Lithium Ion Battery System

Safety Data Sheet

According To Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules And Regulations And According To The Hazardous Products Regulation (February 11, 2015).

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SECTION 1: IDENTIFICATION

1.1. Product Identifier

Product Form: Mixture (USA) / Article (Canada)

Product Name: Lithium Ion Battery System

Synonyms: Lithium Iron Phosphate Battery

1.2. Intended Use of the Product

Lithium Iron Phophate based energy storage

1.3. Name, Address, and Telephone of the Responsible Party

STRYTEN ENERGY
5925 Cabot Parkway
Alpharetta, GA 30005 USA
678.566.9000
https://www.stryten.com/

1.4. Emergency Telephone Number

Emergency Number : VelocityEHS
(800)255-3924 (North America)
+1 (813)248-0585 (International)

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the Substance or Mixture

GHS-US/CA Classification

Acute toxicity (oral) Category 4	H302
Skin corrosion/irritation Category 1	H314
Serious eye damage/eye irritation Category 1	H318
Specific target organ toxicity (repeated exposure) Category 1	H372

Classification above valid for USA only, as OSHA includes lifespan of product to include recycling operations. Canada classifies product upon condition upon arrival only; this product would be non-hazardous under Canada WHMIS 2015.

2.2. Label Elements

GHS-US/CA Labeling

Valid only on battery contents once opened for recycling, or when damaged.

Hazard Pictograms (GHS-US/CA) :

GHS05 GHS07 GHS08

Signal Word (GHS-US/CA) : Danger

Hazard Statements (GHS-US/CA) : H302 - Harmful if swallowed.
H314 - Causes severe skin burns and eye damage.
H318 - Causes serious eye damage.
H372 - Causes damage to organs (bone, tooth) through prolonged or repeated exposure.

Precautionary Statements (GHS-US/CA) : P260 - Do not breathe dust, mist, vapors.
P264 - Wash hands, forearms, and other exposed areas thoroughly after handling.
P270 - Do not eat, drink or smoke when using this product.
P280 - Wear protective gloves, protective clothing, and eye protection.
P301+P312 - IF SWALLOWED: Call a POISON CENTER or doctor if you feel unwell.
P301+P330+P331 - IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
P304+P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.

P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310 - Immediately call a POISON CENTER or doctor.
P314 - Get medical advice/attention if you feel unwell.
P321 - Specific treatment (see section 4 on this SDS).
P330 - Rinse mouth.
P363 - Wash contaminated clothing before reuse.
P405 - Store locked up.
P501 - Dispose of contents/container in accordance with local, regional, national, and international regulations.

2.3. Other Hazards

Exposure may aggravate those with pre-existing eye, skin, respiratory, and kidney conditions. Cells or batteries may flame or leak potentially hazardous organic vapors if exposed to excessive heat, fire or short circuit condition. Damaged or opened cells or batteries can result in rapid heating and the release of flammable vapors. Vapors may be heavier than air and may travel along the ground or be moved by ventilation to an ignition source and flash back. Exposure may aggravate pre-existing eye, skin, or respiratory conditions.

2.4. Unknown Acute Toxicity (GHS-US/CA)

No additional information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substance

Not applicable

3.2. Mixture

Name	Synonyms	Product Identifier	% *	GHS Ingredient Classification
Iron	Iron, elemental / Direct reduced Iron / Iron, reduced / Elemental iron / IRON POWDER / iron	(CAS-No.) 7439-89-6	30 – 60	Comb. Dust
Phosphoric acid, iron(2+) lithium salt (1:1:1)	Ferrous lithium phosphate / Lithium iron(II) phosphate / LiFePO4 / Iron Lithium Phosphate / Iron(II) lithium phosphate	(CAS-No.) 15365-14-7	10 – 30	Not classified
Phosphate(1-), hexafluoro-, lithium	Lithium hexafluorophosphate(1-) / Lithium phosphohexafluoride / Phosphate(1-), hexafluoro-, lithium (1:1) / Lithium hexafluorophosphate	(CAS-No.) 21324-40-3	10 – 30	Acute Tox. 3 (Oral), H301 Skin Corr. 1A, H314 Eye Dam. 1, H318 STOT RE 1, H372
1,3-Dioxolan-2-one	2-Dioxolanone / 2-Oxo-1,3-dioxolan / ETHYLENE CARBONATE / Glycol carbonate / Ethylene glycol carbonate / Cyclic ethylene carbonate / Carbonic acid, cyclic ethylene ester / Ethylene carbonate	(CAS-No.) 96-49-1	5 – 10	Acute Tox. 4 (Oral), H302 Eye Irrit. 2A, H319 STOT RE 2, H373
Dimethyl carbonate	Carbonic acid, dimethyl ester / Methyl carbonate / DIMETHYL CARBONATE	(CAS-No.) 616-38-6	5 – 10	Flam. Liq. 2, H225
Diethyl carbonate	Ethyl carbonate / DIETHYL CARBONATE / Carbonic acid, diethyl ester	(CAS-No.) 105-58-8	5 – 10	Flam. Liq. 3, H226 STOT SE 3, H335
Graphite	C.I. Pigment Black 10 / C.I. 77265 / graphite	(CAS-No.) 7782-42-5	5 – 10	Comb. Dust
Aluminum	Aluminium / Aluminium metal / Aluminium, metal / Aluminum metal / Aluminum, elemental / Aluminum, metal / C.I. 77000 / CI 77000 / Aluminium powder (stabilised) / Aluminium powder (stabilized) / Aluminium	(CAS-No.) 7429-90-5	5 – 10	Comb. Dust

