



## Safety Data Sheet

Regulation : In accordance with Regulation (EU) 2015/830 (REACH), Annex II, and OSHA 29 CFR 1910.1200

### Section I – IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

**Important Note:** As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use. This battery is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

#### 1.1 Product identifier

**Substance name :** MODEL CS100 (100Ah capacity)

#### 1.2 Relevant identified uses of the substance or mixture and uses advised against

**Relevant identified uses :** Lithium-Ion battery

**Uses advised against :** Use for recommended use only

**Further Information :** Not available

#### 1.3 Details of the supplier of the safety data sheet

**Supplier :** SAMSUNG SDI Co., Ltd.

**Street address/P.O. Box :** 150-20, Gongse-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea

**Country ID/Postcode/Place :**

**Telephone number :** +82-31-288-4415

**Responsible Department:** Cell development department

**e-mail address of competent person responsible for the SDS :** Not available

**National contact :** 1-800-424-9300: US and Canada / 1-703-527-3887: International

#### 1.4 Emergency Telephone

**:** +1-703-527-3887

**Opening hours :** Not available

**Other comments :** Not available

#### 1.5 Further Information

**Battery-System:** Lithium-Ion (Li-ion)

**Voltage:** 3.68V

**Anode (negative electrode):** based on intercalation graphite

**Cathode (positive electrode):** based on lithiated metal oxide (Cobalt, Nickel, Manganese)

#### **Remark:**

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. SAMSUNG SDI Co., Ltd. makes no warranty, expressed or implied, with respect to this information and disclaims all liabilities from reliance on it.



## Section II – HAZARDS 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 these 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 provided that the cell or battery integrity remains and the seals remain intact. The potential for exposure should not exist unless the cell or battery leaks, is exposed to high temperatures or is mechanically, electrically or physically abused/damaged. If the cell or battery is compromised and starts to leak, based upon the battery ingredients, the contents are classified as Hazardous.

##### **Hazardous Materials Information Label (HMIS)**

Health: Not available

Flammability: Not available

Physical Hazard: Not available

##### **NFPA Hazard Ratings**

Health: 0

Flammability: 1

Reactivity: 0

### 2.2 Label elements

**Hazard pictograms :** Not applicable

**Signal word :** Not applicable

**Hazard statement :** Not applicable

**Precautionary statements:** Not applicable

**Supplemental Hazard information (EU) :** Not applicable

### 2.3 Other hazards :

**Appearance, Color and Odor:** Solid object with no odor.

**Primary Routes(s) of Exposure:** These chemicals are contained in a sealed enclosure. Risk of exposure occurs only if the cell or pack is mechanically, thermally, electrically or physically abused to the point of compromising the enclosure.



If this occurs, exposure to the electrolyte solution contained within can occur by inhalation, ingestion, eye contact and skin contact.

**Potential Health Effect(s):**

**Acute (short term):** see Section 8 for exposure controls.

In the event that this cell or pack has been ruptured, the electrolyte solution contained within the cell would be corrosive and can cause burns to skin and eyes.

**Inhalation:** Inhalation of materials from a sealed cell is not an expected route of exposure. Vapors or mists from a ruptured cell may cause respiratory irritation.

**Ingestion:** Swallowing of materials from a sealed cell is not an expected route of exposure. Swallowing the contents of an open cell can cause serious chemical burns to mouth, esophagus, and gastrointestinal tract.

**Skin:** Contact between the cell and skin will not cause any harm. Skin contact with the contents of an open cell can cause severe irritation or burns to the skin.

**Eye:** Contact between the cell and the eye will not cause any harm. Eye contact with the contents of an open cell can cause severe irritation or burns to the eye.

**CHRONIC (long term):** see Section 11 for additional toxicological data.

**Interactions with other chemicals:** Immersion in high conductivity liquids may cause corrosion and breaching of the cell or battery enclosure. The electrolyte solution inside of the cells may react with alkaline (basic) materials and present a flammability hazard.

**Potential Environmental Effects:** Not Available.

## Section III – COMPOSITION/INFORMATION ON 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)
182442-95-1	695-690-9	-	23~30	Cobalt lithium manganese nickel oxide	Not available	Not classified
872-50-4	212-828-1	-	15~23	1-methyl-2-pyrrolidone	1-methylpyrrolidin-2-one	Skin Irrit. 2, H315 Eye Irrit. 2, H319 STOT SE 3, H335 Repr. 1B, H360D
7782-42-5	231-955-3	-	10~20	Graphite	Grafito	Not classified
7429-90-5	231-072-3	-	10~16	Aluminium	Al	Flam. Sol. 1, H228 Water-react. 2, H261
7440-50-8	231-159-6	-	2~10	Copper	Cu	Not classified
Trade secret	Trade secret	-	1~10	Trade secret 1	Trade secret	Not classified
Trade secret	Trade secret	-	1~10	Trade secret 2	Trade secret	Not classified



Trade secret	Trade secret	-	1~5	Trade secret 3	Trade secret	Flam. Liq. 2, H225
177997-13-6	700-042-6	-	1~3	Lithium Nickel Cobalt Aluminium oxide	LNCA	Not classified
Trade secret	Trade secret	-	1~3	Trade secret 4	Trade secret	Not classified
1344-28-1	215-691-6	-	1~3	Aluminium oxide	Activated Alumina	Not classified
1333-86-4	215-609-9	-	0.1~0.99	Carbon black	Carbon	Not classified

### **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 IV – FIRST-AID MEASURES**

### **※ General 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. **4.1**

### **Description of first aid measures**

#### **Following eye contact :**

- In case of contact with substance, immediately flush eyes with running water at least 20 minutes.

#### **Following skin contact :**

- In case of contact with substance, immediately flush skin with running water at least 20 minutes.
- Remove and isolate contaminated clothing and shoes.
- Wash contaminated clothing and shoes before reuse.
- Get immediate medical advice/attention.

