HUGHES NETWORK SYSTEMS, LLC

Material Safety Data Sheet
For
3500800-0008

(Assembly 3501192-0001 with O-ring)

Hughes Network Systems, LLC does hereby certify that the attached MSDS of Rosslare Enterprises Ltd. (Rosslare Electronics Shenzhen Ltd.) for product model RS707+121 fully and completely applies to the Hughes part number 3500800-0008 battery pack (assembly 3501192-0001 with O-ring).

21 February 2020
Revision 3

Hughes Network Systems, LLC
11717 Exploration Lane, Germantown, MD 20876

Battery Pack 3500800-0008

The battery pack 3500800-0008 comprises four LG ICR18650E1 Lithium-Ion cells as described in the attached MSDS.

Battery pack capacity is indicated on the Battery pack label shown below.

Battery Pack 3500800-0008

Rosslare Enterprises Ltd.

Rosslare Electronics Shenzhen Ltd.

MATERIAL SAFETY DATA SHEET

For

RS707+122 / 3500800-0008 / 3501192-0001 REV B

Rosslare hereby certify that the chemical materials contained in this RS707+122 / 3500800-0008 / 3501192-0001 battery pack is wholly part of the cell employed in the assembly. As sure, the attached MSDS of LG Chemical Ltd. for the Li-ion cell model INR18650F1L, 3.35Ah, fully complement and become contiguous part of this MSDS certification being provided.

ROSSLARE ENTERPRISES LTD

Date: 21 February 2020

Rosslare Enterprises Ltd. , Room 905-906, 9/F, Wing Fat Ind. Bldg., 12 Wang Tai Rd., Kowloon Bay, Kowloon, Hong Kong.

Rosslare Electronics Shenzhen Ltd., Block 2, Phase 1, A Disrtrict, Baiwangxin Industrial Park, Songbai Rd., Xili, Nanshan, Shenzhen, China

LG Chem	SAFETY DATA SHEET	Version: R0001.0001
		Date of issue: 2020-01-06
		Revision date: Not applicable
	INR18650F1L	Change List:

Copyright 2019. LG Chem, Ltd. all rights reserved.

1. IDENTIFICATION

A. Product name

- INR18650F1L

B. Recommended use and restriction on use

- General use : Not available
- Restriction on use : Not available

C. Manufacturer / Supplier / Distributor information

○ **Manufacturer information**

- Company name : LG Chem, Ltd.
- Address : 188, Munji-ro, Yuseong-gu, Daejeon, Republic of Korea
- Dept. : 소형전지.개발.원통형.개발4팀
- Telephone number : --
- Emergency telephone number : --
- Fax number :
- E-mail address : gaheekang@lgchem.com

○ **Supplier/Distributer information**

- Company name : LG Chem, Ltd.
- Address : 188, Munji-ro, Yuseong-gu, Daejeon, Republic of Korea
- Dept. : 소형전지.개발.원통형.개발4팀
- Telephone number : --
- Emergency telephone number : --
- Fax number :
- E-mail address : gaheekang@lgchem.com

2. HAZARD IDENTIFICATION

A. GHS Classification

- Serious eye damage/irritation : Category2A
- Carcinogenicity : Category1A
- Specific target organ toxicity(Repeated exposure) : Category2
- Acute aquatic toxicity : Category1
- Chronic aquatic toxicity : Category1

B. GHS label elements

○ **Hazard symbols**

○ **Signal words**

- Danger

○ **Hazard statements**

- H319 Causes serious eye irritation
- H350 May cause cancer
- H373 May cause damage to organs through prolonged or repeated exposure (Refer Section SDS 11)
- H400 Very toxic to aquatic life
- H410 Very toxic to aquatic life with long lasting effects

ROSSLARE ENTERPRISES LTD.

○ **Precautionary statements**

1) Prevention

- P201 Obtain special instructions before use.
- P202 Do not handle until all safety precautions have been read and understood.
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P264 Wash hands thoroughly after handling.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P281 Use personal protective equipment as required.

2) Response

- P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- P308+P313 If exposed or concerned: Get medical advice/attention.
- P314 Get medical advice/attention if you feel unwell.
- P337+P313 If eye irritation persists: Get medical advice/attention.
- P391 Collect spillage.

3) Storage

- P405 Store locked up.

