



MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT IDENTIFICATION

18650 Lithium ion cell,1500mAh, 3.7V.

MANUFACTURER

JIANGSU TENPOWER LITHIUM CO., LTD

ADDRESS

Nangang Rd, Emerging industries Zone, Jinfeng Town,Zhangjiagang,Jiangsu,China

COMPANY/UNDERTAKING IDENTIFICATION

Emergency Contacy: 86- 512 – 80159851

2. HAZARDS IDENTIFICATION

Lithium ion cells are not hazardous when used according to the instructions of the manufacturer under normal conditions. In case of abuse, there is a risk of rupture, fire, heat, or leakage of internal components, which could release hazardous materials.

SYMPTOMS OF EXPOSURE

Skin contact

No effect under routine handling and use.

Skin absorption

No effect under routine handling and use.

Eye contact

No effect under routine handling and use.

Inhalation

No effect under routine handling and use.

REPORTED AS CARCINOGEN

Not applicable

3. COMPOSITION INFORMATION

INGREDIENTS	%	CAS NUMBER
Lithium Nickel Oxide	16	12031-65-1
Lithium cobaltate	6.4	12190-79-3

INGREDIENTS	%	CAS NUMBER
lithium manganate	9.6	12057-17-9
Anode active material Graphite	17	7782-42-5
LiPF6	2	21324-40-3
EC	4	96-49-1
EMC	7	623-53-0
PC	1	108-32-7
Nickel	2	7440-02-0
Aluminum	12	7429-90-5
Copper	8	7440-50-8
Carbon	2	7440-44-0
Polyvinylidene fluoride	4	24937-79-9
Polyethylene	3	9002-88-4
Polyethylene terephthalate	6	25038-59-9

FURTHER INFORMATION

For information purposes:

(*) Main ingredients: Lithium hexafluorophosphate , organic carbonates

Because of the cell structure the dangerous ingredients will not be available if used properly.

During charge process a lithium graphite intercalation phase is formed.

Mercury content: Hg < 0.1mg/kg

Cadmium content: Cd < 1mg/kg

Lead content: Pb < 10mg/kg

4. FIRST-AID MEASURES

INHALATION, EYE CONTACT, and SKIN CONTACT: Not a health hazard.

INGESTION

If swallowed, obtain medical attention immediately.

If exposure to internal materials within cell due to damaged outer casing, the following actions are recommended.

INHALATION

Leave area immediately and seek medical attention.

EYE CONTACT

Rinse eyes with water for 15 minutes and seek medical attention.

SKIN CONTACT

Wash area thoroughly with soap and water and seek medical attention.

INGESTION

Drink milk/water and induce vomiting; seek medical attention.

5. FIRE FIGHTING MEASURES

GENERAL HAZARD

Cell is not flammable but internal organic material will burn if the cell is incinerated.

Combustion products include, but are not limited to hydrogen fluoride, carbon monoxide and carbon dioxide.

EXTINGUISHING MEDIA

Use extinguishing media suitable for the materials that are burning.

SPECIAL FIREFIGHTING INSTRUCTIONS

If possible, remove cell(s) from fire fighting area.

If heated above 120°C, cell(s) can explode/vent.

FIREFIGHTING EQUIPMENT

Use NIOSH/MSHA approved full-face self-contained breathing apparatus (SCBA) with full protective gear.

6. ACCIDENTAL RELEASE MEASURES

ON LAND

Place material into suitable containers and call local fire/police department.

IN WATER

If possible, remove from water and call local fire/police department.

7. HANDLING AND STORAGE

HANDLING

No special protective clothing required for handling individual cells.

STORAGE

Store in cool, dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS

Keep away from heat and open flame.

PERSONAL PROTECTION

Store in a cool dry place.

Respirator:

Not required during normal operations.
event of a fire.

SCBA required in the

Eye/face protection:

Gloves:

Foot protection:

Not required beyond safety practices of employer.

Not required for handling of cells.

Steel toed shoes recommended for large container handling.

Product Name: JIANGSU TENPOWER LITHIUM CO., LTD

9. PHYSICAL AND CHEMICAL PROPETIES

Appearance

Form: Solid

Color: Various

Odor: Odourless

Important health, safety and environmental information

Test method

pHValue	N/A
Flash point	N/A
Lower explosion	N/A
Vapor pressure	N/A
Density	N/A
Water solubility	Insoluble
Ignition temperature	N/A

10. STABILITY AND REACTIVITY

REACTIVITY

None

INCOMPATIBILITIES

None during normal operation.

