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Product name: Lithium Ion Battery Cell
NPC Document 15030102
Reference number: SDS-IBT-00002, 1/6/2010
LI-PSDS-2010-016, 2/8/10
Revision: May 18, 2010

Safety data sheet for chemical products (SDS)

1. PRODUCT AND COMPANY IDENTIFICATION

Product name: Lithium Ion Battery Cell
Product code: Cylindrical type cell
Company name: National Power Corporation
Address: 4330 W. Belmont Ave., Chicago IL 60641, USA
Telephone number: 1-773-685-2662
Fax number: 1-773-685-8316
Emergency telephone number: 1-800-424-9300 North America
001-703-527-3887 International

2. COMPOSITION / INFORMATION ON INGREDIENTS

Substance or preparation: Preparation
Information about the chemical nature of product:

Lithium Cobaltate Cells			
Common Chemical name / generic name	CAS Number	Concentration / Concentration Range	Classification and hazard labeling
Lithium Cobaltate (LiCoO2)	12190-79-3	25-40%	-
Iron	7439-89-6	15-25%	-
Aluminum	7429-90-5	2-6%	-
Graphite (Natural graphite) (Artificial graphite)	7782-42-5 7740-44-0	10-20%	-
Copper	7440-50-8	5-15%	Sensitization of the skin group No.2
Organic electrolyte	-	10-20%	Inflammable liquid
Lithium Nickel Manganese Cobalt Cells			
Lithium Nickel Manganese Cobalt Oxide	Not Specified	20-35%	-
Carbon	Not Specified	10-20%	-
Organic electrolyte	Not Specified	10-20%	-

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3. HAZARDS IDENTIFICATION

For the battery cell, chemical materials are stored in a hermetically sealed metal case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage. However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the gas release vent will be operated. The battery cell case will be breached at the extreme, hazardous materials may be released. Moreover, if heated strongly by the surrounding fire, acrid gas may be emitted.

Hazard and effects
Human health effects:

Inhalation: The steam of the electrolyte has an anesthesia action and stimulates a respiratory tract.

Skin contact: The steam of the electrolyte stimulates a skin. The electrolyte skin contact causes sore and stimulation on the skin.

Eye contact: The steam of the electrolyte stimulates eyes. The electrolyte eye contact causes a sore and stimulation on the eye. Especially, substance that causes a strong inflammation of the eyes is contained.

Environmental effects: Since a battery cell remains in the environment, do not dispose into the environment. If the electrolyte contacts with water, it will generate detrimental hydrogen fluoride.

4. FIRST-AID MEASURES

Spilled internal cell materials

Inhalation: Make the victim blow his/her nose, gargle. Seek medical attention if necessary.

Skin contact: Remove contaminated clothes and shoes immediately. Wash extraneous matter or contact region with soap and plenty of water immediately.

Eye contact: Do not rub one’s eyes. Immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention immediately.

A battery cell and spilled internal cell materials

Ingestion: Induce vomiting. When it is impossible or the feeling is not well after vomiting, seek medical attention.

5. FIRE-FIGHTING MEASURE

Suitable extinguishing media: Plenty of water, carbon dioxide gas, nitrogen gas, chemical powder fire extinguishing medium and fire foam.
Specific hazards: Corrosive gas may be emitted during fire.
Specific methods of fire-fighting: When the battery burns with other combustibles simultaneously, take fire extinguishing method which correspond to the combustibles. Extinguish a fire from the windward as much as possible.
Special protective equipment for firefighters:
Respiratory protection: Respiratory equipment of a gas cylinder style or protection-against-dust mask
Hand protection: Protective gloves
Eye protection: Goggle or protective glasses designed to protect against liquid splashes
Skin and body protection: Protective clothing.

6. ACCIDENTAL RELEASE MEASURES

Spilled internal cell materials, such as electrolyte leaked from a battery cell, are carefully dealt with according to the followings.
Precautions for human body: Remove spilled materials with protective equipment (protective glasses and protective gloves). Avoid inhaling the gas as much as possible. Moreover, avoid skin contact as much as possible.
Environmental precautions: Do not dispose of into the environment.
Method of cleaning up: The spilled solids are put into a container. Spilled liquids are absorbed with a dry cloth.
Prevention of secondary hazards: Avoid re-scattering. Do not bring the collected materials close to fire.

