

MATERIAL SAFETY DATA SHEET

SECTION 1 - Company Identification And Chemical Product

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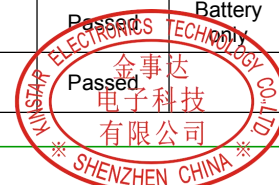
PRODUCT NAME: Lithium Iron Phosphate (LiFePO4) Battery

SECTION 2 - Composition / Information On Ingredients

Ingredient Name	Chemical Formula	CAS No.	Concentration
Lithium Iron Phosphate	LiFePO ₄	15365-14-7	38.09 %
Super-P	C	1333-86-4	0.62 %
Butadiene Styrene Rubber	C ₁₂ H ₁₄	9003-55-8	0.34 %
PVDF	[-CH ₂ -CF ₂] _n	24937-79-9	1.04 %
Graphite	C	1333-86-4	20.10 %
Electrolyte	LiPF ₆	21324-40-3	1.10 %
Copper Foil	Cu	7440-50-8	9.22 %
Aluminum Foil	Al	7429-90-5	4.00
Lead	Pb	7439-92-1	Not Detected
Cadmium	Cd	7440-43-9	Not Detected
Mercury	Hg	7439-97-6	Not Detected

SECTION 3 - Independent Certification of LiFePO4 battery UN Transportation Model Regulation

No	Test Item	Criteria	Result	Remark
T1	Altitude Simulation	No mass loss, leakage, venting, disassembly, rupture, and fire. OCV should not be less than 90% before testing.	Passed	
T2	Thermal Test	No mass loss, leakage, venting, disassembly, rupture, and fire. OCV should not be less than 90% before testing.	Passed	
T3	Vibration	No mass loss, leakage, venting, disassembly, rupture, and fire. OCV should not be less than 90% before testing.	Passed	
T4	Shock	No mass loss, leakage, venting, disassembly, rupture, and fire. OCV should not be less than 91% before testing.	Passed	
T5	External Short Circuit	External temperature should not exceed 170 degC. No disassembly, rupture, and fire within six hours of this test.	Passed	
T6	Impact	External temperature should not exceed 170 degC. No disassembly, and fire within six hours of this test.	Passed	
T7	Over-charge	No disassembly, and fire within seven days of this test.	Passed	Battery only
T8	Forced Discharge	No disassembly, and fire within seven days of this test.	Passed	



SECTION 4 - Hazards Identification

All chemical materials of LiFePO4 battery cell are stored in a hermetically sealed metal case, designed to withstand temperatures and pressures encountered during normal use. There is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage during normal use. However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the gas release vent will be operated and hazardous materials may be released.

Potential Health Effects:

LiFePO4 compounds are considered to be possible human carcinogen(s). These chemicals may cause allergic skin sensitization (rash) and irritate eyes, skin, nose, throat, respiratory system.

Since electrolyte is flammable liquid, it does not bring close to fire. It may cause moderate to severe eye irritation, dryness of the skin. Breathing of its mist, vapor or fume may irritate nose, throat and lungs. Exposure of electrolyte material in the area which contains water may generate hydrofluoric acid, which can cause immediate burns on skin, severe eye burn. The ingestion of electrolyte can cause serious chemical burns of mouth, esophagus and gastrointestinal tract.

■ SECTION 5 - First-Aid Measures

- **Skin:** Remove contaminated clothing and thoroughly wash with soap and plenty of water. If irritation persists, contact a medical doctor.
- **Eyes:** Flush with water for at least 15 minutes. If irritation occurs and persists, contact a medical doctor.
- **Inhalation:** Remove to fresh air. If breathing difficulty or discomfort occurs and persists, see a medical doctor. If breathing has stopped, give artificial respiration and see a medical doctor IMMEDIATELY.
- **Ingestion:** Drink at least 2 glasses of milk or water. Induce vomiting unless patient is unconscious and see a medical doctor IMMEDIATELY.

