According to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]

Material Safety Data Sheet (MSDS)

Product Name:	$LiFePO_4$ battery pack
Model No.:	**12V50AH(ZLI012035); 12V100AH(ZLI012051); 12V200AH(ZLI012100); 24V50AH(ZLI024036); 24V100AH(ZLI024065); 24V100AH(ZLI024070); 24V200Ah(ZLI024100); 36V100AH(ZLI036065); 48V100AH(ZLI048060); 48V200AH(ZLI048140); 48V400AH(ZLI048200)**

Written by: _____ Inspected by: _____ Approved by: _____

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Item No.:	21A769A309
MSDS No.:	EMS.210.113.001.DHE
Initial Date:	Jan. 13, 2021
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Material Safety Data Sheet

MSDS No.: EMS.210.113.001.DHE	Initial Date: Jan. 13, 2021	Version: 1.0
Product Name: $LiFePO_4$ battery pack	Revision Date: Jan. 13, 2021	Item No.: 21A769A309

Section 1 Product and Company Identification

Product identification

Product Name:	$LiFePO_4$ battery pack
Model No.:	12V50AH(ZLI012035); 12V100AH(ZLI012051); 12V200AH(ZLI012100); 24V50AH(ZLI024036); 24V100AH(ZLI024065); 24V100AH(ZLI024070); 24V200Ah(ZLI024100); 36V100AH(ZLI036065); 48V100AH(ZLI048060); 48V200AH(ZLI048140); 48V400AH(ZLI048200)
CAS No.:	Not applicable
EC No.:	Not applicable
Molecular formula:	Not applicable

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

Identified uses:	Equipment accessories
Uses advised against:	No special note

Section 2 Hazard Description

1	For the battery, chemical materials are stored in a hermetically sealed case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger. However, do not open,

	short-circuit, squeeze, burn, disassemble, expose to flame, mix different models, different chemical properties or different types of batteries. The battery case will be breached at the extreme, hazardous materials may be released.
2	Hazard class and label elements of the product according to Regulation (EC) No. 1272/2008 [EU-GHS/CLP]:

GHS Hazard class

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Irritation	Category 2

GHS label elements

Pictogram(s):	
Signal word:	**Warning**

Hazard statements

H315:	Causes skin irritation.
H319:	Causes serious eye irritation.

Precautionary statements

Prevention

P264:	Wash thoroughly after handling.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.

Response

P302+P352:	IF ON SKIN: Wash with plenty of soap and water.
P332+P313:	If skin irritation occurs: Get medical advice/attention.
P337+P313:	If eye irritation persists: Get medical advice/attention.
P362+P364:	Take off contaminated clothing and wash before reuse.
P305+P351+P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Storage

	Not applicable

◆ Disposal

	Not applicable

Hazard description

◆ Physical and chemical hazards

	Non-flammable, no special explosive characteristics.

◆ Health hazards

Inhalation:	May cause respiratory discomfort.
Ingestion:	Abdominal pain and vomiting.
Skin contact:	Cause skin irritation.
Eye contact:	Redness, pain, tears.

◆ Environmental hazards

	Please refer to Section 12 of MSDS.

Section 3 Composition/Ingredient Data

☐Material ■Mixture

Component(s)	Content, %	CAS No.
Lithium iron phosphate	30-33	15365-14-7
Ethylene carbonate	15-20	96-49-1
Dimethyl carbonate		616-38-6
Carbonate,methyl ethyl		623-53-0
Lithium hexafluorophosphate		21324-40-3
Carbon, as Graphite	15-17	7440-44-0
Copper	7-9	7440-50-8
Aluminum	5-7	7429-90-5

Section 4 First Aid Measures

Description of first aid measures

General advice:	Show this material safety data sheet to the doctor in attendance. After receiving the first-aid measure required, consult a physician if necessary.
Skin contact:	Remove contaminated clothing and shoes. Wash off with mild soap and plenty of water. If skin irritation occurs or persists, consult a physician immediately.
Eyes contact:	Check for and remove any contact lenses, occasionally lifting the upper and lower eyelids. Immediately flush eyes with running water, disappear until the chemical residues so far. Provide a readily-accessible eyewash facility and quick-drench safety shower. Do not rubbing eyes with hand. If eye irritation occurs or persists, consult a physician immediately.
Inhalation:	Move exposed person to fresh air. Maintain an open airway. Keep person warm and at rest. If breathing is irregular, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe.
Ingestion:	Wash out mouth with water. Move exposed person to fresh air. Keep person warm and at rest. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention if adverse health effects persist or are severe. Never give anything by mouth to an unconscious person.

