MATERIAL SAFETY DATA SHEET

NAME : LITHIUM-ION RECHARGEABLE BATTERIES

Trade name: BIRD-BTY-TMI3C

Shanghai Baoe Industrial Corporation Limited .

1 - IDENTIFICATION (of the product and the supplier)

1.1 Product : **Rechargeable battery**

Trade name: *LITHIUM-ION POLYMER BATTERIES*

Electrochemical system :

Electrodes	**Negative electrode** Carbon	**Positive electrode** Lithium cobaltite (LiCoO2)
Electrolyte	Solution of lithium hexafluorophosphate in a mixture of organic solvents	
Nominal voltage	3.7 Volts	

Equivalent name : lithiated cobalt oxide.
Ethylene Carbonate (EC) + DiMethyl Carbonate (DMC) + DiEthyl Carbonate (DEC).

2 - COMPOSITION (typical weight percentages of basic material)

Metals	%	Others	%
-Copper,	5~15	- Lithium cobalt oxide	25~50
-Aluminum	2~10	- Carbon	10~30
-Lithium metal	2~3	-Organic solvents	10~20
-Aluminum packing foil	5~15	-Polyvinylidene Fluoride(PVDF)	0~5
-Nickel	0.5~5		

3 - HAZARDS IDENTIFICATION

3.1 Physical :

The Lithium-Ion rechargeable 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) which leads to the activation of the safety valve and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the

circumstances. batteries are fitted with a safety vent for protection in case of excessive internal pressure and/or temperature.

3.2 Chemical :

Classification of dangerous substances contained into the product as per directive 67/548/EEC

Substance		Melting point	Boiling point	Classification			
CAS N°	Chemical symbol			Exposure limit	Indication of danger	Special risk (1)	Safety advices (2)
12190-79-3	LiCoO2	> 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	Organic solvents (EC-DMC DEC)	EC : 38°C DMC : 4°C DEC : -43°C	EC : 243°C DMC : 90°C DEC : 127°C	None established OSHA	Flammable	R21 R22 R41 R42/43	S2 S24 S26 S36 S37 S45
21324-40-3	LiPF6	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 – Nature of special risks :

R 14 Reacts with water.
R 21 Harmful in contact with skin.
R 22 Harmful if 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.

4 - FIRST AID MEASURES

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

In all case, seek medical attention.

Eye contact : Flush with plenty of water (eyelids held open) for at least 15minutes.

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 batteries can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 60°C resulting from inappropriate use or from the environment.
Possible formation of hydrogen fluoride (HF) and phosphorous oxides during fire.
LiPF6 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 the battery 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

The batteries should not be opened, destroyed nor incinerate 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. Do not strike or throw the battery against hard surface. Do not directly solder the battery and pierce the battery with a nail or other sharp object.

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 manufacturer 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 Viton rubber 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 apron and protective working in case of handling of a ruptured battery.

9 - PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance : (Physical shape and color as supplied) Metal squares, hermetically sealed and fitted with an external plastic box.

9.2 Temperature range :

	Continuous	Occasional
in storage	-20/+35°C	-20/+45°C
during discharge	-20/+ 60°C	- 20/+ 60°C
during charge	0/+ 45°C	0/+ 45°C

9.3 Specific energy : ≈ 135 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 : ≈ 300 Wh/kg

9.5 Mechanical resistance : As defined in relevant IEC standard

9.6 Other :

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 - TOXOLOGICAL INFORMATION

B&K Lithium-Ion rechargeable batteries do not contain toxic materials.

12 - ECOLOGICAL INFORMATION

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

13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with applicable regulations which vary from country to country.

(In more countries, the thrashing of used batteries is forbidden and the end-users are invited to dispose them properly, eventually through

not-for-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 : Leachability regulations (mg/l)

Component	Leachability	EC limit	EPA	Other*
Iron	100			5
Nickel	500	2		0.5

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

14 - TRANSPORT INFORMATION

14.1 United Nations :

UN° 3090
Classification 9
Packaging ICAO 903 for Air Transport
IMDG 903 for Sea Transport

14.2 International conventions :

Air IATA Yes
Sea IMDG Yes
Land ADR (road) Yes
RID (rail) Yes

14.3 Other : In the USA : Code of Federal Regulations (49 CFR Ch. 1 § 173-185)

15 - REGULATION INFORMATION

The transport of rechargeable lithium-ion batteries is regulated by various bodies (IATA, IMO, ADR, US-DOT) that follow the United Nations *"Recommendations on the Transport of Dangerous Goods, Model Regulations, 13th Revised edition - 2003 - Ref. ST/SG/AC.10/1 Rev. 13".*
Depending on their lithium metal equivalent weight content, design, and ability to pass safety tests defined by the UN in the *"Recommendations on the Transport of Dangerous Good - Manual of Tests and Criteria - 3rd Revised*

edition - 2002 - Ref. ST/SG/AC.10/11 Rev.3 Amendment 1 «Lithium Batteries»&", the lithium-ion cells and the battery packs may or may not be assigned to the UN N° 3090 Class-9, that is restricted for transport. Individual lithium-ion cells and battery packs with respectively less than 1.5 and 8 grams of equivalent lithium metal content that pass the UN-defined safety tests, are not restricted for transport (1.0 Ah of declared nominal capacity = 0.3 gram of Li equivalent weight content).

16 - 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 as of the date compiled. However, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein.
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