#### **Following inhalation :**

- Specific medical treatment is urgent.
- Move victim to fresh air.
- Administer oxygen if breathing is difficult.

#### **Following ingestion :**

- Do not let him/her eat anything, if unconscious.
- Get immediate medical advice/attention.

#### **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 V – 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 VI – 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** :

- Eliminate all ignition sources.
- Stop leak if you can do it without risk.
- Please note that materials and conditions to avoid.
- Ventilate the area.
- Do not touch or walk through spilled material.

#### **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 :**

- 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 :**

- With clean shovel place material into clean, dry container and cover loosely; move containers from spill area.

**Other information:** Not available

#### **6.4 Reference to other sections**

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

## **Section VII – HANDLING AND STORAGE**

#### **7.1 Precautions for safe handling**

- Avoid short circuiting the cell.
- Avoid mechanical damage of the cell.
- Do not open or disassemble.
- Please note that materials and conditions to avoid.
- Wash thoroughly after handling.
- Please work with reference to engineering controls and personal protective equipment.
- Be careful to high temperature.

#### **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 temperature described in O&M manual which uses this cell, at approx. 20-50% of nominal capacity.
- Store in a closed container.
- Store in cool and dry place.

#### **7.3 Specific end use(s)**

**Recommendations :** Not available

**Industrial sector specific solutions :** Not available



## Section VIII – EXPOSURE CONTROLS / PERSONAL PROTECTION

### 8.1 Control parameters

#### Occupational Exposure limits

Name	ACGIH regulation	Biological exposure index	OSHA regulation	NIOSH regulation	EU regulation
Cobalt lithium manganese nickel oxide	: TWA = 0.2 mg/m <sup>3</sup> (inhalable particulate matter, as Ni)(Nickel insoluble inorganic compounds), TWA = 0.1 mg/m <sup>3</sup> (inhalable particulate matter, as Ni)(Nickel soluble inorganic compounds), TWA = 0.02 mg/m <sup>3</sup> (as Co)(Cobalt inorganic compounds), TWA = 0.02 mg/m <sup>3</sup> (respirable particulate matter, as Mn); 0.1 mg/m <sup>3</sup> (inhalable particulate matter, as Mn)(Manganese inorganic compounds)	Not available	TWA = 1 mg/m <sup>3</sup> (Nickel compounds), C = 5 mg/m <sup>3</sup> (Manganese compounds)	: TWA = 0.015 mg/m <sup>3</sup> (Nickel metal and other compounds, as Ni), TWA = 1 mg/m <sup>3</sup> , STEL = 3 mg/m <sup>3</sup> (Manganese compounds)	Not applicable
1-methyl-2-pyrrolidone	Not applicable	Not available	Not applicable	Not applicable	STEL = 20 ppm; STEL = 80 mg/m <sup>3</sup> , TWA = 10 ppm; TWA = 40 mg/m <sup>3</sup>
Graphite	TWA = 2 mg/m <sup>3</sup> (all forms except graphite fibers, respirable particulate matter)	Not available	TWA = 15 mppcf	TWA = 2.5 mg/m <sup>3</sup> (resp)	Not applicable
Aluminium	TWA = 1 mg/m <sup>3</sup> (respirable particulate matter)(Aluminum, Aluminum insoluble compounds)	Not available	TWA = 15 mg/m <sup>3</sup> (Aluminum metal (as Al), Total dust); 5 mg/m <sup>3</sup> (Respirable fraction)	TWA = 10 mg/m <sup>3</sup> (total); 5 mg/m <sup>3</sup> (resp)	Not applicable
Copper	TWA = 0.2 mg/m <sup>3</sup> (Copper fume), TWA = 1 mg/m <sup>3</sup> (Copper dust and mist, Copper compounds as Cu)	Not available	TWA = 0.1 mg/m <sup>3</sup> (Copper Fume (as Cu)); 1 mg/m <sup>3</sup> (Dusts and mists (as Cu), Cotton dust)	TWA = 1 mg/m <sup>3</sup> (Copper (dusts and mists, as Cu), other copper compounds (as Cu) except Copper fume)	Not applicable
Trade secret 1	Not applicable	Not available	Not applicable	Not applicable	Not applicable
Trade secret 2	Not applicable	Not available	Not applicable	Not applicable	Not applicable



Trade secret 3	Not applicable	Not available	Not applicable	Not applicable	Not applicable
Lithium Nickel Cobalt Aluminium oxide	TWA = 0.2 mg/m <sup>3</sup> (inhalable particulate matter, as Ni)(Nickel insoluble inorganic compounds), TWA = 0.1 mg/m <sup>3</sup> (inhalable particulate matter, as Ni)(Nickel soluble inorganic compounds), TWA = 0.02 mg/m <sup>3</sup> (as Co)(Cobalt inorganic compounds), TWA = 1 mg/m <sup>3</sup> (respirable particulate matter)(Aluminum insoluble compounds)	Not available	TWA = 1 mg/m <sup>3</sup> (Nickel compounds)	TWA = 0.015 mg/m <sup>3</sup> (Nickel metal and other compounds, as Ni)	Not applicable
Trade secret 4	Not applicable	Not available	Not applicable	Not applicable	Not applicable
Aluminium oxide	TWA = 1 mg/m <sup>3</sup> (respirable particulate matter)(Aluminum, Aluminum insoluble compounds)	Not available	TWA = 15 mg/m <sup>3</sup> (Total dust) ; 5 mg/m <sup>3</sup> (Respirable fraction)	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>	Not applicable

## 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.

**Organisational 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 facepiece with goggles to protect.





- An eye wash unit and safety shower station should be available nearby work place.
- Wear breathable safety goggles to protect from particulate material causing eye irritation or other disorder.
- An eye wash unit and safety shower station should be available nearby work place.

#### **Skin protection**

##### **Hand protection**

- Wear chemical resistant gloves.
- Wear appropriate protective gloves by considering physical and chemical properties of chemicals.

