

SHENZHEN PKCELL BATTERY CO., LTD



Polymer Li-ion Battery Technology Specification

Model: ICR18650 2200mAh 3.7V

Customer confirmation	Corporate name	adafruit industries
	Checked	Limor Fried
	Approved	8.18.14 MUST HAVE GENUINE JST BRAND CONNECTORS
	Corporate seal	

Signed: 

Drafted by: _____

Signed by: Mary Jungman

Document No.: QA.S.0221 Edit: A/0

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(If manufacturer want to modify the product technology specification, we won't inform you additionally)

PKCELL BATTERY	Document	Technical Specification ICR18650 2200mAh 3.7V	Edition	A/0
			Valid Date	2014-07-28
	Number	QA.S. 0221	Drafted by	Xiao li
			Signed by	Zhijiang Li

1. SCOPE

This document describes the performance characteristics and testing methods for Polymer Lithium-ion batteries produced by shenzhen pkcell battery Co., Limited.

2.SPECIFICATION

No.	Item	Characteristics	Remarks
1	Nominal Capacity	Minimum:2090mAh Typical: 2200mAh	Standard discharge (0.2C ₅ A) after Standard charge
2	Nominal Voltage	3.7V	—
3	Charging Cut-off Voltage	4.2V	—
4	Discharge Cut-off Voltage	3.0V	—
5	Standard Charge	Constant Current 0.5C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off	Charge Time : Approx 4.0h
6	Maximum Constant Charging Current	2200mA (1.0C)	—
7	Standard Discharge	Discharge at 0.2 C ₅ A to 3.0V	—
8	Maximum Continuous Discharging Current	4400mA (2.0C)	—
9	Operating Temperature	Charge 0~45°C Discharge -20~60°C	—
10	Storage Temperature	-20~45°C for 1Month -20~35°C for 6Months	—
11	Storage Voltage	3.7-3.9V	—
12	Environmental request	RoHS	If the materials of the product and packaging accord with RoHS standard, there will be a RoHS Id on the box.

3. Dimensions

Please refer the drawing in appendix.

4. Appearance

No scratches, dirt, defect, leakage of electrolyte or gassing should be observed as a new product.

5. Standard Testing Environment

Temperature : 25±2°C

Relative humidity : 65±20% (unless specially requested)

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6. Characteristics

6.1 Electrochemical performance characteristics

No.	Item	Testing Method	Requirements
1	Fully Charged State	CCCV or Constant current charge to 4.2V @1C follow by a constant voltage holding at 4.2V until current drops below 22±3mA.	—
2	Rated Capacity	CCCV at 4.2V (per 6.1.1) at room temp. (20±5C), rest for 1-2 hrs then discharge at a constant current of 0.2C to 3.0V, testing will be terminated by either 5 cycles or any one discharge time exceeds 5 hrs	≥2090mAh
3	Cycle Life @25°C	Discharge to 3.0V @1C, then CCCV charge to 4.2V, rest for 10 min. discharge @ 1C to 3.0V and rest for 10 min. Continue the charge/discharge cycles until discharge capacity lower than 70% of rated capacity.	Cycle life ≥500
4	Internal Impedance	Internal impedance is measured on a 50% charged battery at 1KHz AC at ambient temperature (20±2) °C	—
5	Capacity Retention	Fully charge cells per 6.1.1, store them at (20±2)°C for 28 days, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1760mAh
6	High Temperature Characteristics	Fully charge cells per 6.1.1, store them at (55±2)°C for 2 hours, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1760mAh
7	Low Temperature Characteristics	Fully charge cells per 6.1.1, store them at (-10±2)°C for 16~24 hours, then discharge the cells to 3.0V at 0.2C.	Discharge Capacity≥1320mAh
8	Cell Voltage during Transportation	Check open circuit voltage (OCV) of cells prior to the delivery to customers	≥3.7V

6.2 Safety characteristic

No.	Item	Test Method	Requirements
1	Over charge	Discharge cells to 3.0V at 1C, then charge to 14.4V at 3C and rest for 8 hours.	No fire No explosion No leakage
2	Overdischarge	Fully charge cells per 6.1.1, then discharge the battery to 3.0V with 0.2CmA at room temperature, connect with external load of 30Ω for 24 hours.	No fire No explosion No leakage
3	Hot Oven Test	Put a fully charged battery in a forced air oven and raise the temperature at 5±2°C/min. to130±2°C Rest for10 minutes.	No fire No explosion No leakage