4) Disposal

- P501 Dispose of contents/container in accordance with local/regional/national/international regulation

C. Other hazards which do not result in classification : (NFPA Classification)

○ **NFPA grade (0 ~ 4 level)**

- Health : 2, Flammability : 0, Reactivity : 0

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	Trade names and Synonyms	CAS No.	Content(%)
Cobalt lithium manganese nickel oxide	-	182442-95-1	30-50
1,3-Dioxolan-2-one	1,3-Dioxolan-2-one ; Dioxolone-2 ; Ethylene carbonate ; Ethylene glycol carbonate ; Glycol carbonate ; Carbonic acid, cyclic ethylene ester ; Cyclic ethylene carbonate ; 2-Oxo-1, 3-dioxolan	96-49-1	10-20
Graphite	Black lead ; Mineral carbon ; Plumbago	7782-42-5	10-30
Copper	Copper concentrate ; Copper element ; Copper powder ; Copper metal ;	7440-50-8	2-10
Aluminium	Allbri aluminum paste and powder ; Aluminium bronze ; Aluminium flake ; Aluminum dehydrated ; Aluminum powder ; Metana ; Metana aluminum paste ; Noral aluminium ;	7429-90-5	2-10
Lithium hexafluorophosphate(1-)	Lithium hexafluorophosphate ; Phosphate(1-), hexafluoro-, lithium (1:1) ; Phosphate(1-), hexafluoro-, lithium ; lithium hexafluorophosphate(1-) ; LITHIUM PHOSPHOHEXAFLUORIDE ; Lithium fluophosphate ; Lithium hexafluoro phosphate ; Lithium hexafluorophosphate ; Lithium hexafluorophosphate (LiPF6) ; Lithium phosphorus fluoride (LiPF6) ;	21324-40-3	<5
1,1-Difluoroethene homopolymer	-	24937-79-9	<5
Maleic anhydride polymer with 1,3-butadiene and styrene	-	27288-99-9	<1

4. FIRST AID MEASURES

ROSSLARE ENTERPRISES LTD

A. Eye contact

- Do not rub your eyes.
- Immediately flush eyes with plenty of water for at least 15 minutes and call a doctor/physician.
- Get medical attention immediately.
- Go to the hospital immediately if symptoms(flare, irritate) occur.
- Remove contact lenses if worn.

B. Skin contact

- Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
- Wash contaminated clothing thoroughly before re-using.
- Get medical attention immediately.
- Remove contaminated clothing, shoes and isolate.
- Wear gloves when washing the patient, and please avoid contact with contaminated clothing.

C. Inhalation contact

- When exposed to large amounts of steam and mist, move to fresh air.
- Take specific treatment if needed.
- Get medical attention immediately.
- If breathing is stopped or irregular, give artificial respiration and supply oxygen.

D. Ingestion contact

- Please be advised by doctor whether induction of vomit is demanded or not.
- Rinse your mouth with water immediately.
- Get medical attention immediately.

E. Delayed and immediate effects and also chronic effects from short and long term exposure

- Not available

F. Notes to physician

- Notify medical personnel of contaminated situations and have them take appropriate protective measures.
- If exposed or concerned, get medical attention/advice.

5. FIREFIGHTING MEASURES

A. Suitable (Unsuitable) extinguishing media

- Dry chemical, carbon dioxide, regular foam extinguishing agent, spray
- Avoid use of water jet for extinguishing

B. Specific hazards arising from the chemical

- Not available

C. Special protective actions for firefighters

- Notify your local firestation and inform the location of the fire and characteristics hazard.
- Avoid inhalation of materials or combustion by-products.
- Do not approach the tank surrounded by fire until it is extinguished.
- Use appropriate extinguishing measure suitable for surrounding fire.
- Wear appropriate protective equipment.
- Keep containers cool with water spray.

6. ACCIDENTAL RELEASE MEASURES

A. Personal precautions, protective equipment and emergency procedures

- Wear proper personal protective apparatus as indicated in Section 8 and avoid skin contact and inhalation.
- Must work against the wind, let the upwind people to evacuate.
- Move container to safe area from the leak area.
- Avoid skin contact and inhalation.
- Cleanup and disposal under expert supervision is advised.

BOSSLARE ENTERPRISES LTD.

