.
  - **Diiron trioxide** : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
  - **Boehmite (Al(OH)O)** : In the skin irritation test using rabbits, skin irritations were not observed.(OECD Guideline 404, GLP)
  - **Carbon black** : In test on skin irritation with rabbits, skin irritations were not observed. (OECD TG 404)
  - **Nickel; Raney nickel** : Industrial nickel dust causes nickel dermatitis.

## CONTINUED: SECTION 11. TOXICOLOGICAL INFORMATION

- 1-Methyl-2-pyrrolidinone : In the skin irritation test using rabbits, the test material was slightly irritating. (OECD Guideline 404, GLP)
- Chromium : In test on skin irritation with rabbits, skin irritations were not observed.(Read across; chromium(III) oxide)(OECD TG 404, GLP)
- Lithium carbonate;Lithane : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
- Ethylbenzene : In test on skin irritation with rabbits, moderate irritations were observed to rabbit skin.

### Serious eye damage/ irritation :

- Graphite : In the eye irritation test using rabbit, the test material was not irritating. (OECD Guideline 405, GLP)
- Fe : In test on eyes irritation with rabbits, eyes irritations were not observed.(Read across; Fe<sub>3</sub>O<sub>4</sub>)(OECD TG 405, GLP)
- Copper : In test on skin irritation with rabbits, skin irritations were not observed. (OECD TG 405, GLP)
- Aluminum : An eye irritation study of the aluminum oxide was performed in rabbits. No eye irritation/ corrosion effects were observed. (Read across; aluminum oxide)
- Lithium hexafluorophosphate(1-) : In the eye irritation test using fertilised brown leghorn chicken eggs, the test material was severely irritating. (GLP)
- Dimethyl carbonate : In the eye irritation test using rabbit, the test material was not irritating. (GLP)
- Polyethylene : Mild irritants were observed in eye irritation test with rabbits. (Score 11.7/110)
- Diiron trioxide : In the eye irritation test using rabbits, the test material was not irritating. (OECD Guideline 405, GLP)
- Boehmite (Al(OH)O) : In the eyes irritation test using rabbits, the test material was not irritating.(OECD Guideline 405, GLP)
- Carbon black : In test on eyes irritation with rabbits, eyes irritations were not observed. (OECD TG 405)
- 1-Methyl-2-pyrrolidinone : In the eye irritation test using rabbit, the test material was moderately irritating. (OECD Guideline 405, GLP)
- Chromium : In test on eyes irritation with rabbits, eyes irritations were not observed.(Read across; chromium(III) oxide)(OECD TG 405, GLP)
- Lithium carbonate;Lithane : In the eye irritation test using rabbit, the test material was moderately irritating. (OECD Guideline 405, GLP)
- Ethylbenzene : In test on eyes irritation with rabbits, slight irritations were observed to rabbit.

### Respiratory sensitization : Not classified

- Aluminum : Al<sub>2</sub>O<sub>3</sub> was the least inflammatory material tested and led to only weak effects on the mouse lung. (Read across; Aluminium oxide)
- Boehmite (Al(OH)O) : In respiratory sensitization test with mice, it did not induce respiratory sensitization.
- Carbon black : In respiratory sensitization test with mice, it did not induce respiratory sensitization.

### Skin sensitization :

- Graphite : In the skin sensitization test using mice, the test material was not skin sensitization. (OECD Guideline 429, GLP)
- Fe : In the test using guinea pigs, the test substance was not considered to be a dermal sensitizer in guinea pigs.(read across; FeO, Fe<sub>2</sub>O<sub>3</sub>)
- Copper : In maximization test on skin sensitization with guinea pig, skin sensitization was not observed. (OECD TG 406, GLP)
- Aluminum : In test with guinea pigs, it can be concluded that aluminium oxide has no sensitisation potential under the experimental conditions. (Read across; Aluminium oxide)
- Lithium hexafluorophosphate(1-) : In the skin sensitization test using mice, the test material was not skin sensitization. (OECD Guideline 429, GLP)
- 4-fluoro-1,3-dioxolan-2-one : In the skin sensitization test using mice, the test material was skin sensitization. (OECD Guideline 429, GLP)
- Dimethyl carbonate : In the skin sensitization test using guinea pig, this material was not skin sensitizing. (OECD Guideline 406, GLP)
- Polyethylene : No reactions were observed in skin sensitization test with guinea pigs.
- Diiron trioxide : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing.
- Boehmite (Al(OH)O) : In the skin sensitization test using guinea pig, this material was not skin sensitizing.(OECD Guideline 406, GLP)
- Carbon black : In skin sensitization test with guinea pig, it did not induce skin sensitization. (OECD TG 406, GLP)
  