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6.3 Reliability

No.	Item	Test Method	Requirements
1	High Temperature Test	Fully charged per 6.1.1, then rest at 60±2°C for 2 hours.	Electrochemical performance, visual test not changed
2	Low Temperature Test	Fully charge cells per 6.1.1, rest at -20±2°C for 2 hours. Then the cells are placed at room temperature for 3 hours.	No appreciable alternation electrochemically and visually
3	Humidity Test	Fully charge cells per 6.1.1, rest at 40±2°C with 90%~95RH% for 48 hours. Then the cells are placed at room temperature to “dry out” for 2 hours.	No appreciable alternation electrochemically and visually
4	Vibration Test	After standard charged, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No fire No explosion No leakage
5	Drop Test	The cell is to be dropped from a height of 1 meter twice onto concrete ground.	No fire No explosion No leakage
6	Collisions	After the vibration test, according to X.Y.Z each battery average three vertical pulse peak acceleration, the setting for the 100m/s ² , every minute, 40 ~ 80 collision frequency, pulse duration 16ms collision frequency ± 10 thousand.	No fire No explosion No leakage
7	Crush (Fresh, Fully charged)	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min.	No fire No explosion No leakage
8	Short Circuit	This test will be placed the battery electric dipole in the fume hood, short-circuit the anode (total resistance is not more than 50mΩ lines), monitor temperature changes, when the battery is low temperature dropped to about 10 degrees than peak, the end of experiment.	No explosion, No fire The temperature of the surface of the Cells ≤ 150°C
9	Impact(Fresh, Fully charged)	A 56mm diameter bar is inlaid into the bottom of a 10kg weight. And the weight is to be dropped from a height of 1m onto a sample battery and then the bar will be across the center of the sample.	No fire No explosion No leakage

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10	Thermal shock(Fresh, Fully charged)	Batteries in hot box Temperature in 5°C±2°C/min, rising to 50°C±2°C keep 30min	No fire No explosion No leakage
11	Constant damp performance	Standard after the battery, Will a battery into 40°C±2°C, Relative humidity90%~95% At constant temperature and humidity box after 48h Battery will in environmental temperature 20±5°C Aside 2h, 0.2C ₅ A to terminate discharge current voltage,	No obvious deformation, hands rust, smoke, explosion, discharge time ≥36 min

7. Warranty

Warranty period for this product is 6 months starting from the date when the products left the door of manufacturer.

8. Liability

The user has to operate the products according to the instructions printed on the battery label or follow the advices described in this “Product Specification for Lithium Ion Batteries published by shenzhen pkcell battery Co., Limited. In case the battery were overheated or even catch fire or explosion caused by mishandling of the user side, shenzhen pkcell battery Co., Limited. will not be liable for the lose caused by any of such mishandling. shenzhen pkcell battery Co., Limited. will notify the users in written form if any modifications in specification, raw material, production process control.

9. Battery Packing Label

The following warnings should be indicated on the battery pack labels.

- Use a specified charger.
- Do not throw the battery into fire, or heat.
- Do not short-circuit the battery terminals.
- Do not disassemble the battery.

10. Warnings and Cautions in Handling the Lithium-ion Battery

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To prevent potential leaking, overheating or explosion of batteries please be advised to take following precautions:

WARNINGS!