- Keep unauthorized people away,isolate hazard area and deny entry.

B. Environmental precautions

- Prevent runoff and contact with waterways, drains or sewers.
- If large amounts have been spilled, inform the relevant authorities.

C. Methods and materials for containment and cleaning up

- Large spill : Stay upwind and keep out of low areas. Dike for later disposal.
- Notify the central and local government if the emission reach the standard threshold.
- Disposal of waste shall be in compliance with the Wastes Control?Act
- Appropriate container for disposal of spilled material collected.
- Avoid entering to sewers or water system.
- Prevent the influx to waterways, sewers, basements or confined spaces.
- Spilled material should be treated as a potential risk of waste collected.

7. HANDLING AND STORAGE

A. Precautions for safe handling

- Since emptied containers retain product residue(vapor, liquid, solid) follow all MSDS and label warnings even after container is emptied.
- Avoid contact with incompatible materials.
- Get the manual before use.
- Do not handle until all safety precautions have been read and understood.
- Contaminated work clothing should not be allowed out of the workplace.

B. Conditions for safe storage, including any incompatibilities

- Do not apply any physical shock to container.
- Avoid direct sunlight.
- Keep in the original container.
- Please pay attention to incompatibilities materials and conditions to avoid.
- Keep sealed when not in use.
- By specifying a storage area for carcinogenic substances.
- Collected them in sealed containers.
- Store away from water and sewer.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

A. Exposure limits

- **ACGIH TLV**
  - [Cobalt lithium manganese nickel oxide] : TWA 0.1 mg/m3, Nickel Soluble inorganic compounds
  - [Graphite] : TWA, 2 mg/m3, Respirable particulate mass
  - [Copper] : TWA, 0.2 mg/m3 (Fume, as Cu), TWA, 1 mg/m3 (Dusts and Mists, as Cu)
  - [Aluminium] : TWA, 1 mg/m3, Respirable Particulate Matter
- **OSHA PEL**
  - [Aluminium]: 15 mg/m3 (Total dust), 5 mg/m3 (Respirable fraction)
  - [Graphite]: 15 mppcf (Graphite, Natural)/15 mg/m3 (Total dust), 5 mg/m3 (Respirable fraction)(Graphite, syntheric)
  - [Cobalt lithium manganese nickel oxide]: 1mg/m3
  - [Copper]: 0.1 mg/m3 (Fume), 1 mg/m3 (Dusts and mists)

B. Engineering controls

- Business owner is recommended to maintain below recommended exposure limits for the working place with general exhaust of gas/vapour/mist/fume.

C. Individual protection measures, such as personal protective equipment

- **Respiratory protection**
  - Respiratory protection is ranked in order from minimum to maximum.
  - Consider warning properties before use.
- **Eye protection**
  - Wear primary eye protection such as splash resistant safety goggles with a secondary protection face shield.

ROSSLARE ENTERPRISES LTD.

- Provide an emergency eye wash station and quick drench shower in the immediate work area.

○ **Hand protection**

- Wear appropriate glove.

○ **Skin protection**

- Wear appropriate clothing.

○ **Others**

- Not available

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Appearance	
- Appearance	Other
- Color	Not available
B. Odor	Not available
C. Odor threshold	Not available
D. pH	Not available
E. Melting point/Freezing point	Not available
F. Initial Boiling Point/Boiling Ranges	Not available
G. Flash point	Not available
H. Evaporation rate	Not available
I. Flammability(solid, gas)	Not available
J. Upper/Lower Flammability or explosive limits	Not available
K. Vapour pressure	Not available
L. Solubility	Not available
M. Vapour density	Not available
N. Specific gravity(Relative density)	Not available
O. Partition coefficient of n-octanol/water	Not available
P. Autoignition temperature	Not available
Q. Decomposition temperature	Not available
R. Viscosity	Not available
S. Molecular weight	Not available

10. STABILITY AND REACTIVITY

A. Chemical Stability

- This material is stable under recommended storage and handling conditions.

B. Possibility of hazardous reactions

- Hazardous Polymerization will not occur.

C. Conditions to avoid

- Avoid contact with incompatible materials and condition.
- Avoid : Accumulation of electrostatic charges, Heating, Flames and hot surfaces

D. Incompatible materials

- Not available

E. Hazardous decomposition products

- May emit flammable vapour if involved in fire.