Most important acute and delayed symptoms/effects

1	The most important known symptoms and effects are described in section 2 and/or in section 11.

Immediate/special treatment

1	Continue with first aid measures. Treat symptomatically and supportively.
2	Symptoms may be delayed.

Section 5 Firefighting Measures

Extinguishing agent

Suitable/Unsuitable extinguishing agents:	In case of fire, water flooded ground fire. If the battery is burning, water may not be extinguished, but can use water cooling adjacent batteries so as to control the spread of fire. The preferred medium for small fire is carbon dioxide, dry powder, or foam extinguishing agent, but for the lithium battery is burning may be no use, the battery will burn until complete combustion. In fact, all lithium batteries can be controlled by water. However, when using water to produce hydrogen gas may be mixed with air to form explosive mixture. LITH-X (graphite powder) or copper powder fire extinguishers, sand, dry, powdered dolomite or soda can be used as smothering agent

Special hazards arising from the substance or mixture

1	If this product is involved in a fire, the following can be released: Carbon oxides, metal oxides, etc.

Fire precautions and measures

1	Firefighters must wear self-contained breathing apparatus, wear full body fire suit, fire extinguishing in the upwind.
2	As far as possible will be transferred to empty containers from the scene.
3	Keep the fire water spray containers cooling, until the end of fire.
4	If the containers in the fire ground have been color, must be evacuated immediately.
5	Isolated accident scene, prohibit access.
6	Receiving and processing of fire, to prevent environmental pollution.

Section 6 Accidental Release Measures

Personal precautions, protective equipment and emergency procedures

1	No action shall be taken involving any personal risk or without suitable training.
2	Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering.
3	Do not touch or walk through spilt material, avoid slipping.
4	Avoid breathing steam.
5	Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate.
6	Put on appropriate personal protective equipment (see section 8).

Environmental precautions

1	Prevent further leakage or spillage if safe to do so.
2	Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up

1	Small spill: Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor. Large spill: Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth.
2	Contaminated absorbent material may pose the same hazard as the spilt product.
3	Adhered or collected material should be promptly disposed of, in accordance with appropriate laws and regulations.

Section 7 Handling and Storage

Precautions for safe handling

1	Don’t uses or leave the battery near a heat source as fire or heater.
2	If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use or storage, immediately remove it from the device and stop using.
3	Don't put the battery excessive vibration, avoid short circuit, however accidental short circuit for a short period of time will not have a serious impact on the battery.
4	Long-term short circuit can make battery loss of energy, generate a lot of heat burn skin, and even cause a fire or explosion.
5	Chaos of the battery in bulk in containers, coins, metal accessories, metal workbench, covered by or metal belt and so on battery device can be used for assembly is the source of cause a short-circuit.
6	Transport or storage battery should have effective measures of prevent short circuit.
7	Don’t disassembly or damage to the battery.
8	Keep away from heat/sparks/open flames/hot surfaces.
9	Handling carefully to prevent damage the packaging and container.
10	Equipped with corresponding varieties and number of fire equipment and spill contingency processing equipment.

Precautions for storage

1	Stored in a cool, dry and ventilated place, may cause the battery performance loss under high temperature, leakage, rust.
2	Don't expose the battery under the open flame, stored away from water and strong oxidizing agent.
3	Equipped with corresponding varieties and number of fire equipment and spill contingency processing equipment.
4	Keep out of reach of children and pets.