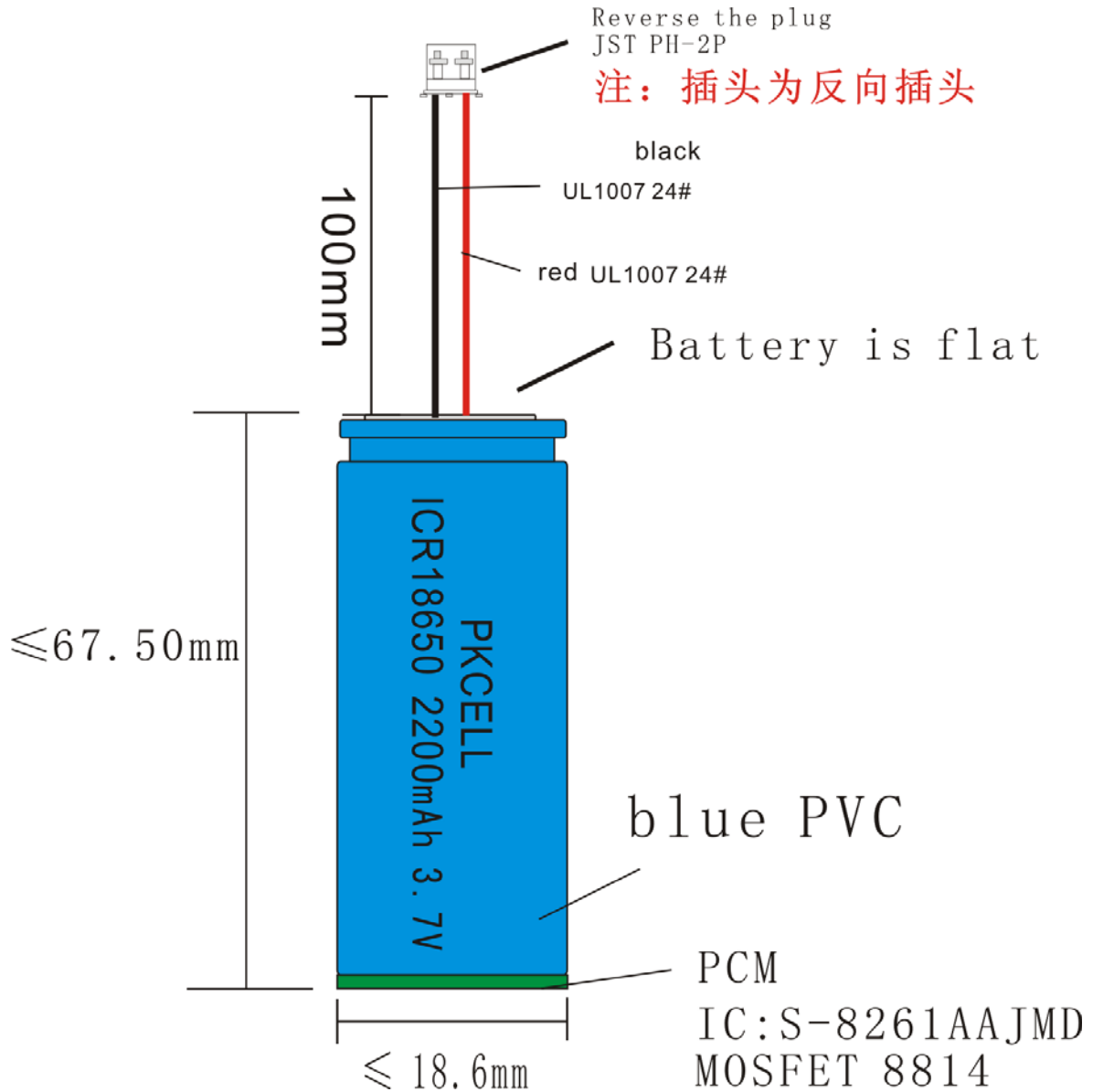
- Do not immerse the battery in water or seawater, and keep the battery in a cool dry environment during stands by period.
- Do not use or leave the battery near a heat source such as fire or heater.
- When recharging, use the battery charger specifically for that purpose.
- Do not reverse the position (+) and negative (-) terminals.
- Do not connect the battery to an electrical outlet.
- Do not dispose the battery in fire or heat.
- Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminal with metal objects such as wire.
- Do not transport or store the battery together with metal objects such as necklaces, hairpins etc.
- 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.
- Outer metal conduct can not contact the aluminum layer in AL laminate film, especially with electrification ,which will be “black spot ”and swelling easily.
- Do not use sharp things to hit the battery.

CAUTIONS!

- Do not use or leave the battery at very high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be shortened.
- Do not use it in a location where static electricity is rich, otherwise, the safety devices may be damaged, causing a harmful situation.
- In case the electrolyte get into the eyes due to the leakage of battery, do not rub the eyes! Rinse the eyes with clean running water, and seek medical attention immediately. Otherwise, it may injure eyes or cause a loss of sight.
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and place it in a contained vessel such as a metal box.
- In case the battery terminals are contaminated, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection between the battery and the electronic circuitry of the instrument.
- Be aware discarded batteries may cause fire, tape the battery terminals to insulate them before disposal.