##### **Other skin protection**

- Wear appropriate protective chemical resistant clothing.
- Wear appropriate protective clothing by considering physical and chemical properties of chemicals.

##### **Respiratory 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)
- In lack of oxygen(< 19.5%), wear the supplied-air respirator or self-contained oxygen breathing apparatus.

#### **8.2.3 Environmental exposure controls**

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

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

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

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

## **Section IX – PHYSICAL AND CHEMICAL PROPERTIES**

### **9.1 Information on basic physical and chemical properties**

#### **Appearance**

**Description :** Solid

**Color :** Various

**Odor :** Odorless

**Odor threshold :** Not available

**pH :** Not available

**Melting point/freezing point :** Not available

**Initial boiling point and boiling range :** Not available

**Flash point :** Not available

**Evaporation rate :** Not available



**Flammability (solid, gas) :** Not available

**Upper/lower flammability or explosive limits :** Not available

**Vapor pressure :** Not available

**Solubility (ies) :** insoluble.

**Vapor density :** Not available

**Relative density :** Not available

**Partition coefficient: n-octanol/water :** Not available

**Auto ignition temperature :** Not available

**Decomposition temperature :** Not available

**Viscosity :** Not available

**Explosive properties :** Not available

**Oxidizing properties :** Not available

**Molecular weight :** Not available

## 9.2 Other information

Not available

## Section X – STABILITY AND REACTIVITY

### 10.1 Reactivity

- Stable at ambient temperature.

### 10.2 Chemical stability

- Stable in general.

### 10.3 Possibility of hazardous reactions

- In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.
- Fire may produce irritating and/or toxic gases.
- Inhalation of material may be harmful.

### 10.4 Conditions to avoid

- Ignition sources (heat, sparks or flames).

### 10.5 Incompatible materials

- Combustibles.

### 10.6 Hazardous decomposition products

- No decomposition if stored and applied as directed.
- Irritating and/or toxic gases

## Section XI – 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** : Not classified (ATEmix = 1,684 mg/kg bw)

- Cobalt lithium manganese nickel oxide : Rat LD<sub>50</sub> > 2,000 mg/kg(NCIS)
- 1-methyl-2-pyrrolidone : Rat LD<sub>50</sub> = 4,150 mg/kg(OECD Guideline 401)
- Graphite : Rat LD<sub>50</sub> > 2,000 mg/kg(OECD Guideline 423, GLP)
- Aluminium : Rat LD<sub>50</sub> > 15,900 mg/kg(Read-across)(OECD Guideline 401)
- Copper : Rat LD<sub>50</sub> = 481 mg/kg(OECD Guideline 401, GLP)
- Trade secret 1 : Rat LD<sub>50</sub> = 10,400 mg/kg(OECD Guideline 401)
- Trade secret 2 : Rat LD<sub>50</sub> > 5,000 mg/kg(OECD Guideline 401, GLP)
- Trade secret 3 : Rat LD<sub>50</sub> > 5,000 mg/kg(male/female)(OECD Guideline 401, GLP)
- Lithium Nickel Cobalt Aluminium oxide : Rat LD<sub>50</sub> > 2,000 mg/kg(OECD Guideline 420, GLP)
- Trade secret 4 : Rat LD<sub>50</sub> = 50~300 mg/kg(OECD Guideline 423, GLP)
- Aluminium oxide : Rat LD<sub>50</sub> > 10,000 mg/kg(OECD Guideline 401, GLP)
- Carbon black : Rat LD<sub>50</sub> > 10,000 mg/kg(OECD Guideline 401, GLP)

**Dermal** : Not classified (ATEmix = 13,200mg/kg bw)

- 1-methyl-2-pyrrolidone : Rat LD<sub>50</sub> > 5,000 mg/kg(OECD Guideline 402)
- Copper : Rat LD<sub>50</sub> > 2,000 mg/kg(OECD Guideline 402, GLP)
- Trade secret 1 : Rat LD<sub>50</sub> = 2,000 mg/kg(male/female)(OECD Guideline 402, GLP)
- Trade secret 3 : Rabbit LD<sub>50</sub> > 2,000 mg/kg(male/female)(GLP)

**Inhalation** : Not classified (ATEmix > 0.888 mg/L / 4 hr)

- 1-methyl-2-pyrrolidone : Rat LC<sub>50</sub> > 5.1 mg/L / 4 hr(OECD Guideline 403)
- Graphite : Rat LC<sub>50</sub> > 2000 mg/m<sup>3</sup> / 4 hr(OECD Guideline 403, GLP)
- Aluminium : Rat LC<sub>50</sub> > 0.888 mg/L / 4 hr(OECD Guideline 403)
- Copper : Rat LC<sub>50</sub> > 5.11 mg/L / 4 hr(OECD Guideline 436, GLP)
- Trade secret 1 : Rat LC<sub>0</sub> = 730 mg/m<sup>3</sup> / 8 hr(male/female)(OECD Guideline 403)
- Trade secret 2 : Rat LC<sub>50</sub> > 17.6 mg/L / 4 hr(OECD Guideline 403, GLP)
- Trade secret 3 : Rat LC<sub>50</sub> > 5.36 mg/L / 4 hr(male/female)(OECD Guideline 403, GLP)
- Aluminium oxide : Rat LC<sub>50</sub> > 2.3 mg/L / 4 hr(OECD Guideline 403, GLP)
- Carbon black : Rat LC<sub>0</sub> = 4.6 mg/m<sup>3</sup> / 4 hr(OECD Guideline 403)

**Skin corrosion/ irritation** : Not classified

- Cobalt lithium manganese nickel oxide : the test material was not irritating.
- 1-methyl-2-pyrrolidone : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404)
- Graphite : In the skin irritation test with rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
- Aluminium : In the skin irritation test using rabbits, the test material was not irritating. (Read-across)(OECD Guideline 404)