11. TOXICOLOGICAL INFORMATION

A. Information on the likely routes of exposure

○ **(Respiratory tracts)**

- Not available

○ **(Oral)**

- Not available

BOSSLARE ENTERPRISES LTD

○ **(Eye·Skin)**

- Causes serious eye irritation

B. Delayed and immediate effects and also chronic effects from short and long term exposure

○ **Acute toxicity**

*** Oral**

- Product (ATEmix) : 2000mg/kg < ATEmix <= 5000mg/kg
- [Cobalt lithium manganese nickel oxide] : LD50 >2000 mg/kg Rat (NICNAS)
- [1,3-Dioxolan-2-one] : LD50 = 10000 mg/kg Rat (NLM)
- [Graphite] : LD50 >2000 mg/kg Rat (OECD Guideline 423 ,GLP)
- [Copper] : LD50 481 mg/kg Rat (OECD TG 401, GLP)
- [Aluminium] : LD50 > 15900 mg/kg Rat (OECD TG 401)

*** Dermal**

- Product (ATEmix) : >5000mg/kg
- [1,3-Dioxolan-2-one] : LD50 > 3000 mg/kg Rabbit (NLM)
- [Copper] : LD50 > 2000 mg/kg Rat (OECD TG 402, GLP)

*** Inhalation**

- Product (ATEmix) : Not available
- [Cobalt lithium manganese nickel oxide] : 0.05< LC50 <=0.5 mg/L/4hr
- [Graphite] : Dust LC50 > 2 mg/ℓ 4 hr Rat (OECD Guideline 403, GLP) (No deaths, not classified (ECHA))
- [Copper] : LC50 > 5.11 mg/ℓ 4 hr Rat (OECD TG 436, GLP)
- [Aluminium] : Dust LC50 > 0.888 mg/ℓ 4 hr Rat (OECD TG 403, GLP)

○ **Skin corrosion/irritation**

- Not available

○ **Serious eye damage/irritation**

- Causes serious eye irritation

○ **Respiratory sensitization**

- Not available

○ **Skin sensitization**

- Not available

○ **Carcinogenicity**

*** IARC**

- Not available

*** OSHA**

- Not available

*** ACGIH**

- [Lithium hexafluorophosphate(1-)] : A4 (Fluorides)
- [1,1-Difluoroethene homopolymer] : A4 (Fluorides)
- [Aluminium] : A4

*** NTP**

- Not available

*** EU CLP**

- Not available

○ **Germ cell mutagenicity**

- Not available

○ **Reproductive toxicity**

- Not available

○ **STOT-single exposure**

- Not available

○ **STOT-repeated exposure**

- May cause damage to organs through prolonged or repeated exposure (Refer Section SDS 11)

○ **Aspiration hazard**

- Not available

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

○ **Fish**

ROSSLARE ENTERPRISES LTD.

- [Cobalt lithium manganese nickel oxide] : LL50 >100 mg/ℓ 96 hr Pimephales promelas (NICNAS)
- [Graphite] : LC50 > 100 mg/ℓ 96 hr (Danio rerio (OECD Guideline 203,GLP)
- [1,3-Dioxolan-2-one] : LC50 = 238.065 mg/ℓ 96 hr (Estimate)
- [Copper] : LC50 0.286 mg/ℓ 96 hr Oncorhynchus mykiss (LC50 0.28640% sewage treatment plant effluent, 0.164river water mg/ℓ 96hr)

○ **Crustaceans**

- [Cobalt lithium manganese nickel oxide] : EL50 >100 mg/ℓ 48 hr Daphnia magna (NICNAS)
- [1,3-Dioxolan-2-one] : LC50 = 9423.147 mg/ℓ 48 hr (Estimate)
- [Graphite] : EC50 > 100 mg/ℓ 48 hr Daphnia magna (OECD Guideline 202 ,GLP)
- [Copper] : LC50 0.0338 mg/ℓ ~ 0.792 mg/ℓ 48 hr Daphnia magna (OECD TG 202)
- [Aluminium] : IUCLID NOEC > 100 mg/ℓ 48 hr Daphnia magna