■ SECTION 6 - Fire-Fighting Measures

- **Hazardous Combustion Products:** When burned, hazardous products of combustion including fume of carbon monoxide, carbon dioxide, and lithium oxide fumes can occur.
- **Extinguishing Media:** Water, carbon dioxide, dry chemical or foam.
- **Basic Fire Fighting Procedures:** Wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
- **Unusual Fire & Explosion Hazardous:** This materials does not represent an unusual fire or explosion hazardous.
Flash Point: 65C(CC)(149F)
Autolgnition Temperature: No date
Flammability Limits in Air, Lower, % by volume: 1.4
Flammability in Air, Upper, % by volume: 11

■ SECTION 7 - Accidental Release Measures

- **Procedure for Release and Spill:** Sweep up and place in a suitable container, dispose or waste according to all local, state and Federal Laws and Regulations.
- Before cleanup measures begin, review the entire MSDS with particular attention Potential Health Effects; and on Recommended Personal Protective Equipment.

■ SECTION 8 - Handling And Storage

- **Handling:** Specific safe handling advice: Never throw out cells in a fire or expose to high temperatures. Do not soak cells in water and seawater. Do not expose to strong oxidizers. Do not give a strong mechanical shock or throw down. Never disassemble, modify or deform. Do not connect the positive terminal to the negative terminal with electrically conductive material.
- **Storage conditions (suitable, to be avoided):** Do not place the battery cell near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures can result in shortened battery cell life and degrade performance.
Store in cool place: temperature: -20-45C, humidity: 45-75%
Incompatible products: Conductive materials, water, seawater, strong oxidizers and strong acids.
Packing material(recommend, not suitable): Insulative and tearproof materials are recommended.

■ SECTION 9 - Exposure Controls / Personal Protection

- **Engineering controls:** Investigate techniques to reduce exposures use with adequate ventilation and recommended personal protective equipment.
- **Eye / Face protection:** Use good industrial practice to avoid eye contact. Processing of this product releases vapors or fumes which may cause eye irritation. Where eye contact may be likely wear chemical goggles and have eye flushing equipment available.
- **Skin protection:** Minimize skin contamination by following good industrial hygiene practices. Wearing protective gloves is recommended. Wash hands and contaminated skin thoroughly after handling.
- **Respiratory protection:** Avoid breathing dust and processing vapors. When adequate ventilation is not available, wear a NIOSH/MSHA respirator approved for protection against inorganic dusts.
Special clothing: Rubber gloves.

■ SECTION 10 - Physical And Chemical Properties

Physical state: Solid
Form: Geometric solid
Color: Metallic color(without outer PVC cover)
PH: Not applicable
Flash point: Not applicable
Explosion properties: Not applicable
Density: Not applicable
Solubility: Not soluble

■ SECTION 11 - Stability And Reactivity

- **Hazardous reactions may occur under some specific conditions.**
- **Conditions to avoid:** when a battery is exposed to an external short-circuit, crushes, modification, high temperature above 70 degree C, it will be the cause of heat generation and ignition. Avoid to be exposed to direct sunlight and high humidity.
- **Materials to avoid:** conductive materials, water, seawater, strong oxidizers and strong alkalis & acids.
- **Hazardous decomposition products:** Acrid or harmful gas is emitted during fire, and may form peroxides.
If leaked, forbidden to contact with strong oxidizers, mineral acids, strong alkalies, halogenated hydrocarbons.



■ SECTION 12 - Toxicological Information

Signs & symptoms: None, unless battery ruptures.

In the event of exposure to internal contents, vapour fumes may be very irritating to the eyes and skin.

Inhalation: Lung irritant.

Skin contact: Skin irritant.

Eye contact: Eye irritant.

Ingestion: Poisoning if swallowed.