12. Dimensions

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No.SET2016-00478

化学品安全技术说明书

MSDS Report

委托单位: 深圳市比苛电池有限公司
Client unit SHENZHEN PKCELL BATTERY CO.,LTD

样品名称: 锂离子电池
Name of sample Lithium-ion Battery

委托单位地址: 深圳市龙华新区中华路 24 号广明科技园 E2 栋
Address E2 Building, Guangming Technology Park, No.24
Zhonghua Road, Longhua New Area, Shenzhen, China



Tested By 主检: *Xielongling* Checked By 审核: *Calvin* Approved By 批准: *Billow*
Date 日期: Jan.12, 2016 Date 日期: Jan.12, 2016 Date 日期: Jan.12, 2016

中检集团南方电子产品测试（深圳）股份有限公司
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Material Safety Data Sheet

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No.SET2016-00478

Reviewed on Jan.12, 2016

1 化学品及企业标识 Identification of substance

样品名称 **Product name:** 锂离子电池 Lithium-ion Battery

型号 **Part No.:** ICR18650 2200MAH

制造商/供应商 **Manufacturer/ Producer:** 深圳市比苛电池有限公司

SHENZHEN PKCELL BATTERY CO.,LTD

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E2 Building, Guangming Technology Park, No.24 Zhonghua Road, Longhua New Area, Shenzhen, China

电话 **Telephone:** 0752-6917372

传真 **Fax:** 0752-6929108

电子邮件 **Mail:** /

化学品安全技术说明书号 **MSDS code:** SET2016-00478

2 成分/组成信息 Composition/Data on components

Chemical characterization:

化学成份 Chemical composition	重量百分比 in % by weight	CAS 号 CAS No.	EC 号 EC No.	分子式 Molecular Formula
Lithium Cobalt Dioxide	35	12190-79-3	235-362-0	LiCoO ₂
Graphite(various Carbons)	18	7782-42-5	231-955-3	C
Organic electrolyte	15	NA	NA	NA
Equivalent Max Lithium	3.5	7439-93-2	231-102-5	Li
Aluminum foil	4	7429-90-5	231-072-3	Al
Copper foil	14	7440-50-8	231-159-6	Cu
Lithium hexafluorophosphate	2	21324-40-3	244-334-7	LiF ₆ P
Steel and inter components	8.5	7439-89-6	231-096-4	Fe

缩写 Abbreviation:

CAS: Chemical Abstract Service

EC: European Inventory of Existing Commercial chemical Substances

3 危险性概述 Hazards identification

紧急情况概述:可能在火灾爆炸,释放氟化氢气体。

Emergency Overview: May explode in a fire, which could release hydrogen fluoride gas.

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侵入途径 Primary routes of entry:

皮肤接触: 接触已损坏电池可能引起灼伤。

Skin contact: Contact with damaged batteries may cause burns.

眼睛接触: 接触已损坏电池可能引起灼伤。

Eye contact: Contact with damaged batteries may cause burns.

吸入: 电池泄露释放蒸汽或气体, 吸入可能导致刺激呼吸道及眼睛。

Inhalation: Inhalation of vapors or fumes released due to heat or a large number of leaking batteries may cause respiratory and eye irritation.

摄入: 电池内物质摄入人体可能会引起口腔、喉咙和肠道烧伤和伤害。

Ingestion: Ingestion of battery contents may cause mouth, throat and intestinal burns and damage.

4 急救措施 First aid measures

皮肤接触: 如果电池泄漏, 电池内物质接触到皮肤, 立即脱去污染的衣着, 用大量清水冲洗15分钟以上。仍感觉刺激或疼痛, 立刻就医。

Skin contact: If the battery is leaking and the contained material contacts the skin, remove contaminated clothes quickly and rinse the skin with plenty of water at least 15 minutes. If irritation or pain persists, get medical aid at once.

