

MATERIAL SAFETY DATA SHEET**Model INR18650MF1 Lithium Ion Rechargeable Battery****LG CHEMICAL LTD****1. Chemical Product and Company Identification****Product Identification**

LG CHEM INR18650MF1 Lithium-Ion Battery

Manufacturer

LG Chemical Ltd.

Twin Tower

Youido-Dong 120, Youngdeungpo-Ku

Seoul, Korea

Emergency Telephone Number

82-2-3773-7256

2. Composition Information

Hazardous Ingredients	%	CAS Number
Aluminum Foil	2-10	7429-90-5
Metal Oxide (proprietary)	20-50	
Polyvinylidene Fluoride (PVDF)	<5	24937-79-9
Copper Foil	2-10	7440-50-8
Carbon (proprietary)	10-30	7440-44-0
Electrolyte (proprietary)	10-20	
Stainless steel, Nickel and inert materials	Remainder	N/A

* Equivalent Lithium content: 0.66g, Cell Energy: 7.95 Wh

3. Hazards Identification

Emergency Overview

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

Use extinguishing media suitable for materials burning in fire.

Primary routes of entry

Skin contact	:	NO
Skin absorption	:	NO
Eye contact	:	NO
Inhalation	:	NO
Ingestion	:	NO

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

4. First Aid Measures

Inhalation

Not a health hazard.

Eye contact

Not a health hazard.

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. 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 160°C, cell(s) may 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 a cool, dry place.

8. Exposure Controls / Personal Protection

Engineering controls

Keep away from heat and open flame. Store in a cool dry place.

Personal Protection

Respirator

Not required during normal operations. SCBA required in the event of a fire.

Eye/face protection

Not required beyond safety practices of employer.

Gloves

Not required for handling of cells.

Foot protection

Steel toed shoes recommended for large container handling.

9. Physical and Chemical Properties

State	Solid
Odor	N/A
PH	N/A
Vapor pressure	N/A
Vapor density	N/A
Boiling point	N/A
Solubility in water	Insoluble
Specific gravity	N/A
Density	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

This product does not elicit toxicological properties during routine handling and use.

Sensitization	Teratogenicity	Reproductive toxicity	Acute toxicity
NO	NO	NO	NO

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

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 Considerations

California regulated debris

RCRA Waste Code : Nonregulated

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

14. Transport Information

Lithium Ion batteries are considered to be "Rechargeable batteries" and meet the requirements of transportation by the U.S. Department of Transportation(DOT), the International Civil Aviation Administration(ICAO), the International Maritime Dangerous Goods (IMDG) Code.

Even classified as lithium ion batteries (UN3480), 2016 IATA Dangerous Goods Regulations 57th edition Packing Instruction 965 Section IB or II is applied.

The general and additional requirements apply to all lithium ion cells and batteries prepared for transport according to this packing instruction:

- 1) Section IB applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities that exceed the allowance permitted in Section II, Table 965-II; and

TABLE 965-IB

	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
Lithium ion cells and batteries	10 kg	10 kg

OUTER PACKAGINGS			
Type	Drums	Jerrycans	Boxes

- 2) Section II applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh and lithium ion batteries with a Watt hour rating not exceeding 100 Wh packed in quantities not exceeding the allowance permitted in Section II, Table 965-II.

TABLE 965-II

Contents	Lithium ion cells and/or batteries with a Watt-hour rating of 2.7 Wh or less	Lithium ion cells with a Watt-hour rating of more than 2.7 Wh but not more than 20 Wh	Lithium ion batteries with a Watt-hour rating of more than 2.7 Wh but not more than 100 Wh
1	2	3	4
Maximum number of cells/batteries per package	No limit	8 cells	2 Batteries
Maximum net quantity per package	2.5 kg	N/A	N/A

Cells and/or batteries specified in columns 2, 3 and 4 of Table 965-II must not be combined in the same package.

Even classified as lithium ion batteries (UN3481), 2016 IATA Dangerous Goods Regulations 57th edition Packing Instruction 966 Section I or II is applied.

The general requirements apply to all lithium ion cells and batteries contained in equipment prepared for transport according to this packing instruction:

1) Section I applies to lithium ion cells with a Watt-hour rating in excess 20 Wh or lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and

TABLE 966-I

UN number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN 3481 Lithium ion batteries packed with equipment	5 kg	35 kg

OUTER PACKAGINGS																	
Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alu-minium	Ply-wood	Fibre	Plastic	Other metal	Steel	Alu-minium	Plastic	Steel	Alu-minium	Wood	Ply-wood	Recon-stituted wood	Fibre-board	Plastic	Other metal
Spec.	1A2	1B2	1D	1G	1H2	1N2	3A2	3B2	3H2	4A	4B	4C1 4C2	4D	4F	4G	4H2	4N

2) Section II applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh or lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities not exceeding the allowance permitted in Section II, Table 966-II.

TABLE 966-II

	Passenger aircraft	Cargo Aircraft Only
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg

OUTER PACKAGINGS			
Type	Drums	Jerricans	Boxes

Even classified as lithium ion batteries (UN3481), 2016 IATA Dangerous Goods Regulations 57th edition Packing Instruction 967 Section I or II is applied.