7. HANDLING AND STORAGE

Handling
Technical measures: Prevention of user exposure: Not necessary under normal use.
Prevention of fire and explosion: Not necessary under normal use.
Precaution for safe handling: Do not damage or remove the external case.
Specific safe handling advice: Never dispose of cells in a fire or heat above 100 C. Do not submerse in water or seawater. Do not expose to strong oxidizers. Do not give a strong mechanical shock or crush. Never disassemble, modify or deform. Do not connect the positive terminal to the negative terminal with electrically conductive material. In the case of charging, use only dedicated charger or charge according to the conditions specified..

Storage
Technical measures: Storage conditions (suitable, to be avoided): Avoid direct sunlight, high temperature, high humidity.
Store in cool place (temperature: -20 ~ 35 degree C, humidity: 45 ~ 85%).
Incompatible products: Conductive materials, water, seawater, strong oxidizers and strong acids
Packing material (recommended, not suitable): Insulative and tear proof materials are recommended.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: No engineering measure is necessary during normal use. In case of internal cell materials' leakage, operate the local exhaust or improve ventilation.

Control parameters

Common chemical name / General name	ACGIH (2002)	
	TLV-TWA	BEI
Lithium Cobaltate (LiCoO2)	0.02mg/m3 (as cobalt)	-
Aluminum	10mg/m3 (metal coarse particulate) 5mg/m3 (inflammable powder) 5mg/m3 (weld fume)	-
Carbon (Natural graphite) (Artificial graphite)	2mg/m3 (inhalant coarse particulate)	-

Copper	0.2mg/m3 (fume) 1.0mg/m3 (a coarse particulate, Mist)	-
Organic electrolyte	-	-

ACGIH: American Conference of Governmental Industrial Hygienists, Inc.
TLV-TWA: Threshold Limit Value-Time Weighted Average concentration
BEI: Biological Exposure Indices

Personal protective equipment
Respiratory protection: Respirator with air cylinder, dust mask
Hand protection: Protective gloves
Eye protection: Goggle or protective glasses designed to protect against liquid splashes
Skin and body protection: Working clothes with long sleeve and long trousers

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance
Physical state: Solid
Form: Cylindrical
Color: Metallic color (without tube)
Odor: No odor
pH: NA
Specific temperatures/temperature ranges at which changes in physical state occur:
There is no useful information for the product as a mixture.
Flash point: NA
Explosion properties: NA
Density: NA
Solubility with indication of the solvent(s): Insoluble in water

10. STABILITY AND REACTIVITY

Stability: Stable under normal use
Hazardous reactions occurring under specific conditions
Conditions to avoid: When a battery cell is exposed to an external short-circuit, crushes, deformation, high temperature above 100 degree C, it will be the cause of heat generation and ignition.
Materials to avoid: Conductive materials, water, seawater, strong oxidizers and strong acids.
Hazardous decomposition products: Acrid or harmful gas is emitted during fire.

11. TOXICOLOGICAL INFORMATION

There is no available data on the product itself. The information of the internal cell materials is as follows.

Lithium cobaltate – $LiCoO_2$
Acute toxicity: No applicable data.
Reference cobalt: LDLo, oral - Guinea pig 20mg/kg
Local effects: Unknown.
Sensitization: The nervous system of respiratory organs may be stimulated sensitively.

Chronic toxicity/Long term toxicity: By the long-term inhalation of coarse particulate or vapor of cobalt, it is possible to cause the serious respiratory-organs disease. Skin reaction or a lung disease for allergic or hypersensitive person may be caused.
Skin causticity: Although it is very rare, the rash of the skin and allergic erythema may result.

Aluminum
Local effects: Aluminum itself has no toxicity. When it goes into a wound, dermatitis may be caused.
Chronic toxicity/Long term toxicity: By the long-term inhalation of coarse particulate or fume, it is possible to cause lung damage (aluminum lungs).

Graphite
Acute toxicity: Unknown.
Local effects: When it goes into one's eyes, it stimulates one's eyes; conjunctivitis, thickening of corneal epithelium or edematous inflammation palpebra may be caused.
Chronic toxicity/Long term toxicity:
Since the long-term inhalation of high levels of graphite coarse particulate may become a cause of lung disease or a tracheal disease.
Carcinogenicity: Graphite is not recognized as a cause of cancer by research organizations and natural toxic substance research organizations of cancer.