眼睛接触: 如果电池泄漏, 电池内物质接触到眼睛, 用大量清水或生理盐水冲洗15分钟以上。立刻就医。

Eyes contact: If the battery is leaking and the contained material contacts the eyes, flush the eyes with plenty of water or saline water at least 15 minutes. Get medical aid at once.

吸入: 如果电池泄漏, 迅速脱离现场至空气新鲜处。保持呼吸道通畅。如呼吸困难, 给输氧。就医。
Inhalation: If the battery is leaking, remove to fresh air immediately. Keep the respiratory tract smooth. Use oxygen if available. Get medical aid.

摄入: 如果电池泄漏, 电池内物质摄入人体, 立即用清水冲洗口腔及周边。立刻就医。

Ingestion: If the battery is leaking and the contained material is ingested, rinse mouth and surrounding area with clear water at once. Get medical aid at once.

5 消防措施 Fire fighting measures

危险特性: 当电池暴露在火中时, 会引起爆炸和释放分解有害物质。

Danger characteristic: Batteries may burst and release hazardous decomposition products when exposed to a fire situation.

有害燃烧产物: 一氧化碳、二氧化碳、金属氧化物、刺激性烟雾等。

Hazardous combustion products: Carbon monoxide, carbon dioxide, metal oxide, irritate fume, etc.

灭火方法及灭火剂: 消防人员必须佩戴过滤式防毒面具(全面罩)或隔离式呼吸器、穿全身防火防毒服,

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在上风向灭火。尽可能将容器从火场移至空旷处。喷水保持火场容器冷却，直至灭火结束。灭火剂：雾状水、泡沫、干粉、二氧化碳、砂土。

Fire-Fighting method & media: The staff must equipped with filtermask (full mask) or isolated breathing apparatus. The staff must wear the clothes which can defence the fire and the toxic gas. Put out the fire in the upwind direction. Remove the container to the open space as soon as possible. Sparying water on the containers in the fireplace to keep them cool until finish extinguishment. Media: hazy water, foam, powder, CO₂, sandy clay.

6 泄露应急处理 Accidental release measures

应急处理:

1. 迅速撤离泄漏污染区人员至安全区，并进行隔离，严格限制出入；
2. 提供适当的防护及通风设备；
3. 用一个不产生粉尘的方法打扫处理泄漏物，尽可能多地收集泄漏处理物于有标签的合适的容器中；
4. 在安全状况下，选用合适方式阻止或减少泄漏，如用沙或泥土收齐围堵泄漏物；
5. 尽可能切断泄漏源，避免流入下水道或其它密闭空间；
6. 如果大量泄漏，收集回收泄漏物于合适且标示的有盖容器内，并运往专门废物处理场所处置。

Disposal methods:

1. Rapid evacuation leakage pollution area personnel to safe areas, and isolation, strictly limited access;
2. Provide adequate protection and ventilation equipment;
3. Cleaning the spillage with the method does not produce dust, collect the leakage in a suitable labeled container as much as possible;
4. In a safe condition, choose appropriate ways to prevent or reduce leakage, for example use sand or clay ring-fence leakage, possible cut off leakage source, avoid into sewer or other enclosed spaces;
5. Cut off the source of leakage as much as possible, avoid entering sewers or other confined space;
6. If a large number of leakage, collect and recycle leakage to suitable and indicative covered container, and shipped to a special waste disposal site disposal.

废弃处理方法: 所有废弃物必须参照联合国，国家，地方性法规进行处置。

Waste treatment methods: All waste must be referring to the United Nations, national and local regulations for disposal.

7 操作处置与储存 Handling and storage

操作注意事项: 皮肤应尽量避免长期接触。工作现场应保持通风。远离热源。未使用时密封容器。减少粉尘积聚和产生。避免眼睛接触，避免呼吸粉尘。接触后用肥皂和水清洗。空容器会包含此化学品残留，不要对空容器进行损坏。

Handling: Avoid long-term repeated contact with skin. Job site should keep ventilation. Keep away from heat. Sealed container when not using. Reduce dust accumulation and generation. Avoid eye contact. Avoid breathing dust. Wash with soap and water after contact. Empty containers will contain this chemical residue. Don't damage the empty container.