- Copper : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
- Trade secret 1 : In the skin irritation test using rabbits, the test material was not classified. (OECD Guideline 404, GLP)
- Trade secret 2 : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404, GLP)
- Trade secret 3 : In the skin irritation test using rabbits, the test material was not irritating. (OECD Guideline 404)
- Lithium Nickel Cobalt Aluminium oxide : In the skin irritation test using rabbits, the test material was corrosive. (an exposure period of 1-hour)(OECD Guideline 404, GLP)
- Trade secret 4 : In the skin irritation test using human skin model, the test material was corrosive. (EU Method B.40, GLP)
- Aluminium oxide : In the skin irritation test using rabbits, very slight erythema was observed. it would not lead to classification.(2/12)(OECD Guideline 404)
- Carbon black : In the skin irritation test using rabbits, the test material was not classified. (OECD Guideline 404)

**Serious eye damage/ irritation : Not classified**

- Cobalt lithium manganese nickel oxide : the test material was not irritating.
- 1-methyl-2-pyrrolidone : In the eye irritation test using rabbits, the test material was irritating. Moderate ocular effects observed, but Corneal and conjunctival effects were reversible within 14 days and 21 days, respectively. (OECD Guideline 405)
- Graphite : In the eyes irritation test with rabbits, the test material was slightly irritating. it was fully reversible within 7 days. (OECD Guideline 405, GLP)
- Aluminium : In the eye irritation test using rabbits, the test material was not irritating. (Read-across)
- Copper : In the eyes irritation test with rabbits, the test material was irritating. but it was fully reversible within 7 days. (OECD Guideline 405, GLP)
- Trade secret 1 : In the eye irritation test using rabbits, the test material was mildly irritating. (OECD Guideline 405, GLP)
- Trade secret 2 : In the eye irritation test using rabbits, the test material was not irritating. (OECD Guideline 405, GLP)
- Trade secret 3 : In the eye irritation test using rabbits, the test material was not irritating. (GLP)
- Lithium Nickel Cobalt Aluminium oxide : In the eye irritation test using The SkinEthic RHC model consists of transformed human keratinocytes, the test material was irritating.
- Trade secret 4 : In the eye irritation test using fertilised brown leghorn chicken eggs, the test material was severely irritating. (GLP)
- Aluminium oxide : In the eyes irritation test using rabbits, slight erythema was observed. it would not lead to classification.(OECD Guideline 405)
- Carbon black : In the eye irritation test using rabbits, the test material was not irritating. (OECD Guideline 405)

**Respiratory sensitization : Not classified**

- Aluminium : In the respiratory sensitization test using mice, the test material was not respiratory sensitization. (Read-across)



- Aluminium oxide : In the respiratory sensitization test using rats, this material was not respiratory sensitizing.(Effects of Asian Sand Dust, Arizona Sand Dust, Amorphous Silica and Aluminium Oxide on Allergic Inflammation in the Murine Lung, 2008)
- Carbon black : This material has not been tested in animals for sensitisation effects on the respiratory tract. In humans, no cases of allergies were reported to the responsible occupational physicians.

**Skin sensitization : Not classified**

- Cobalt lithium manganese nickel oxide : this material was not skin sensitizing. (Mouse)
- 1-methyl-2-pyrrolidone : In the skin sensitization test using mice, the test material was not skin sensitizing. (OECD Guideline 429, GLP)
- Graphite : In the skin sensitization test using mice, the test material was not skin sensitizing. (OECD Guideline 429, GLP)
- Aluminium : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing.
- Copper : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing. (OECD Guideline 406, GLP)
- Trade secret 1 : In the skin sensitization test using guinea pigs, the test material was not classified. (OECD Guideline 406, GLP)
- Trade secret 2 : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing. (OECD Guideline 406, GLP)
- Trade secret 3 : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing. (OECD Guideline 406, GLP)
- Lithium Nickel Cobalt Aluminium oxide : In the skin sensitization test using mouse, the test material was not skin sensitizing. (OECD Guideline 429, GLP)
- Trade secret 4 : In the skin sensitization test using mice, the test material was not skin sensitizing. (OECD Guideline 429, GLP)
- Aluminium oxide : In the skin sensitization test using guinea pigs, this material was not skin sensitizing.(Landsteiner / Draize method)
- Carbon black : In the skin sensitization test using guinea pigs, the test material was not skin sensitizing. (OECD Guideline 406, GLP)

**Carcinogenicity : Not classified**

**IARC**

- Cobalt lithium manganese nickel oxide : Group 1 (Nickel compounds), Group 2B (Cobalt and cobalt compounds)
- Lithium Nickel Cobalt Aluminium oxide : Group 1 (Nickel compounds), Group 2B (Cobalt and cobalt compounds)
- Carbon black : Group 2B

**OSHA**

- Cobalt lithium manganese nickel oxide : Present (Nickel compounds, Cobalt compounds)
- Lithium Nickel Cobalt Aluminium oxide : Present (Nickel compounds, Cobalt compounds)
- Carbon black : Present

**NTP**

- Cobalt lithium manganese nickel oxide : K (Nickel compounds), R (Cobalt compounds)



- Lithium Nickel Cobalt Aluminium oxide : K (Nickel compounds),R (Cobalt compounds)

**ACGIH**

- Cobalt lithium manganese nickel oxide : A1 (Nickel insoluble inorganic compounds), A3 (Cobalt inorganic compounds), A4 (Nickel soluble inorganic compounds, Manganese inorganic compounds)
- Aluminium : A4 (Aluminum, Aluminum insoluble compounds)
- Lithium Nickel Cobalt Aluminium oxide : A1 (Nickel insoluble inorganic compounds), A3 (Cobalt inorganic compounds), A4 (Nickel soluble inorganic compounds, Aluminum insoluble compounds)
- Carbon black : A3