Avoid exposure to heat, open flame, and corrosives.

HAZARDOUS DECOMPOSITION PRODUCTS

None during normal operating conditions. If cells are opened, hydrogen fluoride and carbon monoxide may be released.

CONDITIONS TO AVOID

Avoid exposure to heat and open flame.

Do not puncture, crush or incinerate.

11. TOXICOLOGICAL INFORMATION

Cells are not hazardous when used properly. In case of fire or leakage combustion and decomposition products may cause irritation and toxicity to skin, eye and respiratory systems.

Toxicity data of some substance is listed:

Hydrogen fluoride:

Extremely toxic, May be fatal if inhaled or ingested. Readily absorbed through the skin contact may be fatal. Possible mutagen. LCLO: 50 ppm/30m (human beings), LC50: 1276 ppm/1h (rats).

Carbon and graphite:

Slightly hazards in case of skin contact (irritant), ingestion, inhalation, which will cause chronic damage to upper respiratory tract and cardiovascular system.

Copper:

File No./Rev.: MSDS—163/C

Dust may cause respiratory irritation.

LD50: 3.5 mg kg⁻¹(mouse).

12. ECOLOGICAL INFORMATION

Some materials within the cell are bioaccumulative. Under normal conditions, these materials are contained and pose no risk to persons or the surrounding environment.

13. DISPOSAL INFORMATION

Recommended methods for safe and environmentally preferred disposal :

Product (waste from residues)

Do not throw out a used battery cell. Recycle it through the recycling company.

Contaminated packaging

Neither a container nor packing is contaminated during normal use. When internal materials leaked from a battery cell contaminates, dispose as industrial wastes subject to special control.

RCRA Waste Code:

No regulated

Dispose of according to all federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

With regard to transport, the following regulations are cited and considered:

The International Civil Aviation Organization (ICAO) Technical Instructions, Packing Instruction 965, Section IB ,

The International Air Transport Association (IATA) Dangerous Goods Regulations, Packing Instruction 965, Section IB (61th Edition)

The International Maritime Dangerous Goods (IMDG) Code (2018 Edition),
US Harzardous Materials Regulations 49 CFR(Code of Federal Regulations)
Sections 173-185 Lithium batterie and cells,

The UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria 38.3
Lithium batteries, Rev.6,

The article is nor restricted to IMO IMDG code according to special provision 188(Amdt.39-18)(2018 Edition)

Our products are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to all the applicable international and national governmental regulations, not limited to the above mentioned. We further certify that the enclosed products have been tested and fulfilled the requirements and conditions in accordance with UN Recommendations (T1 – T8) on the Transport of Dangerous Goods Model Regulations and the Manual of Testes and Criteria.

Test results of the UN Recommendation on the Transport of Dangerous Goods

Manual of Test and Criteria(38.3 Lithium battery)		Test results	Remark
No.	Test items		
T1	Altitude Simulation	Pass	
T2	Thermal Test	Pass	
T3	Vibration	Pass	
T4	Shock	Pass	
T5	External Short Circuit	Pass	
T6	Impact	Pass	

T7	Overcharge	Pass	For pack and single cell battery only
T8	Forced Discharge	Pass	

UN code:3480,3481

15. REGULATORY INFORMATION

For shipping regulations see section 14.

16. OTHER INFORMATION

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide.

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. Jiangsu Tenpower Lithium Co., Ltd. makes no warranty, expressed or implied, with respect to this information and disclaims all liabilities from reliance on it

First Edition : 2011-May-1 Latest Edition: 2020-Jan-2

Prepared and Approved By

Jingsu Tenpower Lithium Co., Ltd



Material Safety Data Sheet

1. Product and Company Identification

Important Note: As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use. This battery is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Material Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This MSDS should be retained and available for employees and other users of this product.