○ **Algae**

- [Cobalt lithium manganese nickel oxide] : ErC50 >100 mg/ℓ 72 hr (Pseudokirchneriella subcapitata) (NICNAS)
- [1,3-Dioxolan-2-one] : EC50 = 17.388 mg/ℓ 96 hr (Estimate)
- [Graphite] : ErC50 > 100 mg/ℓ 72 hr (Pseudokirchnerella subcapitata, (OECD Guideline 201,GLP)
- [Copper] : NOEC 0.708 mg/ℓ ~ 0.0376 mg/ℓ 72 hr (Phaeodactylum tricornutum: NOEC = 0.0376 - 0.708 mg/ℓ 72hr, OECD TG 201Phaeodactylum tricornutum: NOEC = 5.7 μg/ℓ, IOS 10253, GLP)
- [Aluminium] : NOEC ≥ 0.052 mg/ℓ 72 hr Selenastrum capricornutum (OECD TG 201, GLP)

B. Persistence and degradability

○ **Persistence**

- [1,3-Dioxolan-2-one] : log Kow = -0.340 (NLM/HSDB)
- [Copper] : log Kow = -0.57 (Estimate)

○ **Degradability**

- Not available

C. Bioaccumulative potential

○ **Bioaccumulative potential**

- [1,3-Dioxolan-2-one] : BCF = 3.2 (NLM/HSDB)
- [Copper] : BCF = 5830

○ **Biodegration**

- Not available

D. Mobility in soil

- [1,3-Dioxolan-2-one] : Koc = 9.2

E. Other adverse effects

- Not available

13. DISPOSAL CONSIDERATIONS

A. Disposal methods

- Stabilization and minimization treatment by incineration or similar method can be applied, if more than two kinds of designated wastes are in mixture state and it is impractical to separate them
- Oil water separation technology shall be applied as pre-waste treatment if it is applicable
- It shall be treated by incineration

B. Special precautions for disposal

- Anyone with business license number who generates industrial wastes shall treat the waste by him/herself or by entrusting to the legal entities who treat the wastes, recycle the wastes of others or install and operate the waste treatment facilities according to the Wastes Control Act
- Dispose of waste in accordance with all applicable laws and regulations.

14. TRANSPORT INFORMATION

A. UN No. (IMDG)

- Not applicable

B. Proper shipping name

- Not applicable

POSSLAKE ENTERPRISES LTD.

C. Hazard Class

- Not applicable

D. IMDG Packing group

- Not applicable

E. Marine pollutant

- Applicable
- Applicable

F. Special precautions for user related to transport or transportation measures

- Local transport follows in accordance with Dangerous goods Safety Management Law.
- Package and transport follow in accordance with Department of Transportation (DOT) and other regulatory agency requirements.
- Air transport(IATA): Not subject to IATA regulations.

15. REGULATORY INFORMATION

A. National and/or international regulatory information

○ **POPs Management Law**

- Not applicable

○ **Information of EU Classification**

*** Classification**

- [Aluminium] : H261,H250
- [Aluminium] : H261,H228

○ **U.S. Federal regulations**

*** OSHA PROCESS SAFETY (29CFR1910.119)**

- Not applicable

*** CERCLA Section 103 (40CFR302.4)**

- [Copper] : 2267.995 kg 5000 lb

*** EPCRA Section 302 (40CFR355.30)**

- Not applicable

*** EPCRA Section 304 (40CFR355.40)**

- Not applicable

*** EPCRA Section 313 (40CFR372.65)**

- [Copper] : Applicable
- [Aluminium] : Applicable

○ **Rotterdam Convention listed ingredients**

- Not applicable

○ **Stockholm Convention listed ingredients**

- Not applicable

○ **Montreal Protocol listed ingredients**

- Not applicable

16. OTHER INFORMATION

A. Reference

- The information contained herein is believed to be accurate. It is provided independently of any sale of the product for purpose of hazard communication. It is not intended to constitute performance information concerning the product. No express warranty, or implied warranty of merchantability or fitness for a particular purpose is made with respect to the product or the information contained herein.
- This Safety Data Sheet was compiled with data and information from the following sources: KOSHA, NITE, ESIS, NLM, SIDS, IPCS

B. Issue date

- 2020-01-06

C. Revision number and Last date revised

- Not applicable

D. Other

- This SDS is prepared according to the Globally Harmonized System (GHS).

BOSSLAKE ENTERPRISES LTD.