- Nickel; Raney nickel : Nickel hypersensitivity dermatitis may be initiated by contact with nickel on the skin.
- 1-Methyl-2-pyrrolidinone : In the skin sensitization test using mice, the test material was not skin sensitization. (OECD Guideline 429, GLP)
- Chromium : In vitro skin sensitisation test, the test substance was not considered to be a dermal sensitizer.
- Lithium carbonate;Lithane : In the skin sensitization test using guinea pig, this material was not skin sensitizing. (OECD Guideline 406, GLP)

## CONTINUED: SECTION 11. TOXICOLOGICAL INFORMATION

### **Carcinogenicity :**

#### **IARC**

- Nickel : Group 2B
- Cobalt and cobalt compounds : Group 2B
- Polyethylene : Group 3
- Diiron Trioxide : Group 3
- Carbon black : Group 2B
- Chromium : Group 3
- Ethylbenzene : Group 2B

#### **NTP**

- Nickel : R
- Iron : Present
- Carbon black : Present

#### **OSHA**

- Nickel : Present
- Carbon black : Present

#### **ACGIH**

- Nickel : A5
- Aluminum : A4
- Cobalt and cobalt compounds : A3
- Diiron Trioxide : A4
- Carbon black : A3
- Chromium : A4
- Ethylbenzene : A3

#### **KOREA-ISHL**

- Lithium Nickel Oxide : 2
- Nickel : 1A
- Cobalt and inorganic compounds : 2
- Carbon black : 2
- Chromium : 1A(Chromium(VI)compounds(Water insoluble inorganic compounds))
- Ethylbenzene : 2

#### **EU**

- Nickel : Carc. 2
- Copper : EPA IRIS: D In carcinogenicity study with rat, tumor was not observed.
- Polyethylene : Fifty rats were implanted with polyethylene. In the polyethylene group, 23 developed tumors (two of these were unrelated to the implants).
- Boehmite (Al(OH)O) : bauxite and alumina exposure was not associated with increased cancer risk.
- Ethylbenzene : there was clear evidence of carcinogenic activity of ethylbenzene in rat(male/female)with based on increased Incidences of renal tubule neoplasms; increased incidence of testicular adenoma. Assay(OECD Guideline 471, GLP) and Negative reactions were observed in vivo (Mammalian Erythrocyte Micronucleus Test(OECD Guideline 474, GLP)).
- Dimethyl carbonate : Negative reactions were observed in both in vitro (Mammalian Chromosome Aberration Test (OECD Guideline 473, GLP)) and in vivo (Mammalian Spermatogonial Chromosome Aberration Test (OECD Guideline 483))
- Polyethylene : Negative reactions were observed in Ames test using Salmonella typhimurium and Escherichia coli.
- Diiron trioxide : Negative reactions were observed in both in vitro (Mammalian Chromosome Aberration Test (OECD Guideline 473, GLP)) and in vivo (DNA damage, chromosome aberration and micronuclei induction test)
- Boehmite (Al(OH)O) : Negative reactions were observed in vitro (mammalian cell gene mutation assay(OECD TG 476, GLP), Negative reactions were observed in vivo Mammalian Erythrocyte Micronucleus Test(OECD TG 474, GLP)
- Carbon black : Negative reactions were observed in both in vitro(Bacterial gene mutation test(OECD TG 471, GLP), Chromosomal aberrations test(OECD TG 476)) and in vivo(DNA damage and/or repair test).
- 1-Methyl-2-pyrrolidinone : Negative reactions were observed in both in vitro (Chromosomal aberrations test (OECD Guideline 476, GLP)) and in vivo (Mammalian Erythrocyte Micronucleus Test (OECD Guideline 474, GLP)).
- Chromium : In vitro mammalian chromosome aberration test, the result of the assay was negative. (Read across; stainless steel)(OECD TG 473, GLP)
- Lithium carbonate;Lithane : Negative reactions were observed in vitro (Bacterial Reverse Mutation Assay(OECD Guideline 471, GLP)).
- Ethylbenzene : Negative reactions were observed in in vitro-mammalian chromosome aberration test(OECD TG 473), mammalian cell gene mutation test (OECD TG 476, GLP) and in vivo- unscheduled DNA synthesis (UDS) test with mammalian liver cells (OECD TG 486, GLP), mammalian erythrocyte micronucleus test (OECD TG 474, GLP).