储存注意事项: 储存在一个低温，干燥，通风良好的环境。避免阳光直射。储存时远离食物和水源，

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吃饭喝水前彻底清洗双手。远离禁忌物，如强氧化剂，强酸。远离火种、热源。配备相应品种和数量的消防器材。储区应备有泄漏应急处理设备和合适的收容材料。

Storage: Stored in a low temperature, dry, well ventilated environment. Avoid direct sunlight. Store away from food and water, wash your hands thoroughly before eat bread or drink water. Far from taboo object, such as strong oxidizer, strong acid. Keep away from fire and heating sources. Equipped with corresponding varieties and number of fire equipment. Storage areas should be equipped with leakage emergency treatment equipment and suitable for accept materials.

8 接触控制/个体防护 Exposure controls and personal protection

监测方法: 无数据资料。

Monitoring method: No data available.

工程控制: 密闭操作时注意通风。确保车间蒸汽浓度在现行OSHA的要求下

Engineering controls: Ensure vapor concentration in the workshop under the requirements of existing OSHA.

呼吸系统防护: 空气中浓度超标时，必须佩戴自吸过滤式防毒面具（半面罩）。紧急事态抢救或撤离时，应该佩戴空气呼吸器。

Respiratory system safeguard: Exceed the standard concentration in air, must wear self-priming filter type gas mask (half mask), emergency rescue or evacuation, should wear air respirator.

眼睛防护: 戴化学安全防护眼镜。

Eye safeguard: Wear chemical safety protective glasses.

身体防护: 穿防毒物渗透工作服。

Body safeguard: Wear anti-static clothes.

手防护: 戴橡胶耐油手套。

Hand safeguard: Wear rubber oil resistant glove.

其他防护: 工作现场严禁吸烟。避免长期反复接触。

Else safeguard: No smoking at job site. Avoid prolonged and repeated contact.

9 理化特性 Physical and chemical properties:

基本的理化特性的信息General Information

状态State: 固体 Solid

颜色Color: 蓝色 Blue

化学性质Chemical properties:

沸点Boiling Point: 无数据资料Not Applicable

相对蒸气密度relative vapour density: 无数据资料Not Applicable

饱和蒸气压saturated vapor pressure: 无数据资料Not Applicable

标称电压Nominal Voltage(Cell/Battery/Power Bank): 3.7V

额定容量Rated capacity: 2200mAh

额定能量Rate Energy: 8.14Wh

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10 稳定性和反应活性 Stability and reactivity

稳定性: 常温常压下稳定。

Stability: Stable under ordinary conditions of use and storage.

避免接触的条件: 无数据资料

Avoid contact conditions: No data available

禁配物: 强氧化剂, 强酸

Prohibited content: Strong oxidizer, strong acids

聚合危害: 无数据资料

Aggregate harm: No data available

分解产物: 正常情况下使用, 无有害物质产生。

Decomposition product: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 毒理学资料 Toxicological information

毒理学影响的信息 toxicology influencing information

急性毒性: 无数据资料

Acute toxicity: No known significant effects or critical hazards.

刺激性: 吸入和皮肤接触可能引起过敏。

Irritation: May cause sensitization by Inhalation and skin contact.

慢性毒性: 无已知重大影响或严重危害。

Chronic toxicity: No known significant effects or critical hazards.

致癌性: 无已知重大影响或严重危害。

Carcinogenicity: No known significant effects or critical hazards.

生殖毒性: 无已知重大影响或严重危害。

Reproduction toxicity: No known significant effects or critical hazards.

如果电池被强制打开或毁坏, 立即丢弃。电池内部成分有刺激性或过敏性。

If the cells are opened through misuse or damage, discard immediately. Internal components of cell are irritants and sensitizers.

12 生态学资料 Ecological information

生态毒性: 无已知重大影响或严重危害。

Ecotoxicity: No known significant effects or critical hazards.

生物降解性: 无已知重大影响或严重危害。

Biological degradability: No known significant effects or critical hazards.

非生物降解性: 无已知重大影响或严重危害。

Non-living things degradability: No known significant effects or critical hazards.

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生物富集和生物积累性: 无已知重大影响或严重危害。
Biology gathering and biology accumulate: No known significant effects or critical hazards.