**EU:** Not classified

**Mutagenicity :** Not classified

- Cobalt lithium manganese nickel oxide : Negative : in vitro test ((Ames test, S. typhimurium, E. Coli)(Chromosome aberration test, human lymphocyte)
- 1-methyl-2-pyrrolidone : Negative reactions were observed in in vitro tests(Bacterial Reverse Mutation Assay(OECD Guideline 471), Mammalian Gene Mutation Test(OECD Guideline 476, GLP) and DNA Damage and/or Repair Study(OECD Guideline 482, GLP)). Negative reactions were observed in in vivo tests(Mammalian Erythrocyte Micronucleus Test(OECD Guideline 474, GLP) and Mammalian Bone Marrow chromosome Aberration Test(OECD Guideline 475, GLP)).
- Graphite : Negative reactions were observed in in vitro test(Bacterial Reverse Mutation Assay(OECD Guideline 471, GLP)).
- Aluminium : Negative reactions were observed in both in vivo (Mammalian Erythrocyte Micronucleus Test(OECD Guideline 474, GLP)) and in vitro (Mammalian cell gene mutation test(OECD Guideline 476, GLP)).
- Copper : Negative reactions were observed in in vivo test(mammalian somatic cell study: cytogenicity/erythrocyte micronucleus(EU Method B.12, GLP)).
- Trade secret 1 : Negative reactions were observed in vitro (Bacterial Reverse Mutation Assay(OECD Guideline 471, GLP)).
- Trade secret 2 : Negative reactions were observed in vitro (Mammalian Chromosome Aberration Test (OECD Guideline 473, GLP))
- Trade secret 3 : Negative reactions were observed in in vivo (Mammalian Spermatogonial Chromosome Aberration Test (OECD Guideline 483, GLP))
- Lithium Nickel Cobalt Aluminium oxide : Negative reactions were observed in in vitro test(Bacterial Reverse Mutation Assay(OECD Guideline 471, GLP))
- Trade secret 4 : Negative reactions were observed in both in vivo (Mammalian Erythrocyte Micronucleus Test(OECD Guideline 474)) and in vitro (Bacterial Reverse Mutation Assay(OECD Guideline 471, GLP)).
- Aluminium oxide : In in vivo test (Mammalian Bone Marrow Chromosome Aberration Test (OECD Guideline 475)), a positive reaction was observed.
- Carbon black : Positive reactions were observed in both in vitro (Chromosomal aberrations test (OECD Guideline 476, GLP)) and in vivo (ypoxanthine-guanine phosphoribosyl transferase gene (hprt) mutations in alveolar epithelial cells).

**Reproductive toxicity :** Not classified



- 1-methyl-2-pyrrolidone : In the two-generation reproductive toxicity test with rats, developmental toxicity was evidenced by increased pup mortality and reduced body weight gain, including corresponding effects in the investigated organs, in pups treated at 500/350 mg/kg bw/day. (NOAEL(F) = 160 mg/kg bw/day) (OECD Guideline 416, GLP)
- Graphite : In the reproductive toxicity with rats, there were no significant adverse effects on reproductive parameters. (OECD Guideline 422, GLP)
- Aluminium : In the reproductive toxicity and developmental toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 422, GLP)(OECD Guideline 414)
- Copper : In the reproductive toxicity and developmental toxicity test with rats, there were no significant adverse effects on reproductive parameters and no evidence of malformations at any doses. (OECD Guideline 416, 414, GLP)
- Trade secret 1 : In the reproductive toxicity test using mouse, adverse effects were not observed, respectively. (GLP)  
In the developmental toxicity test using rabbits, adverse effects were not observed, respectively. (GLP)
- Trade secret 2 : In the reproductive toxicity and developmental toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 414)
- Trade secret 3 : In the reproductive toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 415, GLP)  
In the developmental toxicity test using rabbits, adverse effects were not observed, respectively. (OECD Guideline 414, GLP)
- Lithium Nickel Cobalt Aluminium oxide : In the reproductive toxicity and developmental toxicity test with rats, as the 500 mg/kg/day treatment group was terminated early due to excessive dose level no definitive reproductive effect could be established. and no effect of treatment was detected on reproduction or offspring development, at a treatment level up to 150 mg/kg/day. (OECD Guideline 422, GLP)
- Trade secret 4 : In the reproductive toxicity and developmental toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 416, GLP)(OECD Guideline 414)
- Aluminium oxide : In the reproductive toxicity test using rats, no toxicologically significant effects were noted. (OECD Guideline 422, GLP)(Read across: Al(OH)<sub>3</sub>Cl<sub>17</sub>(in aqueous solution))
- Carbon black : In the reproductive toxicity and developmental toxicity test using mice, adverse effects were not observed, respectively. (OECD Guideline 414, GLP)

**Specific target organ toxicity (single exposure) : Not classified**

- 1-methyl-2-pyrrolidone : In the acute oral toxicity test with rats, ataxia and diuresis(4,150 mg/kg bw) were observed. (OECD Guideline 401)
- Graphite : In the acute oral toxicity test with rats, no signs of discomfort or toxicity effects. (OECD Guideline 423, GLP)
- Aluminium : In the acute oral toxicity test using rats, adverse effects were not observed, respectively. (Read-across)(OECD Guideline 401) In the acute inhalation toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 403)
- Copper : In the acute oral toxicity test with rats, clinical signs observed included lethargy, prostrate posture, green coloured diarrhoea, voiding few faeces and moribundity. (OECD Guideline 401, GLP) In the acute inhalation toxicity test with rats, slight to moderate ataxia, slight to moderate tremor and slight to moderate dyspnoea were observed. (OECD Guideline 436, GLP)