## CONTINUED: SECTION 11. TOXICOLOGICAL INFORMATION

### Reproductive toxicity :

- Graphite :
- Copper : In reproductive toxicity with rats, there were no effects considered (up to 1500 ppm). (OECD TG 416, GLP)
- Aluminum : No reproduction, breeding and early post-natal developmental toxicity was observed in rats at 1000 mg/kg bw for males and females. (OECD TG 422, GLP)(Aluminium chloride; read across)
- Lithium hexafluorophosphate(1-) : In the two-generation reproductive toxicity with rats, no effects observed on reproductive toxicity. (male/female)(OECD Guideline 416, GLP)(OECD Guideline 414)(Information on major hydrolysis product of the registered substance (released rapidly on contact with water/moisture))
- Boehmite (Al(OH)O) : No reproduction, breeding and early post-natal developmental toxicity was observed in rats at 1000 mg/kg body weight for males and females.(OECD Guideline 422, GLP)
- Carbon black : No adverse effects on the reproductive function are expected.(OECD TG 414)
- Chromium : In the 90 days inhalation toxicity study using rat, there were no effects on clinical signs, mortality.(OECD TG 413)
- Ethylbenzene : There were no adverse effects on reproductive or developmental endpoints at dose levels up to 500 ppm EB in this guideline two-generation rat inhalation study. OECD TG 416, GLP); Results of prenatal Developmental Toxicity tests for rats, litter size was comparable between the treated and control dose groups, while a statistically significant dose-related reduction in fetal weights were noted in the 1000 and 2000 ppm dose groups. Visceral malformations occurred in one or few fetuses from the 100, 1000 and 2000 ppm exposure groups, without a clear dose relationship and no statistical significance. NOAEC = 2000ppm (OECD Guideline 414)

### Specific target organ toxicity (single exposure) :

- Fe : If inhaled, iron is a local irritant to the lung and gastrointestinal tract.
- Copper : All animals showed expected gains in bodyweight over the study period and there were no abnormalities noted at necropsy. (OECD TG 423, GLP)
- Aluminum : In test using rats, Clinical signs of depression, laboured respiration, piloerection and hunched appearance was noted at the highest dose 15900 mg/kg. Macroscopic examination at the end of the observation period did not reveal any aluminium-related changes of the internal organs of the aluminium treated animals compared to the control group. (OECD TG 401)(Fumed alumina; read across)
- Lithium hexafluorophosphate(1-) : Clinical signs observed during the study period were lethargy, hunched posture, uncoordinated movements, piloerection at 300 mg/kg, hunched posture, piloerection at 50 mg/kg. The surviving animals had recovered from the symptoms by Day 3.(OECD Guideline 423, GLP)
- Polyethylene : No test substance-related toxic effects were observed in an acute oral toxicity study with rats.
- Carbon black : No effect on endothelins or blood pressure was observed after exposure to carbon black. There were also no effects on body temperature and activity of the animals.
- Nickel; Raney nickel : In the acute oral toxicity using rat, there were no effects on clinical signs, systemic toxicity.(OECD Guideline 401, GLP)
- Chromium : In the acute oral toxicity using rat, salivation increased among all animals 15 minutes after administration of the test substance, and lasted about 8 hours. (OECD TG 420, GLP)
- Ethylbenzene : In acute oral, inhalation, dermal toxicity study with rats, adverse effects were not observed related to acute toxicity.