Copper
Acute toxicity: 60-100mg sized coarse particulate causes a gastrointestinal disturbance with nausea and inflammation.TDLo, hypodermic - Rabbit 375mg/kg
Local effects: Coarse particulate stimulates a nose and a tracheal. When it goes into one's eyes, the symptom of the reddening and the pain is caused.
Sensitization: Sensitization of the skin may be caused by long-term or repetitive contact.
Reproductive effects: TDLo, oral - Rat 152mg/kg

Organic Electrolyte
Acute toxicity: LD50, oral - Rat 2,000mg/kg or more
Local effects: Unknown.
Skin irritation study: Rabbit - Mild
Eye irritation study: Rabbit - Very severe

12. ECOLOGICAL INFORMATION

Persistence/degradability:
Since a battery cell and the internal materials remain in the environment, do not bury or dispose of into the environment.

13. DISPOSAL CONSIDERATIONS

Recommended methods for safe and environmentally preferred disposal:
Product (waste from residues)
Do not dispose of 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.

14. TRANSPORT INFORMATION

In the case of transportation, avoid exposure to high temperature and prevent the formation of any

condensation. Take in a cargo of them without falling, dropping and breakage. Prevent collapse of cargo piles and wet by rain. The container must be handled carefully. Do not give shocks that result in a mark of hitting on a cell. Please refer to Section 7-HANDLING AND STORAGE also.
UN classification:
ID Number 3480 (or 3481)
Proper shipping name:
“Lithium ion batteries” (or “Lithium ion batteries packed with equipment” or “Lithium ion batteries contained in equipment”)
Class 9 *, Packing Group: II *
*However this product is defined as above, it is not recognized as "DANGEROUS GOODS" when its transport condition accords with instructions or provisions depending on region and transportation mode. About the instructions of provisions please see descriptions in box brackets of following regulations.

Even classified as lithium ion batteries UN3480 or UN3481 (Contained in Equipment or Packed with Equipment), The product is handled as Non-Dangerous Goods by meeting the UN Recommendations on the Transportation of Dangerous Goods Model Regulations Special Provision A188. (1)

(a) For a lithium-ion cell, the Watt-hour rating is not more than 20 Wh;

(b) For a lithium-ion battery, the Watt-hour rating is not more than100 Wh. Lithium ion batteries subject to this provision shall be marked with the Watt-hour rating on the outside case, except those manufactured before 1 January 2009 which may be transported in accordance with this special provision and without this marking until 31 December 2010;

(c) Each cell or battery is of the type proved to meet the requirements of each test in the Manual of Tests and Criteria, Part.III, sub-section 38.3;

(d) Cells and batteries, except when installed in equipment, shall be packed in inner packaging that completely encloses the cell or battery. Cells and batteries shall be protected so as to prevent short circuits. This includes protection against contact with conductive materials within the same packaging that could lead to a short circuit. The inner packaging shall be packed in strong outer packaging;

(e) Cells and batteries when installed in equipment shall be protected from damage and short circuit, and the equipment shall be equipped with an effective means of preventing accidental activation. When batteries are installed in equipment, the equipment shall be packed in strong outer packaging constructed of suitable material of adequate strength and design in relation to the packaging capacity and its intended use unless the battery is afforded equivalent protection by the equipment in which it is contained;

(f) Except for packages containing button cell batteries installed in equipment (including circuit boards), or no more than four cells installed in equipment or no more than two batteries installed in equipment, each package shall be marked with the following;

(i) an indication that the package contains “lithium ion" cells or batteries, as appropriate;

(ii) an indication that the package shall be handled with care and that a flammability hazard exists if the package is damaged;

(iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and

(iv) a telephone number for additional information.

(g) Each consignment of one or more packages marked in accordance with paragraph (f) shall be accompanied with a document including the following:

(i) an indication that the package contains “lithium ion" cells or batteries, as appropriate;

(ii) an indication that the package shall be handled with care and that a flammability hazard exists if the

package is damaged;

(iii) an indication that special procedures shall be followed in the event the package is damaged, to include inspection and repacking if necessary; and

(iv) a telephone number for additional information.