	powder / Pigment Metal 1 / Aluminum powder / Aluminium metal, powder / aluminum / Aluminum powder (pigment metal 1)			
Copper	Copper, metallic / Pigment Metal 2 / Copper metal / CI 77400 / Copper, elemental / C.I. Pigment Metal 2 / C.I. 77400 / Granulated copper / copper / Copper, granulated	(CAS-No.) 7440-50-8	5 – 10	Comb. Dust
Polypropylene	1-Propene, homopolymer / Polypropylene wax / Amberlite(tm)14i inert resin / Polymer of prop-1-ene / Propylene homopolymer / Polypropylene and polypropylene wax / Polypropylene homopolymer / Polypropyl-1-ene / POLYPROPYLENE	(CAS-No.) 9003-07-0	1 – 5	Comb. Dust
Polymer X	None	(CAS-No.) 68842-39-7	1 – 5	Not classified
Nickel	Nickel metal / Nickel, elemental / Nickel, metallic / Nickel, metal / C.I. 77775 / Nickel (Metallic)	(CAS-No.) 7440-02-0	< 0.1	Skin Sens. 1, H317 Carc. 2, H351 STOT RE 1, H372 Comb. Dust

* The actual concentration of ingredient(s) is withheld as a trade secret in accordance with the Hazardous Products Regulations (HPR) SOR/2015-17 and 29 CFR 1910.1200. Percentages are listed in weight by weight percentage (w/w%) for liquid and solid ingredients. Gas ingredients are listed in volume by volume percentage (v/v%). Full text of H-statements: see section 16.

SECTION 4: FIRST AID MEASURES

4.1. Description of First-aid Measures

General: Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

Inhalation: For exposure to battery contents: . Using proper respiratory protection, immediately move the exposed person to fresh air. Encourage exposed person to cough, spit out, and blow nose to remove dust. Immediately call a poison center or doctor/physician.

Skin Contact: Immediately remove contaminated clothing. For exposure to battery contents: . Immediately flush skin with plenty of water for at least 30 minutes. Get immediate medical advice/attention.

Eye Contact: Immediately rinse with water for at least 30 minutes. For exposure to battery contents: . Remove contact lenses, if present and easy to do. Continue rinsing. Get immediate medical advice/attention.

Ingestion: For exposure to battery contents: . Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most Important Symptoms and Effects Both Acute and Delayed

General: Exposure to battery contents may result in the following: Causes damage to organs (bone, tooth) through prolonged or repeated exposure. Damage to the batteries may result in the release of toxic products such as hydrogen fluoride, appropriate precautions should be taken. Harmful if swallowed. Causes severe skin burns and eye damage.

Inhalation: Exposure to materials housed in battery: May be corrosive to the respiratory tract.

Skin Contact: Exposure to materials housed in battery: Redness, pain, swelling, itching, burning, dryness, and dermatitis. May cause an allergic reaction in sensitive individuals. Causes severe irritation which will progress to chemical burns.

Eye Contact: Exposure to materials housed in battery: Contact causes severe irritation with redness and swelling of the conjunctiva. . Causes permanent damage to the cornea, iris, or conjunctiva.

Ingestion: Exposure to materials housed in battery: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: Exposure to materials housed in battery: Causes damage to organs (bone, tooth) through prolonged or repeated exposure. Causes damage to organs through prolonged or repeated exposure.

4.3. Indication of Any Immediate Medical Attention and Special Treatment Needed

Application of 2.5% calcium gluconate gel/solution to any affected area is recommended. If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: FIRE-FIGHTING MEASURES

5.1. Extinguishing Media

Suitable Extinguishing Media: For metal fires, dry sand, graphite, or dry table salt may be used. Class D fire extinguishers are also appropriate. Water spray, fog (flooding amounts).

Unsuitable Extinguishing Media: Do not use a heavy water stream. Use of heavy stream of water may spread fire.

5.2. Special Hazards Arising From the Substance or Mixture

Fire Hazard: Not considered flammable but may burn at high temperatures. Fire may produce irritating and/or toxic gases.

Explosion Hazard: Battery may rupture/explode when exposed to excessive heat or fire, if overcharged, short circuited, punctured, or crushed.

Reactivity: Batteries are non-reactive under normal conditions of storage and use. If the internal contents are leaked lithium ion batteries may react with incompatible materials such as water, acids, bases, oxidizers, and reducing agents and form corrosive, irritating, and harmful fumes and by-products.

5.3. Advice for Firefighters

Precautionary Measures Fire: Exercise caution when fighting any chemical fire.

Firefighting Instructions: Remove containers from fire area if this can be done without risk. Do not breathe fumes from fires or vapours from decomposition. Use water spray or fog for cooling exposed containers.

Protection During Firefighting: Do not enter fire area without proper protective equipment, including respiratory protection.