### Specific target organ toxicity (repeat exposure) :

- Fe : Rats were exposed to metallic iron as carbonyl iron via their feed (2.5%) for 2, 4, 6, or 9 weeks. This resulted in a strong increase of non-heme iron in the liver and clear lipid peroxidation in the liver and the mucosa of the duodenum. No evidence for DNA breakage were found. What follows is the original abstract of the publication. (carbonyl iron)
- Copper : In test with rats for 92 days, there were no mortalities or signs of clinical toxicity observed in any of the test species during the duration of the study. Ophthalmoscopic examinations revealed no abnormalities at any dose level tested. At gross pathology, significant decreases in heart and kidney weight were noted in the high dose males in the thymus and kidneys of high dose females. (GLP)
- Aluminum : On occasion workers chronically exposed to aluminum-containing dusts or fumes have developed severe pulmonary reactions including fibrosis, emphysema and pneumothorax.
- Lithium hexafluorophosphate(1-) : According to expert review of fluoride intake and effects on human health, fluoride intake in drinking water at levels close to or above 4 mg/l is associated with dental fluorosis and perhaps also bone fluorosis and/or weakening.; Damage to dental enamel recorded: especially notable in young animals, which also showed atrophy of respiratory organs/tissues with local oedema of bronchial mucosa. Older animals showed peribronchial hyperplasia. Animals around 1 year in age showed cavity formation in their bones.(Information on major hydrolysis product of the registered substance (released rapidly on contact with water/moisture))(OECD Guideline 412)
- Polyethylene : No significant adverse effects were observed in subchronic (90-day) oral toxicity study with rats and dogs.
- Boehmite (Al(OH)O) : There were no clear clinical signs or observations during necropsy which could be related to the treatment.(OECD Guideline 408, GLP), Intratracheal injection of aluminium powder caused nodular pulmonary fibrosis in the lungs of the rats only at the highest dose administered (100 mg).(OECD Guideline 413)
- Carbon black : Mice were continuously fed various types of carbon black in massive quantities (10% in diet) for 12 to 18 months. This led to no detectable changes from the normal in the organs and tissues of the mice fed.
- Nickel; Raney nickel : In nickel plating industry, exposure to nickel containing vapors has been reported to be assoc with asthma.

## CONTINUED: SECTION 11. TOXICOLOGICAL INFORMATION

- Chromium : In the repeated Dose 90-Day Oral toxicity test using rat, there were no effects on clinical signs, mortality.
  - Ethylbenzene : In repeated oral toxicity study with rats for 28 days, increased liver weight and hepatocellular hypertrophy at higher dose levels were observed. (NOEL = 75 mg/kg bw/day) (OECD TG 407, GLP); In repeated inhalation toxicity study with rats for 13 weeks, increases in liver and kidney weights but no other treatment related effects were observed in rats that inhaled  $\geq 250$  ppm ethylbenzene vapour for 13 weeks, NOAEC = 1000ppm (OECD Guideline 413, GLP), Classified as Category 2 according to EU GHS
- Aspiration Hazard :**
- Ethylbenzene : Classified as Category 1 according to EU GHS

## SECTION 12. ECOLOGICAL INFORMATION

\* This is a product that fulfills a certain function in solid state with specific shape without discharging any chemical substance in its use and has no obligation to write (M)SDS. Since this document contains the precautions for safe handling related to its materials or chemical substances consisting of this product, please note that these overall information is irrelevant to this product.

### 12.1 Ecological toxicity

- Acute toxicity : ATEmix = 0.48250mg/l

#### Fish

- Graphite : 96hr-LC<sub>50</sub> (Brachydanio rerio) > 100 mg/L
- Fe : 96hr-LC<sub>50</sub> > 10000 mg/L (OECD TG 203, GLP)
- : 96hr-LC<sub>50</sub> = 54.1 mg/L (Read across; cobalt (II) chloride hexahydrate), 34d-NOEC (Pimephales promelas) = 0.21 mg/L
- Aluminum : 96hr-LC<sub>50</sub> > 218.64 mg/L (GLP)(Read across; aluminium chloride hexahydrate), 28d- NOEC (Pimephales promelas) = 4.7 mg/L (Read across; aluminium sulphate)
- Lithium hexafluorophosphate(1-) : 96hr-LC<sub>50</sub> = 51 ~ 193 mg/L Information on major hydrolysis product of the registered substance (released rapidly on contact with water/moisture); 21d-NOEC = 4 mg F-/L
- Boehmite (Al(OH)O) : 96hr-LC<sub>50</sub> = 1.16 mg/L
- Carbon black : 96hr-LC<sub>0</sub> = 1000 mg/L (OECD TG 203, GLP)
- 1-Methyl-2-pyrrolidinone : 96hr-LC<sub>50</sub> > 500 mg/L (BBA-bulletin No. 33, 2. edition)
- Lithium carbonate; Lithane : 96hr-LC<sub>50</sub> = 30.3 mg/L (OECD Guideline 203, GLP), 34d-NOEC (Danio rerio) = 15.28 mg/L (Read across; lithium hydroxide monohydrate)(OECD Guideline 210, GLP)
- Ethylbenzene : 96hr-LC<sub>50</sub> = 4.2 mg/L (OECD Guideline 203 )