13 废弃处置 Disposal considerations

废弃处置方法: 所有废弃物必须参照联合国, 国家, 地方性法规进行处置。参照地方法规, 倾倒或丢弃的物质可能作为一种限制性的废弃物。清洗过盛装此物质容器的溶液也要按规定处理。需遵守废弃物法, 大气污染法, 水质污染法进行处置。

Waste disposal methods: All waste must be referring to the United Nations, national and local regulations for disposal, the dumped or discarded material may be regard as a restrictive waste referring to local regulations. Cleaned containers containing this substance were also required treatment. Comply with waste law. Atmospheric Pollution Act and water pollution law for disposal.

14 运输信息 Transport information

危险货物编号: 9

Number of dangerous goods: 9

UN 编号: 3480

UN Number: 3480

包装标志: 无数据

Packaging Mark: No data.

包装方法: 无数据

Packaging Method: No data.

运输注意事项:

锂聚合物电池(ICR18650 2200MAH) 符合UN38.3测试要求(UN38.3 测试报告编号SET2015-03949). 参阅国际航空运输协会危险货物规则(第57版)965条款, 国际海运危险货物规则(第37-14版)188条款及230条款。

电池应妥善包装, 防止短路。运输前应先检查包装容器是否完整、密封。运输过程中要确保容器不泄漏、不倒塌、不坠落、不损坏。防止货物倒塌。严禁与氧化剂、食品等混装混运。运输车船必须彻底清洗、消毒, 否则不得装运其它物品。运输过程中防止曝晒, 雨淋, 高温。中途停留时应远离火种、热源。船运时, 配装位置应远离卧室、厨房, 并与机舱、电源、火源等部位隔离。公路运输时要按规定路线行驶, 勿在居民区和人口稠密区停留。禁用木船、水泥船散装运输。

Transport Attentions:

Li-polymer Battery (ICR18650 2200MAH) is compliant with UN38.3 test requirement (UN38.3 Test Report No: SET2015-03949)

According to the Packing Instruction 965 section II of IATA DGR 57th Edition for transportation.

According to the special provision 188 and 230 of IMDG (37-14).

The batteries should be securely packed and protected against short-circuits. Examine whether the package of the containers are integrate and tighten closed before transport. Take in a cargo of them without falling, dropping, and breakage. Prevent collapse of cargo piles. Don't put the goods together with oxidizer and

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chief food chemicals. The transport vehicle and ship must be cleaned and sterilized otherwise it is not allowed to assemble articles. During transport, the vehicle should prevent exposure, rain and high temperature. For stopovers, the vehicle should be away from fire and heat sources. When transported by sea, the assemble place should keep away from bedroom and kitchen, and isolated from the engine room, power and fire source. Under the condition of Road Transportation, the driver should drive in accordance with regulated route, don't stop over in the residential area and congested area. Forbid to use wooden, cement for bulk transport.

15 法规信息 Regulations

OSHA Hazard communication standard (29 CFR 1910.1200)

Hazardous ___ Non-hazardous

请注意废物处理也应该满足当地法规的要求。

Please note that waste disposal should meet local regulatory requirements.

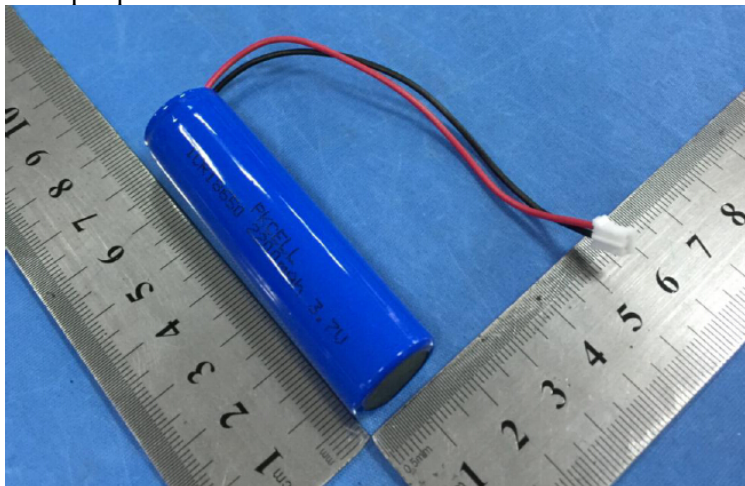
16 其他信息 Other information

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Note:

-Sample photo:



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