Hazardous Combustion Products: Carbon oxides (CO, CO_2). Lithium oxides. Phosphorus oxides. Hydrogen Fluoride (HF). Metal oxides. Toxic fumes may be released. Copper oxides. Oxides of aluminum. Fluorine compounds.

5.4. Reference to Other Sections

Refer to Section 9 for flammability properties.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal Precautions, Protective Equipment and Emergency Procedures

General Measures: Product itself under normal conditions of use is not considered hazardous, for materials housed within product: . Do not breathe vapor, mist or spray. Do not breathe dust. Do not get in eyes, on skin, or on clothing.

6.1.1. For Non-Emergency Personnel

Protective Equipment: Use appropriate personal protective equipment (PPE).

Emergency Procedures: Evacuate unnecessary personnel.

6.1.2. For Emergency Personnel

Protective Equipment: Equip cleanup crew with proper protection.

Emergency Procedures: Ventilate area. Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

6.2. Environmental Precautions

Prevent entry to sewers and public waters.

6.3. Methods and Materials for Containment and Cleaning Up

For Containment: Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams. As an immediate precautionary measure, isolate spill or leak area in all directions.

Methods for Cleaning Up: If battery is not damaged, cleanup spills mechanically and put into approved container for disposal. If battery is damaged and/or leaking: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Recover the product by vacuuming, shoveling or sweeping. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

6.4. Reference to Other Sections

See Section 8 for exposure controls and personal protection and Section 13 for disposal considerations.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for Safe Handling

Additional Hazards When Processed: Batteries are designed to be recharged. However, improperly charging may cause the battery to flame. Use only approved chargers and procedures. Never disassemble a battery or bypass any safety device. Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Damage to the batteries may result in the release of toxic products such as hydrogen fluoride, appropriate precautions should be taken. May release corrosive vapors.

Precautions for Safe Handling: Do not handle until all safety precautions have been read and understood. Since this product is a sealed battery, normal handling hazards are minimal unless the battery is damaged or the internal contents are exposed. If the battery is damaged: Do not breathe dust, vapors, spray from inner battery components. Use appropriate personal protective equipment (PPE). Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Handle empty containers with care because they may still present a hazard. Do not get in eyes, on skin, or on clothing.

Hygiene Measures: Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reuse. Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for Safe Storage, Including Any Incompatibilities

Technical Measures: Avoid reversing battery polarity within the battery assembly. To do so may cause cell to flame or to leak. Comply with applicable regulations.

Storage Conditions: Store in a dry, cool and well-ventilated place. Batteries should be separated from other materials and stored in a noncombustible, well ventilated, sprinkler-protected structure with sufficient clearance between walls and battery stacks. Do not store batteries in a manner that allows terminals to short circuit. Do not place batteries near heating equipment, nor expose to direct sunlight for long periods. Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials. Store in original container or corrosive resistant and/or lined container. Store locked up/in a secure area.

Incompatible Materials: Avoid contact of internal battery components with acids, aldehydes, and carbamate compounds. Water. Reducing agents. Alkalis. Strong acids, strong bases, strong oxidizers.

Storage Temperature: -20 – 35 °C (-4 – 95 °F). Occasional excurions to 45 °C (113 °F)

7.3. Specific End Use(s)

Lithium Iron Phophate based energy storage

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control Parameters

For substances listed in section 3 that are not listed here, there are no established exposure limits from the manufacturer, supplier, importer, or the appropriate advisory agency including: ACGIH (TLV), AIHA (WEEL), NIOSH (REL), OSHA (PEL), or Canadian provincial governments.

Aluminum (7429-90-5)		
USA ACGIH	ACGIH OEL TWA	1 mg/m³ (respirable particulate matter)
USA ACGIH	ACGIH chemical category	Not Classifiable as a Human Carcinogen
USA OSHA	OSHA PEL (TWA) [1]	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)
USA NIOSH	NIOSH REL (TWA)	10 mg/m³ (total dust) 5 mg/m³ (respirable dust)
Alberta	OEL TWA	10 mg/m³ (dust)
British Columbia	OEL TWA	1 mg/m³ (respirable)
Manitoba	OEL TWA	1 mg/m³ (respirable particulate matter)
New Brunswick	OEL TWA	1 mg/m³ (respirable fraction)
Newfoundland & Labrador	OEL TWA	1 mg/m³ (respirable particulate matter)
Nova Scotia	OEL TWA	1 mg/m³ (respirable particulate matter)
Nunavut	OEL STEL	20 mg/m³ (metal-dust)
Nunavut	OEL TWA	10 mg/m³ (metal-dust)
Northwest Territories	OEL STEL	20 mg/m³ (metal-dust)
Northwest Territories	OEL TWA	10 mg/m³ (metal-dust)
Ontario	OEL TWA	1 mg/m³ (respirable particulate matter)
Prince Edward Island	OEL TWA	1 mg/m³ (respirable particulate matter)
Québec	VEMP (OEL TWAEV)	10 mg/m³
Saskatchewan	OEL STEL	20 mg/m³ (dust)
Saskatchewan	OEL TWA	10 mg/m³ (dust)

Copper (7440-50-8)		
USA ACGIH	ACGIH OEL TWA	0.2 mg/m³ (fume)
USA OSHA	OSHA PEL (TWA) [1]	0.1 mg/m³ (fume) 1 mg/m³ (dust and mist)