Section 8 Exposure Controls/Personal Protection

Control parameters

◆ Occupational Exposure limit values

Components CAS No.	Country/region	Occupational exposure limits (8h)		Occupational exposure limits (Short time)	
		ppm	mg/m^3	ppm	mg/m^3
Aluminum 7429-90-5	USA-OSHA	-	15	-	-
	Korea	-	10	-	-
	Ireland	-	1	-	-
	Germany (DFG)	-	4	-	-
	Denmark	-	5	-	10
	Australia	-	10	-	-
Copper 7440-50-8	Netherlands	-	0.1	-	-
	Poland	-	0.2	-	-
	Latvia	-	0.5	-	1
	Germany (DFG)	-	0.01	-	0.02

Engineering controls

1	Ensure adequate ventilation, especially in confined areas.
2	Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

General requirements:	
Respiratory protection:	Respiratory protective equipment is not necessary if used as intended. Respiratory protection may be required under exceptional circumstances when excessive air contamination exists. If the batteries leaks must try to keep the air circulation, avoid operating in a narrow place.
Eye protection:	Not necessary if used as intended, wear goggles/safety glasses giving complete eye protection if the battery damaged or leaking.
Skin and body protection:	Not necessary if used as intended, wear appropriate clothing and boots to minimize skin exposure if the battery damaged or leaking.
Hands protection:	Not necessary if used as intended, wear appropriate protective gloves if the battery damaged or leaking. Check protective gloves prior to each use for their proper condition. The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.

Section 9 Physical and Chemical Properties

Information on basic physical and chemical properties

Appearance and character:	Black Square, solid
Odor:	Odorless
Flash point (°C):	No data
Melting point/freezing point (°C):	No data
Initial boiling point and boiling range (°C):	No data
Evaporation rate:	No data
Steam pressure (20°C):	No data
Relative density (water=1):	No data
Partition coefficient:	No data

n-octanol/water:	
Decomposition temperature (°C):	No data
pH value:	No data
Auto ignition temperature (°C):	No data
Explosion limit [%（v/v）]:	Non explosives
Relative vapor density(air=1):	No data
Solubility:	Insoluble in water
Flammability (solid, gas):	Non-flammable
Oxidizing properties:	The substance does not belong to oxidizing substances

Section 10 Stability and Reactivity

Stability and Reactivity

Stability:	The product is chemically stable.
Reactivity:	Stable under recommended storage and handling conditions.
Incompatible materials:	Strong oxidizing agents, strong acids and strong bases.
Conditions to avoid:	In contrast to the nature of the material, overheating, exposed to damp air or water, mechanical vibration and power abuse.
Hazardous decomposition products:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11 Toxicological Information

Toxicological Information

Acute toxicity:	No data.
Skin corrosion/irritation:	Causes skin irritation (Category 2).
Eye corrosion/irritation:	Causes serious eye irritation (Category 2).
Respiratory	These products are not known to cause human respiratory sensitization.

sensitization:	
Skin sensitization:	These products are not known to cause skin sensitization.
Germ cell mutagenicity:	According to the existing data, the product is not classified.
Carcinogenicity:	No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.
Reproductive toxicity:	According to the existing data, the product is not classified.
Specific target organ toxicity - single exposure:	According to the existing data, the product is not classified.
Specific target organ toxicity - repeated exposure:	According to the existing data, the product is not classified.
Aspiration hazard:	According to the existing data, the product is not classified.
Additional reproductive toxicity hazards:	According to the existing data, the product is not classified.

Section 12 Ecological Information

Aquatic toxicity

Acute/Chronic aquatic toxicity:	According to the existing data, the product is not classified.

Persistence and degradability

Persistence:	No data.

Bioaccumulative potential

Bioaccumulation:	No data.

Mobility in soil

Mobility:	No data.

Results of PBT and vPvB assessment

Component(s)	CAS No.	Results of PBT and vPvB assessment
Lithium iron phosphate	15365-14-7	Not belong to PBT/vPvB
Ethylene carbonate	96-49-1	Not belong to PBT/vPvB

Component(s)	CAS No.	Results of PBT and vPvB assessment
Dimethyl carbonate	616-38-6	Not belong to PBT/vPvB
Carbonate,methyl ethyl	623-53-0	Not belong to PBT/vPvB
Lithium hexafluorophosphate	21324-40-3	Not belong to PBT/vPvB
Carbon, as Graphite	7440-44-0	Not belong to PBT/vPvB
Copper	7440-50-8	Not belong to PBT/vPvB
Aluminum	7429-90-5	Not belong to PBT/vPvB

Section 13 Disposal Considerations

Waste disposal

Residual waste:	Before disposal should refer to the relevant national and local laws and regulation. The generation of waste should be avoided or minimized wherever possible. Recommended transfer to a suitable container and arrange for collection by specialized disposal company if recycling is not feasible.
Contaminated packaging:	The generation of waste should be avoided or minimized wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.
Disposal considerations:	Dispose of container and unused contents in accordance with national and local relevant regulations laws.