#### Crustacean

- Graphite : 48hr-EC<sub>50</sub> (Daphnia magna) > 100 mg/L
- Fe : 48hr-EC<sub>50</sub> > 100 mg/L (OECD TG 202, GLP)
- : 48hr-EC<sub>50</sub> = 2.618 mg/L (GLP)(Read across; cobalt (II) chloride hexahydrate), 42d-NOEC (Neanthes arenaceodentata) = 0.713 mg/L (ASTM Method E1562, GLP)
- Aluminum : 48hr-LC<sub>50</sub> = 0.071 mg/L (Read across; CAS 13473-90-0), 8d-NOEC (Ceriodaphnia dubia) = 4.9 mg/L (Read across; CAS 7784-13-6)
- Lithium hexafluorophosphate(1-) : 48hr-LC<sub>50</sub> > 100 mg/L (OECD Guideline 202, GLP);21d- NOEC(Daphnia magna) = 10 mg/L (Information on major hydrolysis product of the registered substance (released rapidly on contact with water/moisture)) (OECD guideline 202, GLP)
- 4-fluoro-1,3-dioxolan-2-one : 48hr-LC<sub>50</sub> = 8.4 mg/L (OECD Guideline 202, GLP)
- Boehmite (Al(OH)O) : 48hr-EC<sub>50</sub> > 100 mg/L (OECD Guideline 202, GLP)
- Carbon black : 24hr-EC<sub>50</sub> > 5600 mg/L (OECD TG 202, GLP)
- 1-Methyl-2-pyrrolidinone : 24hr-EC<sub>50</sub> > 1000 mg/L German Industrial Standard DIN 38 412 Part 11
- Lithium carbonate; Lithane : 48hr-EC<sub>50</sub> = 33.2 mg/L (OECD Guideline 202, GLP), 21d-NOEC (Daphnia magna) = 9 mg/L (Read across; lithium)(OECD Guideline 211, GLP)
- Ethylbenzene : 48hr-EC<sub>50</sub> = 1.8 ~ 2.4 mg/L (EPA method F), 7d-NOEC(Ceriodaphnia dubia) = 0.96 mg/L (U.S. EPA 600/4-91-003)

#### Algae

- Graphite : 72hr-EC<sub>50</sub> (Selenastrum capricornutum) > 100 mg/L
- : 96hr-EC<sub>50</sub> = 71.314 mg/L (Read across; cobalt (II) chloride hexahydrate), 96hr-NOEC (Dunaliella tertiolecta) = 4.672 mg/L
- : 96hr-EC<sub>50</sub> > 500 mg/L
- Aluminum : 72hr-EC<sub>50</sub> = 0.0169 mg/L (OECD TG 201), (Read across; CAS 13473-90-0)
- Lithium hexafluorophosphate(1-) : 96hr-EC<sub>50</sub> > 100 mg/L ; 96h-NOEC = 22 mg/L (OECD Guideline 201, GLP)
- 4-fluoro-1,3-dioxolan-2-one : 72hr-EC<sub>50</sub> = 32 mg/L
- Boehmite (Al(OH)O) : 72hr-EC<sub>50</sub> > 100 mg/L (OECD Guideline 201, GLP)
- Carbon black : 72hr-EC<sub>50</sub> > 10000 mg/L , 72hr-NOEC > 10,000mg/l (OECD TG 201, GLP)