USA NIOSH	NIOSH REL (TWA)	1 mg/m³ (dust and mist) 0.1 mg/m³ (fume)
USA IDLH	IDLH	100 mg/m³ (dust, fume and mist)
Alberta	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
British Columbia	OEL TWA	1 mg/m³ (dust and mist) 0.2 mg/m³ (fume)
Manitoba	OEL TWA	0.2 mg/m³ (fume)
New Brunswick	OEL TWA	0.2 mg/m³ (fume)
Newfoundland & Labrador	OEL TWA	0.2 mg/m³ (fume)
Nova Scotia	OEL TWA	0.2 mg/m³ (fume)
Nunavut	OEL STEL	3 mg/m³ (dust and mist) 0.6 mg/m³ (fume)
Nunavut	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Northwest Territories	OEL STEL	3 mg/m³ (dust and mist) 0.6 mg/m³ (fume)
Northwest Territories	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Ontario	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Prince Edward Island	OEL TWA	0.2 mg/m³ (fume)
Québec	VEMP (OEL TWAEV)	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Saskatchewan	OEL STEL	0.6 mg/m³ (fume) 3 mg/m³ (dust and mist)
Saskatchewan	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)
Yukon	OEL STEL	0.2 mg/m³ (fume) 2 mg/m³ (dust and mist)
Yukon	OEL TWA	0.2 mg/m³ (fume) 1 mg/m³ (dust and mist)

Graphite (7782-42-5)		
USA ACGIH	ACGIH OEL TWA	2 mg/m³ (all forms except graphite fibers-respirable particulate matter)
USA OSHA	OSHA PEL (TWA) [1]	15 mg/m³ (synthetic-total dust) 5 mg/m³ (synthetic-respirable fraction) 15 mppcf (natural-respirable dust)
USA OSHA	OSHA PEL (TWA) [2]	15 mppcf (natural) (See 29 CFR 1910.1000 TABLE Z-3)
USA NIOSH	NIOSH REL (TWA)	2.5 mg/m³ (natural-respirable dust)
USA IDLH	IDLH	1250 mg/m³ (Graphite (natural))
Alberta	OEL TWA	2 mg/m³ (all forms except Graphite fibres-respirable)
British Columbia	OEL TWA	2 mg/m³ (all forms except Graphite fibres-respirable)
Manitoba	OEL TWA	2 mg/m³ (all forms except Graphite fibers-respirable particulate matter)
New Brunswick	OEL TWA	2 mg/m³ (all forms except Graphite fibers-respirable fraction)
Newfoundland & Labrador	OEL TWA	2 mg/m³ (all forms except Graphite fibers-respirable particulate matter)
Nova Scotia	OEL TWA	2 mg/m³ (all forms except Graphite fibers-respirable particulate matter)
Nunavut	OEL STEL	4 mg/m³ (natural, all forms, except Graphite fibres-

		respirable fraction)
Nunavut	OEL TWA	2 mg/m³ (natural, all forms, except Graphite fibres-respirable fraction)
Northwest Territories	OEL STEL	4 mg/m³ (natural, all forms, except Graphite fibres-respirable fraction)
Northwest Territories	OEL TWA	2 mg/m³ (natural, all forms, except Graphite fibres-respirable fraction)
Ontario	OEL TWA	2 mg/m³ (except Graphite fibres-respirable particulate matter)
Prince Edward Island	OEL TWA	2 mg/m³ (all forms except Graphite fibers-respirable particulate matter)
Québec	VEMP (OEL TWAEV)	2 mg/m³ (containing no Asbestos and <1% Crystalline silica, except Graphite fibres-respirable dust)
Saskatchewan	OEL STEL	4 mg/m³ (natural, except Graphite fibres-respirable fraction)
Saskatchewan	OEL TWA	2 mg/m³ (natural, except Graphite fibres-respirable fraction)
Yukon	OEL TWA	20 mppcf 30 mppcf (synthetic) 10 mg/m³ (synthetic)

Nickel (7440-02-0)		
USA ACGIH	ACGIH OEL TWA	1.5 mg/m³ (inhalable particulate matter)
USA ACGIH	ACGIH chemical category	Not Suspected as a Human Carcinogen
USA ACGIH	BEI (BLV)	5 µg/l Parameter: Nickel - Medium: urine - Sampling time: post-shift at end of workweek (background)
USA OSHA	OSHA PEL (TWA) [1]	1 mg/m³
USA NIOSH	NIOSH REL (TWA)	0.015 mg/m³
USA IDLH	IDLH	10 mg/m³
Alberta	OEL TWA	1.5 mg/m³
British Columbia	OEL TWA	0.05 mg/m³
Manitoba	OEL TWA	1.5 mg/m³ (inhalable particulate matter)
New Brunswick	OEL TWA	1.5 mg/m³ (inhalable fraction)
Newfoundland & Labrador	OEL TWA	1.5 mg/m³ (inhalable particulate matter)
Nova Scotia	OEL TWA	1.5 mg/m³ (inhalable particulate matter)
Nunavut	OEL STEL	3 mg/m³ (inhalable fraction)
Nunavut	OEL TWA	1.5 mg/m³ (inhalable fraction)
Northwest Territories	OEL STEL	3 mg/m³ (inhalable fraction)
Northwest Territories	OEL TWA	1.5 mg/m³ (inhalable fraction)
Ontario	OEL TWA	1 mg/m³ (inhalable fraction)
Prince Edward Island	OEL TWA	1.5 mg/m³ (inhalable particulate matter)
Québec	VEMP (OEL TWAEV)	1.5 mg/m³ (inhalable dust)
Saskatchewan	OEL STEL	3 mg/m³ (inhalable fraction)
Saskatchewan	OEL TWA	1.5 mg/m³ (inhalable fraction)
Yukon	OEL STEL	3 mg/m³
Yukon	OEL TWA	1 mg/m³