- Trade secret 1 : In the acute dermal/inhalation toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 402, GLP)(OECD Guideline 403)
- Trade secret 2 : In the acute oral and inhalation toxicity test using rats, ataxia, hunched posture, lethargy, decreased respiratory rate and laboured respiration are observed. (OECD Guideline 401, GLP) (OECD Guideline 403, GLP)
- Trade secret 3 : In the acute oral toxicity test using rats, hypoactivity, ataxia and loss of the righting reflex were observed. (OECD Guideline 401, GLP)  
In the acute dermal toxicity test using rabbits, adverse effects were not observed, respectively. (GLP)  
In the acute inhalation toxicity test using rats, adverse effects were not observed, respectively. (OECD Guideline 403, GLP)
- Lithium Nickel Cobalt Aluminium oxide : In the repeated oral toxicity test with rats, no signs of systemic toxicity were noted during the observation period. (OECD Guideline 420, GLP)
- Trade secret 4 : In the acute oral toxicity test with rats, lethargy, hunched posture, uncoordinated movements, piloerection were observed. (OECD Guideline 423, GLP)
- Aluminium oxide : In the acute oral/inhalation toxicity test using rats, no abnormal clinical signs were recorded.(OECD Guideline 401/403, GLP)
- Carbon black : In the acute oral toxicity and acute inhalation toxicity test with rats, adverse effects were not observed, respectively. (OECD Guideline 401, GLP)(OECD Guideline 403)

**Specific target organ toxicity (repeat exposure) : Not classified**

- Cobalt lithium manganese nickel oxide : In surviving animals in 50 mg / m<sup>3</sup> (3 weeks recovery group), the minimum degradation / regeneration in lung was observed. NAOEC (no adverse effect observation) was not decided.(Rat, 6 hr/day, 2 times exposure, 28 days observation, 2, 10, 50mg / m<sup>3</sup>, inhalation test, short term - lung toxicity test)
- 1-methyl-2-pyrrolidone : In the repeated oral toxicity test in 90 days with rats, a specific target organ for compound-related adverse systemic toxicity was not identified. (OECD Guideline 408, GLP)
- Graphite : In the repeated oral toxicity test with rats, no signs of discomfort or toxicity effects. (OECD Guideline 422, GLP) In the repeated inhalation toxicity test with rats, in the Graphite high-dose group, clearly adverse effects such as markedly increased incidence of interstitial fibrosis, were seen in the lung. (OECD Guideline 412, GLP)
- Aluminium : "In the repeated oral toxicity toxicity tests using rats, toxicity to organs was not observed. (Read-across)(OECD Guideline 422, GLP) In the repeated inhalation toxicity toxicity tests using rats, toxicity to organs was not observed. (OECD Guideline 413)"
- Copper : In the repeated oral toxicity and inhalation toxicity test using rats, toxicity to organs was not observed. (EU Method B.26, GLP)(OECD Guideline 412, GLP)
- Trade secret 1 : In the repeated oral toxicity tests using rats, toxicity to organs was not observed. (OECD Guideline 452)
- Trade secret 2 : In the repeated oral toxicity test using rats, toxicity to organs was not observed. OECD Guideline 407, GLP)
- Trade secret 3 : In the repeated oral toxicity tests using rats, toxicity to organs was not observed. (OECD Guideline 408, GLP)
- Lithium Nickel Cobalt Aluminium oxide : In the repeated oral toxicity test with rats, microscopic changes in the spleen and kidneys seen for animals of either sex at 500 and 150 mg/kg/day and





males only at 50 mg/kg/day. The changes identified in the kidneys of male rats are specific for male rats only and are considered not to represent “serious damage” to health. (OECD Guideline 422, GLP)

- Aluminium oxide : In the repeated oral toxicity test using rats, no toxicologically significant effects were noted. (OECD Guideline 422, GLP)(Read across: Aluminium chloride basic)

In the repeated inhalation toxicity test using rats, Intratracheal injection of aluminium powder caused nodular pulmonary fibrosis in the lungs of the rats only at the highest dose administered (100 mg). but Progressive fibrosis was not observed in rats on inhalation exposure to the powders indicating that the intratracheal instillation mode of test compound delivery may lead to artifacts not representative of actual inhalation exposures. (OECD Guideline 413)

- Carbon black : In the sub-chronic inhalation toxicity test using rats, there was clear evidence of inflammation and some alveolar epithelial cell hyperplasia and fibrosis at the high exposure group. In the mid-exposure group there was evidence of inflammation characterised by accumulation of neutrophils and macrophages within the alveolar spaces.

**Aspiration Hazard** : Not available

## Section XII – 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** : Not classified (L(E)C<sub>50</sub> = 0.33 mg/L)

#### Fish

- 1-methyl-2-pyrrolidone : 96hr-LC<sub>50</sub>(Oncorhynchus mykiss) > 500 mg/L (OBBA-bulletin No. 33, 197 5)
- Graphite : 96hr-LC<sub>50</sub>(Danio rerio) > 100 mg/L (OECD Guideline 203, GLP)
- Aluminium : 96hr-LC<sub>50</sub>(Pimephales promelas) = 1.16 mg/L (GLP)
- Copper : 96hr-LC<sub>50</sub>(Oncorhynchus mykiss) = 0.164 mg/L
- Trade secret 1 : 96hr-LC<sub>50</sub>(Oncorhynchus mykiss) > 100 mg/L (OECD Guideline 203, GLP)
- Trade secret 2 : 96hr-LC<sub>50</sub>(Oncorhynchus mykiss) > 100 mg/L (OECD Guideline 203, GLP)
- Trade secret 3 : 96hr-LC<sub>50</sub>((Danio rerio) ≥ 100 mg/L (OECD Guideline 203, GLP)
- Trade secret 4 : 96hr-LC<sub>50</sub>(Oncorhynchus mykiss) = 51 mg/L
- Aluminium oxide : 96hr-LC<sub>50</sub>(Pimephales promelas) = 1.16 mg/L (Read across : aluminum chloride hexahydrate)(PA/600/4-85/013, GLP)
- Carbon black : 96hr-LC<sub>0</sub>(Danio rerio) = 1,000 mg/L (OECD Guideline 203, GLP)