## CONTINUED: SECTION 12. ECOLOGICAL INFORMATION

- 1-Methyl-2-pyrrolidinone : 72hr-EC<sub>50</sub> = 600.5 mg/L
- Lithium carbonate; Lithane : 72hr-EC<sub>50</sub> > 400 mg/L
- Ethylbenzene : 96hr-EC<sub>50</sub> = 3.6 mg/L (U.S. EPA. 1985. Toxic substance Control Act Test guidelines)

### 12.2 Persistence and degradability

#### Persistence

- Graphite : Low persistency (log Kow is less than 4 estimated.) (Log Kow = 0.78)
- : Low persistency (log Kow is less than 4 estimated.) (Log Kow = 0.82)
- Aluminum : Low persistency (log Kow is less than 4 estimated.) (Log Kow = 0.33) (estimated)
- Lithium hexafluorophosphate(1-) : Low persistency (log Kow is less than 4 estimated.) (Log Kow = 0.354) (20 °C, pH > 6.5 - < 7.5) (OECD Guideline 107, GLP)
- 4-fluoro-1,3-dioxolan-2-one : Low persistency (log Kow is less than 4 estimated.) (Log Kow = -0.435)
- 1-Methyl-2-pyrrolidinone : Low persistency (log Kow is less than 4 estimated.) (Log Kow = -0.46)
- Ethylbenzene : Low persistency (log Kow is less than 4 estimated.) (Log Kow = 3.6) (EU Method A.8)

**Degradability** : Not available

### 12.3 Bioaccumulative potential

#### Bioaccumulation

- Graphite : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 2.433)
- Copper : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 0.02 ~ 20)
- : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 23) (Read across; 57CoCl)
- : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 2.5)
- Aluminum : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 3.162) (estimated)
- Lithium hexafluorophosphate(1-) : Bioaccumulation is expected to be low according to the BCF < 500 (BCF < 31)
- 4-fluoro-1,3-dioxolan-2-one : Bioaccumulation is expected to be low according to the BCF < 500 (BCF= 3.162) (estimated)
- Dimethyl carbonate : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 3.2)
- Nickel; Raney nickel : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 70)
- Ethylbenzene : Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 1)

#### Biodegradation

- Lithium hexafluorophosphate(1-) : As well-biodegraded, it is expected to have low accumulation potential in living organisms (= 86% biodegradation was observed after 28 days) (OECD Guideline 301 C, GLP)
- 4-fluoro-1,3-dioxolan-2-one : As not well-biodegraded, it is expected to have high accumulation potential in living organisms (= 38% biodegradation was observed after 21 days) (OECD Guideline 301 D, GLP)
- Dimethyl carbonate : As well-biodegraded, it is expected to have low accumulation potential in living organisms (= 86% biodegradation was observed after 28 days) (OECD Guideline 301 C, GLP)
- Polyethylene : As not well-biodegraded, it is expected to have high accumulation potential in living organisms (= 0% biodegradation was observed after 28 days)
- Carbon black : carbon black is an inorganic substance and will not biodegraded by microorganisms.
- 1-Methyl-2-pyrrolidinone : As well-biodegraded, it is expected to have low accumulation potential in living organisms (= 73% biodegradation was observed after 28 days)
- Ethylbenzene : As well-biodegraded, it is expected to have low accumulation potential in living organisms (70% ~ 80% biodegradation was observed after 28 days) (ISO 14593-CO<sub>2</sub>-Headspace Test)

### 12.4 Mobility in soil

- 4-fluoro-1,3-dioxolan-2-one : Low potency of mobility to soil. (Koc = 5.117)
- Nickel; Raney nickel : Low potency of mobility to soil. (Koc = 2.86)
- 1-Methyl-2-pyrrolidinone : Low potency of mobility to soil. (Koc = 20.94) (estimated)
- Ethylbenzene : Low potency of mobility to soil. (Koc = 257.04)