8.2. Exposure Controls

Appropriate Engineering Controls: Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Personal Protective Equipment: Not required under normal conditions of use. When handling damaged batteries: . Insufficient ventilation: wear respiratory protection. Gloves. Protective clothing. Protective goggles. Face shield. Insufficient ventilation: wear respiratory protection.

Materials for Protective Clothing: Not required under normal conditions of use. When handling damaged batteries: . Chemically resistant materials and fabrics. Corrosion-proof clothing.

Hand Protection: Not required under normal conditions of use. When handling damaged batteries: . Wear protective gloves.

Eye and Face Protection: Not required under normal conditions of use. When handling damaged batteries: . Chemical safety goggles and face shield.

Skin and Body Protection: Not required under normal conditions of use. When handling damaged batteries: . Wear suitable protective clothing.

Respiratory Protection: Not required under normal conditions of use. When handling damaged batteries: . If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other Information: When using, do not eat, drink or smoke.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on Basic Physical and Chemical Properties

Physical State	:	Solid
Appearance	:	Metal squares, hermetically sealed and fitted with an external plasticbox.
Odor	:	No data available
Odor Threshold	:	No data available
pH	:	No data available
Evaporation Rate	:	No data available
Melting Point	:	No data available
Freezing Point	:	No data available
Boiling Point	:	No data available
Flash Point	:	No data available
Auto-ignition Temperature	:	No data available
Decomposition Temperature	:	No data available
Flammability (solid, gas)	:	No data available
Lower Flammable Limit	:	No data available
Upper Flammable Limit	:	No data available
Vapor Pressure	:	No data available
Relative Vapor Density at 20°C	:	No data available
Relative Density	:	No data available
Specific Gravity	:	No data available
Solubility	:	No data available
Partition Coefficient: N-Octanol/Water	:	No data available
Viscosity	:	No data available
Nominal Voltage	:	9.6V, 12.8V, 16V
Nominal Capacity	:	3Ah, 6Ah

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity:

Batteries are non-reactive under normal conditions of storage and use. If the internal contents are leaked lithium ion batteries may react with incompatible materials such as water, acids, bases, oxidizers, and reducing agents and form corrosive, irritating, and harmful fumes and by-products.

10.2. Chemical Stability:

Stable under recommended handling and storage conditions (see section 7).

10.3. Possibility of Hazardous Reactions:

Hazardous polymerization will not occur.

10.4. Conditions to Avoid:

Do not heat, expose to fire, disassemble, short circuit, immerse in water, or overcharge batteries. Direct sunlight, extremely high or low temperatures, and incompatible materials. Avoid creating or spreading dust.

10.5. Incompatible Materials:

Avoid contact of internal battery components with acids, aldehydes, and carbamate compounds. Water. Reducing agents. Alkalis. Strong acids, strong bases, strong oxidizers.

10.6. Hazardous Decomposition Products:

Thermal decomposition may produce: Oxides of phosphorus. Lithium oxides. Oxides of iron. Hydrogen fluoride. Metal oxides. Carbon oxides (CO, CO_2). Toxic fumes. Thermal decomposition generates : Corrosive vapors.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on Toxicological Effects - Product

Likely routes of exposure: None under normal use. From exposure to battery contents: Dermal. Eye contact. Oral. Inhalation.

Acute Toxicity (Oral): (Exposure to battery contents only - no effect for exposure to intact cells/batteries)

Acute Toxicity (Dermal): Not classified

Acute Toxicity (Inhalation): Not classified

LD50 and LC50 Data:

Lithium Ion Battery System	
ATE US/CA (oral)	377.64 mg/kg body weight

Skin Corrosion/Irritation: (Exposure to battery contents only - no effect for exposure to intact cells/batteries)

Eye Damage/Irritation: (Exposure to battery contents only - no effect for exposure to intact cells/batteries)

Respiratory or Skin Sensitization: Not classified

Germ Cell Mutagenicity: Not classified

Carcinogenicity: Not classified

Specific Target Organ Toxicity (Repeated Exposure): (Exposure to battery contents only - no effect for exposure to intact cells/batteries)

Reproductive Toxicity: Not classified

Specific Target Organ Toxicity (Single Exposure): Not classified

Aspiration Hazard: Not classified

Symptoms/Injuries After Inhalation: Exposure to materials housed in battery: May be corrosive to the respiratory tract.

Symptoms/Injuries After Skin Contact: Exposure to materials housed in battery: Redness, pain, swelling, itching, burning, dryness, and dermatitis. May cause an allergic reaction in sensitive individuals. Causes severe irritation which will progress to chemical burns.

