MATERIAL SAFETY DATA SHEET

Reference No. 100101

LITHIUM ION BATTERY

1. PRODUCT IDENTIFICATION

Product Lithium ion Battery

Model LIR18650

2. Composition & Information on Ingredients

Composition:

Steel, Copper, Aluminum:	31%
Polypropylene:	10%:
Lithium cobaltite:	29%
Organic solvents:	13%
Salts:	1%
Lithium metal:	0%

Electrochemical system:

Negative Electrode:	Carbon
Positive Electrode:	Lithium cobaltite (LiCoO2)
Electrolyte:	Solution of lithium hexafluorophosphate (LiPF6) in a mixture of organic solvents
Nominal Voltage:	3.7 V

No more than 0.5g/pc lithium is contained.

3. HAZARD DATA

3.1 Physical:

The Lithium-Ion batteries described in this Material Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the Manufacturer.

Under normal conditions of use, the solid electrode materials and liquid electrolyte they contain are non-reactive provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) leading to the activation of safety valves and/or the rupture of the battery containers. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

Chemical:

Classification of Dangerous Substances Contained into the Product as per Directive

Substance		Melting Point	Boiling Point	Classification			
CAS N°	Chemical symbol			Exposure limit	Indication of danger	Special risk (1)	Safety advice (2)
12190-79-3	$LiCoO_2$	> 1000°C	N/A	0.1 mg/m3 OSHA		R22 R43	S2 S22 S24 S26 S36 S37 S43 S45
EC : 96-49-1 DMC : 616-38-6 DEC : 105-58-8 EA : 141-78-6	Organic solvents (DC-DMC DEC-EA)	EC : 38°C DMC : 4 °C DEC : -43°C EA : -84°C	EC : 243°C DMC : 90°C DEC : 127°C EA : 77°C	None established OSHA	Flammable	R21 R22 R41 R42/43	S2 S24 S26 S36 S37 S45
21324-40-3	$LiPF_6$	N/A (decomposes at 160°C)	N/A	None established OSHA	Irritant Corrosive	R14 R21 R22 R41 R43	S2 S8 S22 S24 S26 S36 S37 S45

1. Name of Special Risks:

R 14 Reacts with water
R 21 Harmful in contact with skin
R 22 Harmful is swallowed
R 41 Risk of serious damage to the eye
R 42/43 May cause sensitization by inhalation and skin contact
R 43 May cause sensitization by skin contact

2. Safety Advices:

S 2 Keep out of reach from children
S 8 Keep away from moisture
S 22 Do not breathe dust
S 24 Avoid contact with skin
S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical attention
S 36 Wear suitable protective clothing

S 37 Wear suitable gloves
S 45 In case of incident, seek medical attention.
S45 In case of incident, seek medical attention

4. First Aid Measures

In case of battery rupture or explosion, evacuate personnel from contaminated area and provide maximum ventilation to clear out corrosive fumes/gases and pungent odour.

In all case, seek immediate medical attention.

Eye contact:	Flush with plenty of water (eyelids-held open) for at least 15 minutes.
Skin contact:	Remove all contaminated clothing and flush affected areas with plenty of water and soap for at least 15 minutes. Do not apply greases or ointments.
Ingestion:	Dilute by giving plenty of water and get immediate medical attention. Assure that the victim does not aspirate vomited material by use of positional drainage. Assure that mucus does not obstruct the airway. Do not give anything by mouth to an unconscious person.
Inhalation:	Remove to fresh air and ventilate the contaminated area. Give oxygen or artificial respiration if needed.

5. **Fire-Fighting Measures**

Fire and explosion hazard:	The battery can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 70°C resulting from inappropriate use or the environment. Possible formation of hydrogen fluoride (HF) and phosphorous oxides during fire. Li PF6 salt contained in the electrolyte releases hydrogen fluoride (HF) in contact with water.
Extinguishing media:	*Suitable :* CO2, Dry chemical or Foam extinguishers *Not to be used :* Type D extinguishers
Special exposure hazards:	Following cell overheating due to external source or due to unproper use, electrolyte leakage or battery container rupture may occur and release inner component/material in the environment. **Eye contact** : The electrolyte solution contained in the battery is irritant to ocular tissues. **Skin contact** : The electrolyte solution contained in thebattery causes skin irritation. **Ingestion** : The ingestion of electrolyte solution causes tissue damage to throat and gastro/respiratory tract. **Inhalation** : Contents of a leaking or ruptured battery can cause respiratory tract, mucus, membrane irritation and edema.

Special protective equipment:	Use self-contained breathing apparatus to avoid breathing irritant fumes. Wear protective clothing and equipment to prevent body contact with electrolyte solution.

6. Accidental Release Measures

The material contained within the batteries would only be expelled under abusive conditions. Using shovel or broom, cover battery or spilled substances with dry sand or vermiculite, place in approved container (after cooling if necessary) and dispose in accordance with local regulations.

7. Handling and Storage

When packing the batteries, do not allow battery terminals to contact each other, or contact with other metals.

●Be sure to pack batteries by providing partitions in the packaging box, or in a separate plastic bag so that the single batteries are not mixed together..(1)(2)

●Use strong material for packaging boxes so that they will not be damaged by vibration , impact, dropping and stacking during their transportation.(1)(2)(3)

●Do not let water penetrate into packaging boxes during their storage and transportaion.

●The batteries will be stored at room temperature, charged to about 30-50% of capacity.

●Do not store the battery in places of the high temperature exceeding 35deg.C or under direct sunlight or in front of a stove. Please also avoid the places of high humidity. Be sure not to expose the battery to condensation, water drop of not to store it under frozen condition.