**12.5 Results of PBT and vPvB assessment** : Not available

**12.6 Other adverse effects** : Not available

## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

Product/Packaging disposal

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

**Waste codes / Waste designation according to LoW(2015)** : 16-06-05

#### Waste treatment-relevant information

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

**CONTINUED: SECTION 13. DISPOSAL CONSIDERATIONS**

**Sewage disposal-relevant information:** Not available  
**Other disposal recommendations:** Not available

**SECTION 14. TRANSPORT INFORMATION**

- When a number of batteries are transported by ship, vehicle and railroad avoid high temperature and dew condensation.
- Avoid transportation which may cause damage of package.
- Lithium-ion batteries are not subject to dangerous goods regulation for the purpose of transportation by the International Maritime Dangerous Goods regulations (IMDG). For Lithium-ion batteries, the Watt-hour rating is no more than 20Wh /cell and 100Wh/ battery pack can be treated as "non-dangerous goods" by the United Nations Recommendations on the Transport of Dangerous Goods/Special Provision 188, provided that the products are prevented from being short-circuited with each other and are packaged in an appropriate condition which satisfies Packing Group II performance level.
- IATA (International Air Transport Association): Dangerous Goods Regulation Packing Instruction 965 (Lithium ion or lithium polymer cells and batteries without electronic equipment) went into effect April 1, 2016: Lithium ion cells and batteries must be offered for transport at a state of charge not exceeding 30 per cent of their rated capacity. UN 3480, PI 965, Section IA and IB and II will be restricted to carriage on cargo aircraft. All packages must bear the Cargo Aircraft Only label in addition to the other marks and labels required by the Regulations.

Section II requirements apply to lithium-ion cells with a Watt-hour rating not exceeding 20 Wh and lithium-ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities that within the allowance permitted in Section II, Table 965-11.

**TABLE 965-II**

Contents	Lithium-ion cells and/or batteries with a Watt-hour rating of 2.7 Wh or less	Lithium-ion cells with a Watt-hour rating of more than 2.7Wh but not more than 20Wh	Lithium-ion batteries with a Watt-hour rating of more than 2.7Wh but not more than 100Wh
Maximum number of cells / batteries per package	No limit	8 cells	2 Batteries
Contents	Lithium-ion cells and/or batteries with a Watt-hour rating of 2.7 Wh or less	Lithium-ion cells with a Watt-hour rating of more than 2.7Wh but not more than 20Wh	Lithium-ion batteries with a Watt-hour rating of more than 2.7Wh but not more than 100Wh
Maximum net quantity per package	2.5 kg	N/A	N/A

Lithium-ion cells and batteries meeting the requirements in this section are not subject to other additional requirements of these Regulations except for:

- Each cell and battery is of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, subsection 38.3;
  - cells and batteries must be manufactured under a quality management program;
  - for batteries, The Watt-hour rating must be marked on the outside of the battery case;
  - Each package must be capable of withstanding a 1.2m drop test in any orientation without:
    - damage to cells or batteries contained therein;
    - shifting of the contents so as to allow battery to battery (or cell to cell) contact;
    - release of contents.
- Each package must be labeled with a lithium battery handling label.

Section IB requirements apply to lithium-ion cells with a Watt-hour rating not exceeding 20 Wh and lithium-ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities that exceed the allowance permitted in Section II, Table 965-II.

Quantities of lithium-ion cells or batteries that exceed the allowance permitted in Section II, Table 965-II must be assigned to Class 9 and are subject to all of the applicable provisions of Regulation.

## CONTINUED: SECTION 14. TRANSPORT INFORMATION

Where classified as lithium batteries packed with equipment (UN3481), IATA Dangerous Goods Regulations packing instruction 966 is applied.

Where classified as lithium batteries installed in equipment (UN3481), IATA Dangerous Goods Regulations packing instruction 967 is applied.

## SECTION 15. REGULATORY INFORMATION

### 15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture

#### EU regulations

#### Authorizations and/or restrictions on use:

**Authorizations:** Not regulated

#### Restrictions on use:

- Nickel : Regulated
- 1-Methyl-2-pyrrolidinone : Regulated

#### Other EU regulations:

- 1-Methyl-2-pyrrolidinone : Regulated

#### Foreign Regulatory Information External information :

**U.S.A management information (OSHA Regulation) :** Not regulated

**U.S.A management information (CERCLA Regulation) :**

- Copper : 5,000 lb
- Nickel : 100 lb
- Chromium : 5,000 lb

- Ethylbenzene : 1,000 lb

**U.S.A management information (EPCRA 302 Regulation) :** Not regulated

**U.S.A management information (EPCRA 304 Regulation) :** Not regulated

**U.S.A management information (EPCRA 313 Regulation) :**

- Aluminium (metal) : Regulated
- Copper : Regulated
- Nickel : Regulated
- 1-Methyl-2-pyrrolidinone : Regulated
- Chromium : Regulated
- lithium carbonate : Regulated

**Substance of Roterddame Protocol :** Not regulated

**Substance of Stockholme Protocol :**

- lithium hexafluorophosphate(1-) : Regulated

**Substance of Montreal Protocol :** Not regulated

### 15.2 Chemical safety assessment :

- No chemical safety assessment has been carried out for this product by the supplier.