Medical conditions generally aggravated by exposure: In the event of exposure to internal contents, moderate to severe irritation, burning and dryness of the skin may occur, Target organs nerves, liver and kidneys.

Eco Toxicological information: No information available.

Local environmental Effects: Unknown.

Since some internal materials remain in the environment, do not bury or throw out into the environment.

■ SECTION 13 - Disposal Information

Waste disposal must be in accordance with the applicable regulations. Disposal of the LiFePO₄ battery cells should be performed by permitted, professional disposal page: firms knowledgeable in state or local requirements of hazardous waste treatment and hazardous waste transportation. Incineration should never be performed by battery but users, eventually by trained professional in authorized facility with proper gas and fume treatment.

■ SECTION 14 - Transportation / Shipping Information

Label for conveyance: Lithium Battery Mark; Class 9 Hazard Label; Cargo Aircraft Only Label.

UN Number: UN3480.

EmS Number: F-A, S-I

Shipper (manufacturer) or fully comply with the requirements of UN Manual of Tests and Criteria Part III, subsection 38.3.

- US DOT, All KinStar batteries are not subject to the requirements of the Department of battery meets the exceptions under 173.185(b). The KinStar batteries are exempted from the US DOT regulations as long as they are separated to prevent short circuits and packed in strong packing for condition normally encountered in transportation.
- ICAO and IATA, All KinStar batteries are regulated as hazardous material by the international civil aviation origination (ICAO) and the International Air Transportation Association (IATA) when transporting more than 24 batteries or 12 batteries in a single package. They must be transported in accordance with IATA 2021 Dangerous Goods Regulations Section II of Packing Instruction -- "PI965".
- IMO, All KinStar batteries are regulated as hazardous material by the international maritime organization (IMO) when transporting more than 24 batteries or 12 batteries in a single package. These must be transported according to the requirement in special provision "188" and "230".
- ADR, RID, all KinStar batteries are regulated as hazardous material by the ADR(road) and RID(rail) when transporting more than 24 batteries or 12 batteries in a single package. These must be transported according to the requirement in special provision "188" and "230".
- BUILDING OF NEW BATTERY PACK - If you build any of KinStar LiFePO₄ battery into battery pack, you must assure that they are being tested in accordance with the UN Model Regulation, Manual of Test and Criteria, part III, subsection 38.3.
- We further certify that the captioned shipment is not classified as dangerous goods and it complies with Section II of Packing Instruction -- "PI965" of current edition--62th of the IATA Regulation in particular.

■ SECTION 15 - Regulation Information

- The transportation of the LiFePO₄ battery is regulated by various bodies(IATA, IMO, ADR, US-DOT) that follows the "united nations" Recommendation on the transportation of dangerous goods.
- LiFePO₄ battery and cells in aircrafts are subjected to shipping requirements exceptions under 49 CFR 173.185.
- Shipping of LiFePO₄ battery in aircrafts are regulated by the international civil aviation organization(ICAO) and the international air transportation(IATA) requirements in special provision " PI965". The shipment contains of PI965 including the passing of the UN38.3 test and the reference number. The LiFePO₄ battery is complied with IATA-DGR; special provision A123.
- Shipping of LiFePO₄ battery on sea are regulated the international maritime dangerous goods(IMDG) requirements of UN3480.
- LiFePO₄ compounds supposed hazardous and subjected to reporting requirements of section 313 of title 1:1 of the suspended are amendments and reauthorization act of 1986(SARA) and 40 CFR part 372.
- Packing Instruction has the shipment comply with Part 1 of PI965. the consignment does not contain any recalled and / or defective batteries.

■ SECTION 16 - Other Information

This file is only effective to the LiFePO₄ batteries provided by KinStar Electronics Technology Co., Ltd. KinStar provides the composition information of batteries, and promises its integrity and accuracy. Users should read this file carefully, and use the batteries in correct method. The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. KinStar makes no warranty expressed or implied with respect to lithium content information is available from KinStar on request.

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