Commercial product name

INR18650-15Q

Use of the substance/preparation

Lithium-Ion battery

Manufacturer

SAMSUNG SDI Co., LTD

Address

HQ: 150-20, Gongse-ro, Giheung-gu, Yongin-si, Gyeonggi-do, Korea

Company/undertaking identification

Emergency Contact(Chemtrec)

1-800-424-9300: US and Canada / 1-703-527-3887: International

Further Information

Battery-System: Lithium-Ion (Li-ion)

Nominal Voltage: 3.6V

Rated Capacity: 1.5Ah

Wh rating: 5.4Wh

Anode (negative electrode): based on intercalation graphite

Cathode (positive electrode): based on lithiated metal oxide (Cobalt, Nickel, Manganese)

Remark:

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. SAMSUNG SDI Co., Ltd. makes no warranty, expressed or implied, with respect to this information and disclaims all liabilities from reliance on it.

2. Hazards Identification

Route(s) of Entry

There is no hazard when the measures for handling and storage are followed.

Signs and Symptoms of Exposure

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.



OSHA Hazard Communication: This material is not considered hazardous by the OSHA Hazard Communication Standard 29CFR 1910.1200.

Carcinogenicity (NTP): Not listed
 Carcinogenicity (IARC): Not listed
 Carcinogenicity (OSHA): Not listed

Special hazards for human health and environment

There is no hazard when the measures for handling and storage are followed.
 In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

3. Composition/information on ingredients

Hazardous components

CAS-No.	Chemical name	Quantity
7439-89-6	Iron	< 21%
7440-50-8	Copper	< 18%
12031-65-1	Lithium nickelate	< 15%
7782-42-5	Graphite	< 12%
12057-17-9	Lithium manganese oxide	< 10%
7429-90-5	Aluminium	< 8%
616-38-6	dimethyl carbonate	< 5%
9002-88-4	Polyethylene	< 4%
96-49-1	1,3-Dioxolan-2-one	< 2%
21324-40-3	lithium hexafluorophosphate(1-)	< 2%
623-53-0	Ethyl methyl carbonate	< 2%
9003-07-0	1-Propene homopolymer	< 2%
7440-02-0	Nickel	< 1%
24937-79-9	1,1-Difluoroethene homopolymer	< 1%
1333-86-4	Carbon black	< 1%
25640-14-6	1,4-Benzenedicarboxylic acid dimethyl ester polymer with 1,4-cyclohexanedimethanol and 1,2-ethanediol	< 1%
9010-94-0	2-Methyl-2-propenoic acid methyl ester polymer with 1,3-butadiene, ethenylbenzene and 2-propenenitrile	< 1%
554-13-2	lithium carbonate	< 1%
114435-02-8	4-Fluoro-1,3-dioxolan-2-one	< 1%
35239-19-1	2-Propenoic acid polymer with butyl 2-propenoate, ethenyl acetate and 2-ethylhexyl 2-propenoate	< 1%
9003-07-04	1-Propene homopolymer	< 1%
110-61-2	Butanedinitrile	< 1%
9004-32-4	Cellulose, carboxymethyl ether, sodium salt	< 1%
14807-96-6	Talc (Mg3H2(SiO3)4)	< 1%
24968-12-5	poly(1,4-butylene terephthalate)	< 1%



7439-96-5	Manganese	< 1%
24937-78-8	Acetic acid ethenyl ester polymer with ethene	< 1%
36619-23-5	1,4-Benzenedicarboxylic acid, dimethyl ester, polymer with 1,3-propanediol	< 1%
7440-44-0	Carbon	< 1%
13463-67-7	titanium dioxide	< 1%
7440-21-3	Silicon	< 1%
25038-81-7	1H,3H-Benzo[1,2-c:4,5-c']difuran-1,3,5,7-tetrone polymer with 4,4'-oxybis[benzenamine]	< 1%
7439-95-4	Magnesium	< 1%

Full text of each relevant R phrase can be found in heading 16.

Further Information

For information purposes:

(*) Main ingredients: Lithium hexafluorophosphate, organic carbonates

Because of the cell structure the dangerous ingredients will not be available if used properly. During charge process a lithium graphite intercalation phase is formed.

Mercury content: Hg < 0.1mg/kg

Cadmium content: Cd < 1mg/kg

Lead content: Pb < 10mg/kg

4. First Aid Measures

General information

The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing.

Undamaged, closed cells do not represent a danger to the health.

After inhalation

Ensure of fresh air. Consult a physician.

After contact with skin

In case of contact with skin wash off immediately with plenty of water. Consult a physician.

After contact with eyes

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical treatment by eye specialist.

After ingestion

Drink plenty of water.