Section 14 Transport Information

Transport Information

UN No.:	UN3480
UN Transport name:	Lithium ion batteries
Hazard class(es) :	9
Packaging group:	N/A

Environmental hazard Marine pollutant (Yes/No):	No
ICAO/ATA:	Can be shipped by air in accordance with International Civil Aviation Organization (ICAO), TI or International Air Transport Association (IATA), DGR Packing Instructions (PI) 965 Section II appropriate of IATA DGR 62nd (2021 Edition) for transportation.
IMDG CODE:	The batteries are not restricted to IMDG Code 2018 Edition (Amdt 39-18) according to special provision 188.
ADR/AND:	The batteries are not subject to the provisions of United Nations Economic Commission for Europe (UNECE) ADR/ADN if they meet the requirements of special provision 188 of Chapter 3.3. Applicable as from 1 January 2019.

In addition, to be permitted in transport each lithium cell and battery types must have passed the applicable tests set out in Subsection 38.3 of the UN Manual of Tests and Criteria.

Section 15 Regulatory Information

Safety, health and environmental regulations/legislation specific for the substance or mixture:

1	Regulatory information: Reference to the local, national, US, EU, CA and international regulations.

CAS No.	TSCA	IECSC	EINECS/ELINCS/NLP	DSL/NDSL
7429-90-5	Listed	Listed	Listed	Listed in DSL
7429-90-5	Listed	Listed	Listed	Listed in DSL
21324-40-3	Listed	Listed	Listed	Listed in DSL
96-49-1	Listed	Listed	Listed	Listed in DSL
616-38-6	Listed	Listed	Unlisted	Listed in DSL
623-53-0	Listed	Listed	Listed	Listed in NDSL
15365-14-7	Listed	Unlisted	Listed	Listed in NDSL

Section 16 Other Information

Abbreviations or phrases

ACGIH:	American Conference of Governmental Industrial Hygienists
ADR:	European Agreement concerning the International Carriage of Dangerous Goods by Road
CAS:	Chemical Abstracts Service
CLP:	Classification, labeling and packaging
EC:	Council of Europe
ECHA:	European Chemicals Agency
EINECS:	European Inventory of Existing commercial Chemical Substances
GHS:	Globally Harmonized System of Classification and Labelling of Chemicals
IARC:	International Agency for Research on Cancer
IATA:	International Air Transport Association
RID:	Regulation for rail International transportation of Dangerous goods
ICAO:	International Civil Aviation Organization
IMDG:	International Maritime Dangerous Goods Code
IC_{50}:	Inhibitory Concern Triton 50%
LC_{50}:	Lethal Concentration 50%
LD_{50}:	Median Lethal Dose 50%
MAPROL:	International Convention for the Prevention of Pollution from Ships
REACH:	REGULATION concerning the Registration, Evaluation, Authorization and Restriction of Chemicals
STEL:	Short Term Exposure Limit
TWA:	Time Weighted Average
MAC:	Maximum Allowable Concentration
OSHA:	Occupational Safety and Health Administration
NIOSH:	National Institute for Occupational Safety and Health
TLV:	Threshold Limit Value
TLV-TWA:	Threshold Limit Value-Time Weighted Average
TLV- STEL:	Threshold Limit Value-Short term Exposure Limit

Material Safety Data Sheet

MSDS No.: EMS.210.113.001.DHE	**Initial Date: Jan. 13, 2021**	**Version: 1.0**
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PC-TWA:	Permissible Concentration-Time Weighted Average
PC-STEL:	Permissible Concentration-Short Term Exposure Limit
PEL:	Permissible Exposure Limit
OELs:	Occupational Exposure Limits

Reference

1	IARC
2	OECD: The Global Portal to Information on Chemical Substances
3	U.S. Department of Transportation: ERG
4	Germany GESTIS-database on hazard substance
5	CAMEO Chemicals
6	NLM: ChemIDplus
7	EPA: Integrated Risk Information System
8	IPCS: The International Chemical Safety Cards (ICSC)

Disclaimer

1	The above information is believed to be correct but we can not guarantee the absolute universality and accuracy and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any **guarantee** of the properties of the product.
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