Symptoms/Injuries After Eye Contact: Exposure to materials housed in battery: Contact causes severe irritation with redness and swelling of the conjunctiva. . Causes permanent damage to the cornea, iris, or conjunctiva.

Symptoms/Injuries After Ingestion: Exposure to materials housed in battery: This material is harmful orally and can cause adverse health effects or death in significant amounts. May cause burns or irritation of the linings of the mouth, throat, and gastrointestinal tract.

Chronic Symptoms: Exposure to materials housed in battery: Causes damage to organs (bone, tooth) through prolonged or repeated exposure. Causes damage to organs through prolonged or repeated exposure.

11.2. Information on Toxicological Effects - Ingredient(s)

LD50 and LC50 Data:

Aluminum (7429-90-5)	
LC50 Inhalation Rat	> 0.888 mg/L/4h (No deaths)
Copper (7440-50-8)	
LC50 Inhalation Rat	> 5.11 mg/l/4h
Graphite (7782-42-5)	
LD50 Oral Rat	> 2000 mg/kg
LC50 Inhalation Rat	> 2000 mg/m³ (Exposure time: 4 h)
Phosphoric acid, iron(2+) lithium salt (1:1:1) (15365-14-7)	
LD50 Dermal Rat	> 2000 mg/kg (Source: ECHA_API)
LC50 Inhalation Rat	> 3.2 mg/l/4h
Iron (7439-89-6)	
LD50 Oral Rat	98.6 g/kg

Nickel (7440-02-0)	
LD50 Oral Rat	> 9000 mg/kg (Source: EU_RAR)
LC50 Inhalation Rat	> 10.2 mg/l (Exposure time: 1 h Source: EU_RAR)

1,3-Dioxolan-2-one (96-49-1)	
LD50 Oral Rat	> 5000 mg/kg
LD50 Dermal Rat	> 2000 mg/kg
LD50 Dermal Rabbit	> 26420 mg/kg (Source: ECHA_API)
LC50 Inhalation Rat	> 730 mg/m³ (Exposure time: 8 h Source: ECHA)
ATE US/CA (oral)	500.00 mg/kg body weight

Dimethyl carbonate (616-38-6)	
LD50 Oral Rat	13 g/kg (Source: NLM_CIP)
LD50 Dermal Rabbit	> 5 g/kg (Source: NLM_CIP)
LC50 Inhalation Rat	> 5.36 mg/l/4h

Diethyl carbonate (105-58-8)	
LD50 Oral Rat	> 15000 mg/kg (Source: ECHA)
LC50 Inhalation Rat	> 1268 mg/m³ (Exposure time: 7 h)

Polypropylene (9003-07-0)	
IARC Group	3

Nickel (7440-02-0)	
IARC Group	2B
National Toxicology Program (NTP) Status	Reasonably anticipated to be Human Carcinogen.
OSHA Hazard Communication Carcinogen List	In OSHA Hazard Communication Carcinogen list.

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecology - General: Not classified.

Copper (7440-50-8)	
LC50 Fish 1	0.0068 – 0.0156 mg/l (Exposure time: 96 h - Species: Pimephales promelas Source: EPA)
EC50 - Crustacea [1]	0.03 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 Fish 2	< 0.3 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static] Source: EPA)

Graphite (7782-42-5)	
LC50 Fish 1	> 100 mg/l (Exposure time: 96 h - Species: Danio rerio [semi-static])
EC50 - Crustacea [1]	> 100 mg/l (Exposure time: 48 h - Species: Daphnia magna [static])
ErC50 algae	> 100 mg/l (Exposure time: 72 h - Species: Pseudokirchneriella subcapitata [static])
NOEC Chronic Fish	> 100 mg/l (Exposure time: 96 h - Species: Danio rerio [semi-static])
NOEC Chronic Crustacea	> 100 mg/l (Exposure time: 48 h - Species: Daphnia magna [static])
NOEC Chronic Algae	> 100 mg/l (Exposure time: 72 h - Species: Pseudokirchneriella subcapitata [static])

Nickel (7440-02-0)	
LC50 Fish 1	100 mg/l (Exposure time: 96 h - Species: Brachydanio rerio)
EC50 - Crustacea [1]	100 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 Fish 2	15.3 mg/l
EC50 - Crustacea [2]	1 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])

1,3-Dioxolan-2-one (96-49-1)	
LC50 Fish 1	> 100 mg/l (Exposure time: 96 h - Species: Oncorhynchus mykiss Source: ECHA)

Dimethyl carbonate (616-38-6)	
LC50 Fish 1	> 100 mg/l Species: Danio rerio
EC50 - Crustacea [1]	> 100 mg/l Species: Daphnia magna
ErC50 algae	> 100 mg/l SPecies: Pseudokirchnerella subcapitata
NOEC Chronic Fish	> 100 mg/l Species: Danio rerio
NOEC Chronic Crustacea	25 mg/l Species: Daphnia magna
NOEC Chronic Algae	> 100 mg/l Species: Pseudokirchnerella subcapitata

12.2. Persistence and Degradability

Lithium Ion Battery System	
Persistence and Degradability	Inorganic product which cannot be eliminated from water by biological purification processes.

Copper (7440-50-8)	
Persistence and Degradability	Not readily biodegradable.