(h) Except when batteries are installed in equipment, each package shall be capable of withstanding a 1.2 m drop test in any orientation without damage to cells or batteries contained therein, without shifting of the contents so as to allow battery to battery (or cell to cell) contact and without release of contents: and

(i) Except when batteries are contained in or packed with equipment, packages shall not exceed 30 kg gross mass for marine transportation. (Not exceed10kg for air transportation)

For marine transportation the product is handled as Non-Dangerous Goods by meeting the IMO International Maritime Dangerous Goods (IMDG Code) 2008 Edition (Amendment 43-08) SP188 (Same as UN Special Provision A188 above).(3)

(j) Any person preparing or offering cells or batteries for transport must receive adequate instruction on these requirements commensurate with their responsibilities.

(k) Except when batteries are installed in or packed with equipment, packages shall not exceed10kg gross mass.

Lithium ion batteries identified by 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).

(l) Each package contains more than four cells or more than two batteries must be labeled with a lithium battery handling label. * The width 120mm X length 110mm sized lithium battery handling label must be labeled onto the side of a package without bending it.

(m) The words “Lithium ion batteries”, “not restricted” and “packing instruction number” must be included in the Additional Handling Information on the air waybill, when an air waybill is used. (packing instruction number Cell and Battery: packing instruction 965, Packed with Equipment: PI966, Contained in Equipment: PI967)

The Lithium-Ion cells or batteries as stated in Appendix are made in compliance to the requirements stated in the latest edition of the IATA Dangerous Goods Regulations Packing Instruction 965 General requirements and Section. such that they can be transported as a NOT RESTRICTED (non-hazardous/non-dangerous) goods. However, if those lithium-ion cells or batteries are pack with or contained in an equipment, then it is the responsibility of the shipper to ensure that the consignment are packed in compliance to the latest edition of the IATA Dangerous Goods Regulations General requirements and Section. Packing Instruction 966 or 967 in order for that consignment to be declared as NOT RESTRICTED (non-hazardous/non-Dangerous).

During the transportation of a large amount of batteries by ship, trailer or railway, do not leave them in the places of high temperatures and do not allow them to be exposed to condensation.

During the transportation do not allow packages to be fallen down or damaged.

Regulation depends on region and transportation mode
Worldwide air transportation:
IATA-DGR [“packing instruction 965 section II” (or “packing instruction 966 section II” or packing instruction 967 section II”]
Worldwide, sea transportation:
IMO-IMDG Code [special provision 188]
Europe road transportation:
ADR [special provision 188]

15. REGULATORY INFORMATION

Regulations specifically applicable to the product:

Waste Disposal and Public Cleaning Law [Japan]
Laws for Promotion and Effective Utilization of Resources [Japan]
US department of Transportation 49 Code of federal Regulations [USA]
UN (United Nations): Recommendations on the Transportation of Dangerous Goods Model Regulations Sixteenth revised edition

ICAO (International Civil Aviation Organization): Technical Instructions for the safety transport of dangerous goods by air 2009-2010 Edition

IATA (International Air Transport Organization): Dangerous Goods Regulations 51st Edition Effective 1 January 2010

IMO (International Maritime Organization): International Maritime Dangerous Goods (IMDG) Code 2008 Edition (Amendment 43-08)

*About overlapping regulations, please refer to Section 14-TRSANSPORT INFORMATION.

16. OTHER INFORMATION

This safety data sheet is offered to ensure agency who handles this product handles it safely.
The agency should utilize this safety data sheet effectively (put it up, educate person in charge) and take proper measures.
The information contained in this safety data sheet is based on the present state of knowledge and current legislation.
This safety data sheet provides guidance on health, safety and environmental aspects of the product and should not be construed as any guarantee of technical performance or suitability for particular applications.

Reference

Chemical substances information: Japan Advanced Information center of Safety and Health

International Chemical Safety Cards (ICSCs): International Occupational Safety and Health Information Centre (CIS)

2002 TLVs and BEIs: American Conference of Governmental Industrial Hygienists (ACGIH)

Dangerous Goods Regulations – 51st Edition Effective 1 January 2010: International Air Transport Association (IATA)

IMDG Code - 2008 Edition: International Maritime Organization (IMO)

The European Agreement concerning international Carriage of Dangerous Goods by Road – 2009

The United Nations Economic Commission for Europe (UNECE)

RTECS (CD-ROM) MSDS of raw materials prepared by the manufactures