The general requirements apply to all lithium ion cells and batteries contained in equipment prepared for transport according to this packing instruction:

- 1) Section I applies to lithium ion cells with a Watt-hour rating in excess 20 Wh or lithium ion batteries with a Watt-hour rating in excess of 100 Wh, which must be assigned to Class 9 and are subject to all of the applicable requirements of these Regulations; and

TABLE 967-I

UN number	Net quantity per package Passenger aircraft	Net quantity per package Cargo Aircraft Only
UN 3481 Lithium ion batteries contained in equipment	5 kg	35 kg

OUTER PACKAGINGS—Strong outer packagings, such as:																	
Type	Drums						Jerricans			Boxes							
Desc.	Steel	Alu- minium	Ply- wood	Fibre	Plastic	Other metal	Steel	Alu- minium	Plastic	Steel	Alu- minium	Wood	Ply- wood	Recon- stituted wood	Fibre- board	Plastic	Other metal

- 2) Section II applies to lithium ion cells with a Watt-hour rating not exceeding 20 Wh or lithium ion batteries with a Watt-hour rating not exceeding 100 Wh packed in quantities not exceeding the allowance permitted in Section II, Table 967-II.

TABLE 967-II

	Passenger aircraft	Cargo Aircraft Only	
Net quantity of lithium ion cells or batteries per package	5 kg	5 kg	
OUTER PACKAGINGS			
Type	Drums	Jerricans	Boxes

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 3 subsection 38.3.

The product has been evaluated according to the UN Manual of Tests and Criteria.

No.	Test Item	Criteria	Result
Test 1	Altitude simulation	-No leakage, venting, disassembly, rupture and no fire. -Measuring mass before/after each test. (If M>5g, less than 0.1%) -Measuring voltage before/after each test. (more than 90%)	Pass
Test 2	Thermal test		Pass
Test 3	Vibration		Pass
Test 4	Shock		Pass

Test 5	External circuit short	-No disassembly, rupture and fire within six hours of this test.	Pass
Test 6	Impact	-Max. temperature should not exceed 170 °C.	Pass
Test 7	Overcharge	-No disassembly and fire within seven days of the test.	Pass

IMDG Code [special provision 188]

The “Special Provisions” are referred to in Column M of the List of Dangerous Goods and the information

contained therein is additional to that shown for the relevant entry. Where the wording of the special provision is equivalent to that in the UN Model Regulations the UN special provision number is shown in parentheses immediately following the air mode special provision number.

A88 Prototype or low production, (i.e. annual production runs consisting of no more than 100 lithium cells or batteries) lithium cells or batteries that have not been tested to the requirements in subsection 38.3 of the UN Manual of Tests and Criteria may be transported aboard cargo aircraft, if approved by the appropriate authority of the State of origin and the following requirements are met:

- (a) except as provided in paragraph (c), the cells or batteries must be transported in an outer packaging that is a metal, plastic or plywood drum or a metal, plastic or wooden box and that meets the criteria for Packing Group I packagings;
- (b) except as provided in paragraph (c), each cell or battery must be individually packed in an inner packaging inside an outer packaging and surrounded by

cushioning material that is non-combustible, and by cushioning material that is non-combustible, and against short-circuiting;

(c) lithium batteries with a mass of 12 kg or greater and having a strong, impact resistant outer casing, or assemblies of such batteries, may be packed in strong outer packagings or protective enclosures not subject to the requirements of Section 6 of these Regulations. The batteries or battery assemblies must be protected against short circuiting; and

(d) a copy of the document of approval showing the quantity limitations must accompany the consignment.

A99 Irrespective of the per package quantity limit for cargo aircraft specified in Column L of the List of Dangerous Goods (Subsection 4.2), and in Section I of Packing Instructions 965, 966, 967, 968, 969 or 970, a lithium battery or battery assembly (UN 3090 or UN 3480), including when packed with, or contained in equipment (UN 3091 or UN 3481) that meets the other requirements of Section I of the applicable packing instruction may have a mass exceeding 35 kg, if approved by the appropriate authority of the State of origin. A copy of the document of approval must accompany the consignment.

A154 Lithium batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport (e.g. those being returned to the manufacturer for safety reasons).

A164 Any electrical battery or battery powered device, equipment or vehicle having the potential of a dangerous evolution of heat must be prepared for transport so as to prevent:

(a) a short circuit (e.g. in the case of batteries by the effective insulation of exposed terminals; or in the case of equipment, by disconnection of the battery and protection of exposed terminals); and

(b) unintentional activation.

A183 Waste batteries and batteries being shipped for recycling or disposal are forbidden from air transport unless approved by the appropriate national authority of the State of Origin and the State of the Operator.

15. Regulatory Information

This product is not hazardous under the criteria of the Federal Occupational Safety and Health Administration(OSHA) Hazard Communication Standard. (29 CFR 1910.1200)

IATA Dangerous Goods Regulations 57th Edition Effective 1 January 2016.

_____Hazardous

_____✓_____Non-hazardous

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:

Report Representative

LG Chem.