Call a physician immediately.

5. Fire Fighting Measures

Suitable extinguishing media



Cold water and dry powder in large amount are applicable.
Use metal fire extinction powder or dry sand if only few cells are involved.

Special hazards arising from the chemical

May form hydrofluoric acid if electrolyte comes into contact with water.
In case of fire, the formation of the following flue gases cannot be excluded:
Hydrogen fluoride (HF), Carbon monoxide and carbon dioxide.

Protective equipment and precautions for firefighters

Wear self-contained breathing apparatus and protective suit.
Additional information
If possible, remove cell(s) from fire fighting area. If heated above 125°C, cell(s) can explode/vent. Cell is not flammable but internal organic material will burn if the cell is incinerated.

6. Accidental Release Measures

Personal precautions

Use personal protective clothing.
Avoid contact with skin, eyes and clothing.
Avoid breathing fume and gas.

Environmental precautions

Do not discharge into the drains/surface waters/groundwater.
Methods for cleaning up/taking up
Take up mechanically and send for disposal.

7. Handling and Storage

Handling

Advice on safe handling

Avoid short circuiting the cell. Avoid mechanical damage of the cell. Do not open or disassemble.
Advice on protection against fire and explosion
Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage rooms and vessels

Storage at room temperature (approx. 20°C) at approx. 20~60% of the nominal capacity (OCV approx. 3.6 - 3.9 V/cell).
Keep in closed original container.

8. Exposure controls/personal protection Exposure limit values Exposure limits

Ingredient	Risk Codes	Safety Description	Hazard	Exposure Controls/Personal Protection
Cobalt oxide	R22;R43; R50/53	S24;S37;S60;S61	Xn(Harmful) N (Dangerous for the environment)	0.1 mg/m ³ (TWA)



Manganese (VI) oxide	R20/22	S25	Xn(Harmful)	Airborne Exposure Limits: - OSHA Permissible Exposure Limit (PEL): 5 mg/m ³ Ceiling for manganese compounds as Mn - ACGIH Threshold Limit Value (TLV): 0.2 mg/m ³ (TWA) for manganese, elemental and inorganic compounds as Mn
Nickel oxide	R43,R49,R53	S45,S53,S61	T(Toxic)	Airborne Exposure Limits: For Nickel, Metal and Insoluble Compounds, as Ni: - OSHA Permissible Exposure Limits (PEL) - 1 mg/m ³ (TWA). For Nickel, Elemental / Metal: - ACGIH Threshold Limit Value (TLV) - 1.5 mg/m ³ (TWA), A5 - Not suspected as a human carcinogen. For Nickel, Insoluble Compounds, as Ni: - ACGIH Threshold Limit Value (TLV) - 0.2 mg/m ³ (TWA), A1 - Confirmed human carcinogen
Carbon	R36/37/38, R36/37, R20, R10	S22;S24/25	F(Highly Flammable) Xn(Harmful) Xi(Irritant)	Airborne Exposure Limits: - OSHA Permissible Exposure Limits (PELs): activated carbon (graphite, synthetic): Total particulate = 15 mg/m ³
Aluminium foil	R17,R15,R36/38,R10,R67,R65,R62,R51/53,R48/20,R38,R11,	S7/8,S43,S26,S62,S61, S36/37, S33,S29,S16,S9	F(Highly Flammable) Xn(Harmful) Xi(Irritant)	Airborne Exposure Limits: -OSHA Permissible Exposure Limit (PEL): 15 mg/m ³ (TWA) total dust and 5 mg/m ³ (TWA) repairable fraction for Aluminum metal as Al -ACGIH Threshold Limit Value (TLV): 10 mg/m ³ (TWA) Aluminum metal dusts
Copper foil	R11 R36 R37 R38	S5,S26,S16,S61, S36/37	F(Highly Flammable) N(Dangerous for the environment) Xn(Harmful) Xi(Irritant)	Copper Dust and Mists, as Cu: - OSHA Permissible Exposure Limit (PEL) - 1 mg/m ³ (TWA) - ACGIH Threshold Limit Value (TLV) - 1 mg/m ³ (TWA) Copper Fume: - OSHA Permissible Exposure Limit (PEL) - 0.1 mg/m ³ (TWA) - ACGIH Threshold Limit Value (TLV) - 0.2 mg/m ³ (TWA)
Polyvinylidene fluoride (PVdF)		S22;S24/25		

Additional advice on limit values

During normal charging and discharging there is no release of product.