#### Crustacean

- 1-methyl-2-pyrrolidone : 24hr-EC<sub>50</sub>(Daphnia magna) > 1,000 mg/L (DIN 38412 Part 11)
- Graphite : 48hr-EC<sub>50</sub>(Daphnia magna) > 100 mg/L (OECD Guideline 202, GLP)
- Aluminium : 48hr-LC<sub>50</sub>(Ceriodaphnia dubia) = 0.72 mg/L (GLP)



- Copper : 48hr-LC<sub>50</sub>(Ceriodaphnia dubia) = 0.014 mg/L
- Trade secret 1 : 48hr-EC<sub>50</sub>(Ceriodaphnia dubia) = 5,900 mg/L
- Trade secret 2 : 48hr-EC<sub>50</sub>(Daphnia magna) > 100 mg/L (OECD Guideline 202, GLP)
- Trade secret 3 : 48hr-EC<sub>50</sub>(Daphnia magna) > 100 mg/L (OECD Guideline 202, GLP)
- Trade secret 4 : 48hr-LC<sub>50</sub>(Daphnia magna) > 100 mg/L (OECD Guideline 202, GLP)
- Aluminium oxide : 48hr-LC<sub>50</sub>(Ceriodaphnia dubia) = 0.72 mg/L (Read across : aluminum chloride hexahydrate)(EPA/600/4-85/013, GLP)
- Carbon black : 24hr-EC<sub>50</sub>(Daphnia magna) > 5,600 mg/L (OECD Guideline 202, GLP)

#### **Algae**

- 1-methyl-2-pyrrolidone : 72hr-EC<sub>50</sub>(Desmodesmus subspicatus) = 600.5 mg/L (DIN 38412 Part9)
- Graphite : 72hr-EC<sub>50</sub>(Pseudokirchneriella subcapitata) > 100 mg/L (OECD Guideline 201, GLP)
- Aluminium : 72hr-EC<sub>50</sub>(Pseudokirchneriella subcapitata) = 0.2 mg/L (OECD Guideline 201, GLP)
- Copper : 96hr-EC<sub>50</sub>(Chlamydomonas reinhardtii) = 0.047 mg/L
- Trade secret 1 : 72hr-EC<sub>50</sub>(Pseudokirchneriella subcapitata) > 100 mg/L (OECD Guideline 201, GLP)
- Trade secret 2 : 72hr-EC<sub>50</sub>(Desmodesmus subspicatus) > 62 mg/L (OECD Guideline 201, GLP)
- Trade secret 3 : 72hr-EC<sub>50</sub>(Pseudokirchneriella subcapitata) > 100 mg/L (OECD Guideline 201, GLP)
- Trade secret 4 : 96hr-EC<sub>50</sub>(Pseudokirchneriella subcapitata) > 100 mg/L (OECD Guideline 201, GLP)
- Aluminium oxide : 72hr-EC<sub>50</sub>(Selenastrum capricornutum) = 1.05 mg/L (Read across : Aluminium powder)(OECD Guideline 201, GLP)
- Carbon black : 72hr-EC<sub>50</sub>(Desmodesmus subspicatus) > 10,000 mg/L (OECD Guideline 201, GLP)

#### **Chronic toxicity : Not classified**

##### **Fish**

- Aluminium : 33day-NOEC(Danio rerio) = 0.0715 mg/L (OECD Guideline 210, GLP)
- Copper : 30day-NOEC(Perca fluviatilis) = 0.188 mg/L (OECD Guideline 204)
- Trade secret 4 : 22day-NOEC(Pimephales promelas) = 0.2 mg/L (EPA 540/86, GLP)
- Aluminium oxide : 33day-NOEC(Brachydanio rerio) = 0.0715 mg/L (OECD Guideline 210, GLP)(Read across : reagent grade aluminum nitrate nonahydrate)

##### **Crustacean**

- 1-methyl-2-pyrrolidone : 21day-NOEC = 12.5 mg/L (OECD Guideline 211, GLP)
- Aluminium : 28day-NOEC(Hyalella azteca) = 0.0531 mg/L (GLP)
- Copper : 14day-NOEC(Penaeus mergulensis and Penaeus monodon (prawns) = 0.033 mg/L
- Trade secret 3 : 21day-NOEC(Daphnia magna) = 25 mg/L (OECD Guideline 211, GLP)
- Trade secret 4 : 7day-NOEC(Ceriodaphnia dubia) = 2.55 mg/L (EPA/600/4-91/002)
- Aluminium oxide : 17day-NOEC(Aeolosoma sp.) = 0.9625 mg/L (GLP)(Read across: Aluminum nitrate nonahydrate)

##### **Algae**



- 1-methyl-2-pyrrolidone : 72hr-EC50(Desmodesmus subspicatus) = 672.8 mg/L (DIN 38412 Part9)
- Graphite : 72hr-NOEC(Pseudokirchneriella subcapitata)  $\geq$  100 mg/L (OECD Guideline 201, GLP)
- Copper : 19day-NOEC(Macrocystis pyrifera) = 0.0102 mg/L
- Trade secret 1 : 72hr-NOEC(Pseudokirchneriella subcapitata) = 100 mg/L (OECD Guideline 201, GLP)
- Trade secret 2 : 72hr-NOEC(Desmodesmus subspicatus) = 62 mg/L (OECD Guideline 201, GLP)
- Trade secret 4 : 96hr-NOEC(Pseudokirchneriella subcapitata) = 22 mg/L (OECD Guideline 201, GLP)
- Aluminium oxide : 72hr-NOEC(Selenastrum capricornutum) = 0.28 mg/L (Read across : Aluminium powder)(OECD Guideline 201, GLP)
- Carbon black : 72hr-NOEC(Desmodesmus subspicatus)  $>$  10,000 mg/L (OECD Guideline 201, GLP)

## 12.2. Persistence and degradability

### Persistence

- 1-methyl-2-pyrrolidone : Low persistency (log Kow is less than 4 estimated.) ( log Kow = -0.46 )
- Trade secret 1 : Low persistency (log Kow is less than 4 estimated.) ( log Kow = 0.11 ) (20 °C, 5.33 < pH < 5.79)
- Trade secret 2 : Low persistency (log Kow is less than 4 estimated.) ( log Kow = 0.972 ) (40 °C, EU Method A.8, GLP)
- Trade secret 3 : Low persistency (log Kow is less than 4 estimated.) ( log Kow = 0.354 ) (20°C, 6.5 < pH < 7.5)
- Trade secret 4 : Hydrolysis readily in contact with water. According to this it was not possible to determine the partition coefficient. (OECD Guideline 107, GLP)

### Degradability

- Cobalt lithium manganese nickel oxide : Because it is an inorganic substance, it is not decomposed.