12.3. Bioaccumulative Potential

Lithium Ion Battery System	
Bioaccumulative Potential	Bioaccumulation of product components cannot be excluded.

Phosphoric acid, iron(2+) lithium salt (1:1:1) (15365-14-7)	
Partition coefficient n-octanol/water (Log Pow)	> 0.564 (at 20 °C)

1,3-Dioxolan-2-one (96-49-1)	
Partition coefficient n-octanol/water (Log Pow)	0.11 (at 20 °C (at pH >5.33-<5.79)

Dimethyl carbonate (616-38-6)	
Partition coefficient n-octanol/water (Log Pow)	0.354 (at 20 °C (at pH >6.5-<7.5)

Diethyl carbonate (105-58-8)	
Partition coefficient n-octanol/water (Log Pow)	1.33 (at 25 °C)

12.4. Mobility in Soil

Lithium Ion Battery System	
Ecology - Soil	No data available.

12.5. Other Adverse Effects

Other Adverse Effects: None known.

Other Information: Avoid release to the environment.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste Treatment Methods: Material should be recycled if possible.

Sewage Disposal Recommendations: Do not dispose of waste into sewer. Do not empty into drains.

Waste Disposal Recommendations: Dispose of contents/container in accordance with local, regional, national, territorial, provincial, and international regulations.

Additional Information: Container may remain hazardous when empty. Continue to observe all precautions. Batteries should be completely discharged prior to disposal and/or the terminals taped or capped to prevent short circuit. Recycle the material as far as possible.

Ecology - Waste Materials: Avoid release to the environment.

SECTION 14: TRANSPORT INFORMATION

The shipping description(s) stated herein were prepared in accordance with certain assumptions at the time the SDS was authored, and can vary based on a number of variables that may or may not have been known at the time the SDS was issued.

14.1. In Accordance with DOT

Proper Shipping Name : LITHIUM ION BATTERIES / LITHIUM ION BATTERIES CONTAINED IN OR PACKED WITH THE EQUIPMENT, BUT NOT ATTACHED TO THE SOURCE / LITHIUM ION BATTERIES CONTAINED IN OR PACKED WITH THE EQUIPMENT, INSTALLED / INTEGRATED AT THE SOURCE.

Hazard Class : 9

Identification Number : UN3480 / UN3481 / UN 3481

Label Codes : 9

ERG Number : 147

14.2. In Accordance with IMDG

Proper Shipping Name : LITHIUM ION BATTERIES / LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT / LITHIUM ION BATTERIES PACKED WITH EQUIPMENT

Hazard Class : 9

Identification Number : UN3480 / UN3481 / UN 3481

Label Codes : 9

EmS-No. (Fire) : F-A

EmS-No. (Spillage) : S-I

14.3. In Accordance with IATA

Proper Shipping Name : LITHIUM ION BATTERIES / LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT / LITHIUM ION BATTERIES PACKED WITH EQUIPMENT

Hazard Class : 9A

Identification Number : UN3480 / UN3481 / UN 3481

Label Codes : 9A

ERG Code (IATA) : 12FZ

14.4. In Accordance with TDG

Proper Shipping Name : LITHIUM ION BATTERIES / LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT / LITHIUM ION BATTERIES PACKED WITH EQUIPMENT.

Hazard Class : 9

Identification Number : UN3480 / UN3481 / UN 3481

Label Codes : 9

SECTION 15: REGULATORY INFORMATION

15.1. US Federal Regulations

Lithium Ion Battery System	
SARA Section 311/312 Hazard Classes	Health hazard - Specific target organ toxicity (single or repeated exposure) Health hazard - Acute toxicity (any route of exposure) Health hazard - Serious eye damage or eye irritation Health hazard - Skin corrosion or Irritation

Phosphate(1-), hexafluoro-, lithium (21324-40-3)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active	
EPA TSCA Regulatory Flag	PMN - PMN - indicates a commenced PMN substance.

Aluminum (7429-90-5)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
SARA Section 313 - Emission Reporting	1 % (dust or fume only)

Polypropylene (9003-07-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active	
EPA TSCA Regulatory Flag	XU - XU - indicates a substance exempt from reporting under the Chemical Data Reporting Rule, (40 CFR 711).

Copper (7440-50-8)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	5000 lb no reporting of releases of this hazardous substance is required if the diameter of the pieces of the solid metal released is >100 µm
SARA Section 313 - Emission Reporting	1 %

Graphite (7782-42-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active

Phosphoric acid, iron(2+) lithium salt (1:1:1) (15365-14-7)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active	
EPA TSCA Regulatory Flag	PMN - PMN - indicates a commenced PMN substance. S - S - indicates a substance that is identified in a final Significant New Use Rule. 5E - 5E - indicates a substance that is the subject of a TSCA section 5E order.

Iron (7439-89-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active

Nickel (7440-02-0)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active Subject to reporting requirements of United States SARA Section 313	
CERCLA RQ	100 lb (only applicable if particles are < 100 µm)
SARA Section 313 - Emission Reporting	0.1 %

1,3-Dioxolan-2-one (96-49-1)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active

Dimethyl carbonate (616-38-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active

Diethyl carbonate (105-58-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory - Status: Active

15.2. US State Regulations

State or local regulations

California Proposition 65

⚠ **WARNING:** This product can expose you to Nickel, which is known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.