## SECTION 16. OTHER INFORMATION

Product safety data sheet for PA0001N0006A/PA0001N0007A/PA001N0008A prepared in accordance with Regulation (EU) 2015/830 (REACH), Annex II, and OSHA 29 CFR 1910.1200

### 16.1 Indication of changes

**Date Updated :** 28 June, 2018

**Version :** Rev. 01

## CONTINUED: SECTION 16. OTHER INFORMATION

### 16.2 Abbreviations and acronyms

ACGIH = American Conference of Government Industrial Hygienists

CLP = Classification Labelling Packaging Regulation ; Regulation (EC) No 1272/2008

CAS No. = Chemical Abstracts Service number

DMEL = Derived Minimal Effect Levels

DNEL = Derived No Effect Level

EC Number = EINECS and ELINCS Number (see also EINECS and ELINCS)

EU = European Union

IARC = International Agency for Research on Cancer

ISHL = Industrial Safety & Health Law

NIOSH = National Institute for Occupational Safety & Health

NTP = National Toxicology Program

OSHA = European Agency for Safety and Health at work PBT = Persistent, Bioaccumulative and Toxic substance PNEC(s) = Predicted No Effect Concentration(s)

REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 453/2010

STP = Sewage Treatment Plant

SVHC = Substances of Very High Concern

vPvB = Very Persistent and Very Bioaccumulative

UN = United Nations

MARPOL = International Convention for the Prevention of Pollution from Ships (IMO)

IBC = Intermediate Bulk Container

CERCLA = Comprehensive Environmental Response, Compensation & Liability Act (US)

EPCRA = Emergency Planning and Community Right-to-Know Act (US) EINECS = European Inventory of Existing Commercial chemical Substances ELINCS = European List of Notified Chemical Substances

### 16.3 Key literature reference and sources for data :

U.S. National library of Medicine (NLM) Hazardous Substances Data Bank (HSDB) LookChem; <http://www.lookchem.com/>

IUCLID: <http://ecb.jrc.ec.europa.eu/IUCLID-DataSheets/7631905.pdf> CHRIP(Cheical Risk Information Platform)

EPISUITE v4.11; <http://www.epa.gov/opt/exposure/pubs/episuitedl.html>

The Chemical Database -The Department of Chemistry at the University of Akron; <http://ull.chemistry.uakron.edu/erd/>

ECOTOX: <http://cfpub.epa.gov/ecotox/>

International Chemical Safety Cards (ICSC): <http://www.nihs.go.jp/ICSC/> National Chemical Information System (<http://ncis.nier.go.kr>)

Korea Dangerous Material Inventory Management System (<http://hazmat.nema.go.kr>) REACH information on registered substances;

<https://echa.europa.eu/information-on-chemicals/registered-substances>

EU CLP; <https://echa.europa.eu/information-on-chemicals/cl-inventory-database> NIOSH Pocket Guide;

NIOSH Pocket Guide; <http://www.cdc.gov/niosh/npg/npgdcas.html>

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>

National Toxicology Program; <http://ntp.niehs.nih.gov/results/dbsearch/>

TOMES-LOLI@; <http://www.rightanswerknowledge.com/loginRA.asp>

UN Recommendations on the transport of dangerous goods 17<sup>th</sup> American Conference of Governmental Industrial Hygienists TLVs and BEIs.

### 16.4 Classification and procedure used to derive the classification for mixtures according to Regulation(EC) 1272/2008(CLP) :

Not classified

### 16.5 Relevant H-statements : Not applicable

### 16.6 Training advice :

- Do not handle until all safety precautions have been read and understood.

### 16.7 Further information :

Data of Sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product (s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)"

The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.