## 12.3. Bioaccumulative potential

### Bioaccumulation

- 1-methyl-2-pyrrolidone : Bioaccumulation is expected to be low according to the BCF < 500 ( BCF = 3.162 ) (estimated)
- Trade secret 3 : Bioaccumulation is expected to be low according to the BCF < 500 ( BCF < 3.2 )
- Trade secret 4 : Bioaccumulation is expected to be low according to the BCF < 500 ( BCF = 53~58)

### Biodegradation

- 1-methyl-2-pyrrolidone : As well-biodegraded, it is expected to have low accumulation potential in living organisms(73% biodegradation was observed after 28 days) (OECD Guideline 301C)
- Trade secret 1 : As well-biodegraded, it is expected to have low accumulation potential in living organisms(86% biodegradation was observed after 29 days) (OECD Guideline 301B)
- Trade secret 2 : As well-biodegraded, it is expected to have low accumulation potential in living organisms(98% biodegradation was observed after 28 days) (GLP)



- Trade secret 3 : As well-biodegraded, it is expected to have low accumulation potential in living organisms(86% biodegradation was observed after 28 days) (OECD Guideline 301C)

#### 12.4 Mobility in soil

- 1-methyl-2-pyrrolidone : No potency of mobility to soil. ( $K_{oc} = 4.65$ ) (estimated)
- Trade secret 1 : No potency of mobility to soil. ( $K_{oc} = 11.9$ )
- Trade secret 2 : No potency of mobility to soil. ( $K_{oc} = 1.58$ ) (OECD Guideline 121, GLP)
- Trade secret 3 : No potency of mobility to soil. ( $K_{oc} = 2.9 \sim 6.65$ ) (25 °C)

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

**12.6 Other adverse effects :** Not available

## Section XIII – DISPOSAL CONSIDERATION

### 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.

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

**Other disposal recommendations:** Not available

## Section XIV – TRANSPORTATION INFORMATION

※ If those lithium-ion batteries are packed with or contained in an equipment, then it is the responsibility of the shipper to ensure that the consignment are packed in compliance to the latest edition of the IATA Dangerous Goods Regulations section II of either Packing Instruction 966 or 967 in order for that consignment to be declared as NOT RESTRICTED (non-hazardous/non-Dangerous). If those lithium-ion batteries are packed with or contained in an equipment, UN No. is UN3481.

**14.1 UN Number :** 3480

**14.2 UN Proper shipping name :** LITHIUM ION BATTERIES (including lithium ion polymer batteries)

**14.3 Transport Hazard class :** 9

**14.4 Packing group :** I

**14.5 Special provisions :** 188



**14.6 Packing instructions :** P903

**14.7 Environmental hazards :** No

**14.8 Special precautions for user**

in case of fire : F-A

in case of leakage : S-I

**14.9 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code :** Not Available

**14.10 IATA Transport :** PI 965-Section IB

**14.11 Package labels**



## Section XV – REGULATORY INFORMATION

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

### EU regulations

**Harmonized classification – Annex VI of Regulation (EC) No 1272/2008 (CLP Regulation):**

- 1-methyl-2-pyrrolidone: Skin Irrit. 2, H315, Eye Irrit. 2, H319, STOT SE 3, H335, Repr. 1B, H360D

**Authorisations and/or restrictions on use:** Not regulated

**Authorisations:** Not regulated

**Restrictions on use:**

- 1-methyl-2-pyrrolidone: regulated

**Other EU regulations:**

**Candidate List of substances of very high concern for Authorisation:**

- 1-methyl-2-pyrrolidone: regulated

### U.S.A regulations

**U.S.A Inventory (TSCA):**

- Cobalt lithium manganese nickel oxide : Present [PMN; S; 5E] (ACTIVE)

- 1-methyl-2-pyrrolidone : Present [R] (ACTIVE)

- Graphite : Present (ACTIVE)

- Aluminium : Present (ACTIVE)

- Copper : Present (ACTIVE)

- Trade secret 1 : Present (ACTIVE)

- Trade secret 2 : Present (ACTIVE)

- Trade secret 3 : Present (ACTIVE)

- Lithium Nickel Cobalt Aluminium oxide : Present [PMN] (ACTIVE)



- Trade secret 4 : Present [PMN] (ACTIVE)
- Aluminium oxide : Present (ACTIVE)
- Carbon black : Present (ACTIVE)

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

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

- Copper : 5000lb

**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) :**

- Cobalt lithium manganese nickel oxide : Regulated (Nickel, Cobalt, Manganese compounds)
- 1-methyl-2-pyrrolidone : Regulated
- Aluminium : Regulated (fume or dust)
- Copper : Regulated
- Lithium Nickel Cobalt Aluminium oxide : Regulated (Nickel Compounds, Cobalt Compounds)
- Aluminium oxide : Regulated (fibrous forms)

**Substance of Rotterdam Protocol :** Not regulated

**Substance of Stockholme Protocol :** Not 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 XVI – OTHER INFORMATION EU**

**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 :** 15 Dec. 2020

**Version :** Rev. 03

### **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 (Chemical 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; <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 17th

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.