Chemical Name (CAS No.)	Carcinogenicity	Developmental Toxicity	Female Reproductive Toxicity	Male Reproductive Toxicity
Nickel (7440-02-0)	X			

Aluminum (7429-90-5)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

Copper (7440-50-8)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

Graphite (7782-42-5)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List

Nickel (7440-02-0)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List
U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List

1,3-Dioxolan-2-one (96-49-1)
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List

Dimethyl carbonate (616-38-6)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List

Diethyl carbonate (105-58-8)
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List
U.S. - Massachusetts - Right To Know List

15.3. Canadian Regulations

Lithium Ion Battery System
Listed on the Canadian NDSL (Non-Domestic Substances List)

Phosphate(1-), hexafluoro-, lithium (21324-40-3)
Listed on the Canadian NDSL (Non-Domestic Substances List)

Aluminum (7429-90-5)
Listed on the Canadian DSL (Domestic Substances List)

Polypropylene (9003-07-0)
Listed on the Canadian DSL (Domestic Substances List)

Copper (7440-50-8)
Listed on the Canadian DSL (Domestic Substances List)

Graphite (7782-42-5)
Listed on the Canadian DSL (Domestic Substances List)

Phosphoric acid, iron(2+) lithium salt (1:1:1) (15365-14-7)
Listed on the Canadian DSL (Domestic Substances List)

Iron (7439-89-6)
Listed on the Canadian DSL (Domestic Substances List)

Nickel (7440-02-0)
Listed on the Canadian DSL (Domestic Substances List)

1,3-Dioxolan-2-one (96-49-1)
Listed on the Canadian DSL (Domestic Substances List)

Dimethyl carbonate (616-38-6)
Listed on the Canadian DSL (Domestic Substances List)

Diethyl carbonate (105-58-8)
Listed on the Canadian DSL (Domestic Substances List)

SECTION 16: OTHER INFORMATION, INCLUDING DATE OF PREPARATION OR LAST REVISION

Date of Preparation or Latest Revision : 03/26/2024

Other Information : This document has been prepared in accordance with the SDS requirements of the OSHA Hazard Communication Standard 29 CFR 1910.1200 and Canada's Hazardous Products Regulations (HPR) SOR/2015-17.

GHS Full Text Phrases:

H225	Highly flammable liquid and vapor
H226	Flammable liquid and vapor
H301	Toxic if swallowed
H302	Harmful if swallowed
H314	Causes severe skin burns and eye damage

H317	May cause an allergic skin reaction
H318	Causes serious eye damage
H319	Causes serious eye irritation
H335	May cause respiratory irritation
H351	Suspected of causing cancer
H372	Causes damage to organs through prolonged or repeated exposure
H373	May cause damage to organs through prolonged or repeated exposure

Glossary of Data Source Abbreviations

ATSDR: Agency for Toxic Substances and Disease Registry (U.S. Department of Health and Human Services)
AU_WES: Australia WES
CHEMVIEW: ChemView (U.S. Environmental Protection Agency)
EC_RAR: European Commission Renewal Assessment Report
EC_SCOEL: European Commission Scientific Committee on Occupational Exposure Limits
ECETOC: European Centre for Ecotoxicology and Toxicology of Chemicals Reports
ECHA_API: European Chemicals Agency API
ECHA_RAC: ECHA Committee for Risk Assessment
EFSA: European Food Safety Authority
EPA: U.S. Environmental Protection Agency
EPA_AEGL: Acute Exposure Guideline Levels (U.S. Environmental Protection Agency)
EPA_FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act Reregistration Eligibility Decision (U.S. Environmental Protection Agency)
EPA_HPV: High Production Volume Chemicals (U.S. Environmental Protection Agency)
EPA_TRED: Risk Assessment for Tolerance Reassessment Eligibility Decision (U.S. Environmental Protection Agency)
EU_CLH: European Union Harmonised Classification and Labelling Proposal
EU_RAR: European Union Risk Assessment Report
FOOD_JOURN: Food Research Journal (1956)
IARC: The International Agency for Research on Cancer
IDLH: National Institute for Occupational Health and Safety Immediately Dangerous to Life or Health Value Profiles
IUCLID: International Uniform Chemical Information Database
JAPAN_GHS: Japan GHS Basis for Classification Data
JP_J-CHECK: Japan J-Check
KR_NIER: South Korea National Institute of Environmental Research Evaluations
NICNAS: Australia National Industrial Chemicals Notification and Assessment Scheme
NIOSH: National Institute for Occupational Health and Safety (U.S. Department of Health and Human Services)
NLM_CIP: National Library of Medicine ChemID plus database
NLM_HSDB: National Library of Medicine Hazardous Substance Data Bank
NLM_PUBMED: National Library of Medicine PubMed database
NTP: National Toxicology Program
NZ_CCID: New Zealand Chemical Classification and Information Database
OECD_EHSP: Environment, Health, and Safety Publication (Organisation for Economic Co-operation and Development)
OECD_SIDS: Screening Information Data Sets (Organisation for Economic Co-operation and Development)
WHO: World Health Organization

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

NA GHS SDS 2015 (Can, US)