●Batteries are sure to be packed in such a way as to prevent short circuits under conditions normally encountered in transport.(1)(2)(3)

●Please avoid storing the battery in the places where it is exposed to the static electricity so that no damage will not be caused to the protection circuit of the battery pack.

The batteries should not be opened, destroyed nor incinerated since they may leak or rupture and release in the environment the ingredients they contain.

Handling	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. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays.
Storage	Store in a cool (preferably below 30°C) and ventilated area away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 70°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not jumble them.
Other	Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range.

Applying pressure on deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

8. Exposure Controls/Personal Protection

Respiratory protection:	Not necessary under normal use. In case of battery rupture, use self contained full-face respiratory equipment.
Hand protection:	Not necessary under normal use. Use gloves if handling a leaking or ruptured battery.
Eye protection:	Not necessary under normal use. Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.
Skin protection:	Not necessary under normal use Use rubber protective working in case of handling of a ruptured battery.

9. Physical And Chemical Properties

9.1 Appearance (Physical shape and color as supplied:)

Small prismatic metal cylinders, hermetically sealed and fitted with an external plastic sleeving.

9.2 Temperature range:

	Continuous	Occasional
In storage	+30°C max	-40/+70°C
During discharge	-30/+70°C	-40/+70°C
During charge	0/+50°C	0/+50°C

9.3. Specific energy: about130 Wh/kg

(Note : Wh = Nominal voltage x Rated Ah as defined in IEC Standard N° 285. Kg = Average battery weight)

9.4 Specific pulse power: about 300 Wh/kg

10. Stability and Reactivity

Conditions to avoid	Heat above 70°C or incinerate. Deform, mutilate, crush, pierce, disassemble. Short circuit. Prolonged exposure to humid conditions.
Materials to avoid:	N/A
Hazardous decomposition products:	Corrosive/Irritant Hydrogen fluoride (HF) is produced in case of reaction of *lithium hexafluorophosphate (LiPF6)* with water.. Combustible vapors and formation of Hydrogen fluoride (HF) and phosphorous oxides during fire.

11. Toxilogical Information

EEMB Lithium-Ion batteries do not contain toxic materials.

12. Ecological Information

When properly used or disposed, the Lithium-Ion batteries do not present environmental hazard.

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with applicable regulations which vary from country to country.
(In most countries, the trashing of used batteries is forbidden and the end-users are invited to dispose them properly, eventually through not-for-profit profit organizations, mandated by local governments or organized on a voluntary basis by professionals).

Lithium-Ion batteries should have their terminals insulated and be preferably wrapped in plastic bags prior to disposal.

13.1 . Incineration : Incineration should never be performed by battery users but eventually by trained professionals in authorized facilities with proper gas and fumes treatment.

13.2 Landfilling: According to the proper laws and regulations in different countries or areas, the battery should be buried deeply in the specified place.

13.3 Recycling: Send to authorized recycling facilities, eventually through licensed waste carrier.

14. **TRANSPORTATION INFORMATION**

We hereby certify that the captioned lithium ion batteries are non-hazardous materials for air transportation in any nature The consignment is fully described by proper shipping name and packed, marked and in proper condition for carriage by air. We hereby further certify that the consignment is not classified as dangerous under the current edition of the IATA 51th Effective 1 January 2010, Dangerous goods regulations and all applicable carrier and government regulations and the battery can be shipped by air.

We also acknowledge that we may be liable for damage resulting from any blunder or omission and we further agree that any air carrier involved in the carriage of this consignment may reply upon this certification.

1.Cells and batteries are packed in inner packagings that completely enclose the cell or battery (retail type plastic blister packs meet this requirement);

2.cells and batteries are protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit;

3.each package are capable of withstanding a 1.2 m drop test in any orientation without:
-damage to cells or batteries contained therein;
- shifting of the contents so as to allow battery to battery (or cell to cell) contact;
release of contents.

4.Quantity per package shall not exceed 10kg.

5.each consignment are accompanied with a document such as an air waybill with an indication that:
- the package contains lithium ion cells or batteries;
- the package are handled with care and that a flammability hazard exists if the package is damaged;
- special procedures are followed in the event the package is damaged, to include inspection and repacking if necessary; and -a telephone number for additional information.

Recommendations on the transport of dangerous goods-Model Regulations 15th revised edition,IATA Special Provision A154,A164 and IMDG Special Provision 188.

15.UN CLASS: Even classified as lithium ion batteries (UN3480),2010 IATA Dangerous Goods Regulations 51th edition Packing Instruction 965 Section II is applied. The product is handled as Non-Dangerous Goods by meeting the following requirements.(1)

Lithium ion cells and batteries offered for transport are not subject to other additional requirements of the UN Regulations if they meet the following(1)(3)

1.for cells m the Watt-hour rating is not more than 20WH

2.for batteries, Watt-hour rating is not more than 100WH

The Watt-hour rating must be marked on outside of the battery case except those manufactured before 1 January 2010 which may be transported without this marking until 31 December 2011.

3. each cell or battery is of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria Part Ⅲ subsection 38.3.

Regulatory Information

IATA Dangerous Goods Regulations 51th Edition Effective 1 January 2010.

ICAO Technical Instructions for the safe transport of dangerous goods by air.

16.Reference

(1) UN Recommendation on the Transportation of Dangerous Goods Model Regulations.
(ST/SG/AC.10/1/Rev.15)

(2)Federal Resister/Vol.65.NO.174/Thursday, September 7,2000/Notices.

(3)IATA Dangerous Goods Regulations 51th Edition Effective 1 January 2010.

(4)TLVs and BEIs 1999 ACGIH

17.Other Information / Disclaimer

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable. However, no representation, warranty (either or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein.

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