Occupational exposure controls

No specific precautions necessary.

Protective and hygiene measures

When using do not eat, drink or smoke. Wash hands before breaks and after work.

Respiratory protection

No specific precautions necessary.

Hand protection

No specific precautions necessary.

Eye protection

No specific precautions necessary.

Skin protection

No specific precautions necessary.

9. Physical and Chemical Properties

Appearance

Form: Solid
Color: Various
Odor: Odourless

Important health, safety and environmental information

Test method

pHValue:	n.a.
Flash point:	n.a.
Lower explosion limits:	n.a.
Vapour pressure:	n.a.
Density:	n.a.
Water solubility:	Insoluble
Ignition temperature:	n.a.

10. Stability and Reactivity USA, EU

Stability

Stable

Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Do not puncture, crush or incinerate.

Materials to avoid

No materials to be especially mentioned.

Hazardous decomposition products

In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.

Possibility of Hazardous Reactions

Will not occur

Additional information

No decomposition if stored and applied as directed.

11. Toxicological Information

Empirical data on effects on humans

If appropriately handled and if in accordance with the general hygienic rules, no damages to health have become known.

12. Ecological Information

Further information

Ecological injuries are not known or expected under normal use. Do not flush into surface water or sanitary sewer system.

13. Disposal Considerations

Advice on disposal

For recycling consult manufacturer.

Contaminated packaging

Disposal in accordance with local regulations.

14. Transport Information

With regard to transport, the following regulations are cited and considered:

- The International Civil Aviation Organization (ICAO) Technical Instructions, Packing Instruction 965, Section I B or II (2015-2016 Edition),
- The International Air Transport Association (IATA) Dangerous Goods Regulations, Packing Instruction 965, Section I B or II (56th Edition, 2015)
- The International Maritime Dangerous Goods (IMDG) Code (2014 Edition), [Special provision 188, 230]
- US Hazardous Materials Regulations 49 CFR(Code of Federal Regulations) Sections 173.185 Lithium batteries and cells,
- The UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria 38.3 Lithium batteries, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type (latest version is Revision 5, Amendment 2)
- UN No. 3480

Our products are properly classified, described, packaged, marked, and labeled, and are in proper condition for transportation according to all the applicable international and national governmental regulations, not limited to the above mentioned. We further certify that the enclosed products have been tested and fulfilled the requirements and conditions in accordance with UN Recommendations (T1 – T8) on the Transport of Dangerous Goods Model Regulations and the Manual of Testes and Criteria.

Test results of the UN Recommendation on the Transport of Dangerous Goods

Manual of Test and Criteria (38.3 Lithium battery)	Test Results	Remark
---	---------------------	---------------



No	Test item		
T1	Altitude Simulation	Pass	
T2	Thermal Test	Pass	
T3	Vibration	Pass	
T4	Shock	Pass	
T5	External Short Circuit	Pass	
T6	Impact/Crush	Pass	
T7	Overcharge	Pass	For pack and single cell battery only
T8	Forced Discharge	Pass	

15. Regulatory Information

U.S. Regulations

National Inventory TSCA

All of the components are listed on the TSCA inventory.

SARA

To the best of our knowledge this product contains no toxic chemicals subject to the supplier notification requirements of Section 313 of the Superfund Amendments and Reauthorization Act (SARA/EPCRA) and the requirements of 40 CFR Part 372.

Regulatory information EU

Labeling

Hazardous components which must be listed on the label

As an article the product does not need to be labeled in accordance with EC directives or respective national laws.

EU regulatory information

1999/13/EC (VOC): 0 %

16. Other Information

Hazardous Materials Information Label (HMIS)

Health: 0
 Flammability: 0
 Physical Hazard: 0

NFPA Hazard Ratings

Health: 0
 Flammability: 0
 Reactivity: 0
 Unique Hazard:

Full text of R-phrases referred to under sections 2 and 3

R10 Flammable.
 R20/22 Harmful by inhalation and if swallowed.
 R22 Harmful if swallowed.
 R34 Causes burns.
 R40 Limited evidence of a carcinogenic effect.
 R43 May cause sensitization by skin contact.



R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.

Further Information

Data of sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product

(s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)"

The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.