MATERIAL SAFETY DATA SHEET (MSDS)

Product Name: **ACK053 Nickel-Metal Hydride Battery Pack**

1. Product and Company Identification

Product: Rechargeable Nickel-Metal Hydride Battery Pack
2.4V 1900mAH 4.6Wh
Manufactured exclusively for 3M PSD Värnamo
Manufactured By: Flexworks HuiZhou Limited
Address: No.1 Xingli Road,XiaotieVilliage,Xiaojinkou, Huizhou,Guangdong Province,China.
Emergency Phone: +86 752 7213570
Revised: 11-01-2017
Reference: Sophia Feng
E-mail: Sophia.feng@flexthree.com
Reference to FDK NiMH cell MSDS (TW-CEX-E01-21)

2. Hazards Identification

2.1 Most important hazard and effects

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 misuse, 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 or harmful fume may be emitted.

2.2 Human health effects:

* Inhalation: The electrolyte inhalation affects the respiratory tract membrane and the lungs. Fume may cause a cough, chest pain and dyspnea. Bronchitis and pneumonia may occur. Possibly could be carcinogen.
* Skin contact: The electrolyte skin contact affects the skin seriously and may cause dermatitis.
* Eye contact: The electrolyte leaked from the battery cell is strong alkali. When it goes into an eye, the cornea may be affected and it may lead to blindness.
* Ingestion: The electrolyte ingestion irritates the mouth and the throat seriously results in vomiting, nausea, hematemesis, stomach pains and diarrhea.

2.3 Environmental effects:

* Since a battery cell remains in the environment, do not throw out it into the environment.

2.4 Specific hazards :

2.5 As previously described

3. Composition / Information on Ingredients

CAS #	Chemical Name	Concentration / Concentration range	Classification and hazard labeling
7439-89-6	Iron(Fe)	15-25%	--
7439-96-5	Manganese(Mn)	Trace	--
7723-14-0	Phosphorus(P)	Trace	--
7440-47-3	Chromium(Cr)	Trace	--
7440-50-8	Copper(Cu)	5%	--
7440-02-0	Nickel(Ni)	5-10%	Specific hazard
7440-31-5	Tin(Sn)	1%	--
9003-56-9	ABS resin	23%	--
24936-68-3	Polyamide resin	0.4%	--
25038-59-9	PET resin	0.1%	--
6484-52-2	TPE resin	0.2%	--
7440-02-0(Ni) 7440-48-4(Co) 7439-96-5(Mn) 7429-90-5(Al)	Hydrogen Absorbing Alloy	13-23%	Specific hazard
7440-02-0(Ni) 7440-48-4(Co) 7440-66-6(Zn)	Nickel-Cobalt-Zinc oxide	10-15%	Acute toxicity specific hazard
1310-58-3 1310-73-2 1310-65-2	Potassium Hydroxide, Sodium Hydroxide, Lithium Hydroxide	0-10%	Acute toxicity corrosivity irritant property
1333-86-4	Carbon Black	0-1%	Specific hazard
38891-59-7	Epoxy Resin	1.5%	--
65997-17-3	Glass fiber	1%	--
	components(fuse and diodes)	0.05%	--

4. First Aid Measures

4.1 Internal cell materials of an opened battery cell

* Inhalation :

Cover the victim in a blanket, move to the place of fresh air and keep quiet. Seek medical attention immediately. When dyspnea (breathing difficulty) or asphyxia (breath-hold), give artificial respiration immediately.

- Skin contact :

Remove contaminated clothes and shoes immediately. Wash the adherence or contact region with soap and plenty of water. Seek medical attention immediately.

- Eye contact :

Immediately flush eyes with water continuously for at least 15 minutes. Seek medical

attentionimmediately.

4.2 A battery cell and internal cell materials of an opened battery cell

* Ingestion :Do not induce vomiting. Seek medical attention immediately.

5. Fire Fighting Measures

5.1 Although a battery cell is not flammability, in case of fire, move it to the safe place quickly. The following measures are taken when it cannot be moved.

* Suitable extinguishing media: Dry sand, chemical powder fire extinguishing medium.
* Specific hazards: Acrid or harmful fume is emitted during fire.
* Special protective equipment for firefighters: Protective equipment written in Section 8.

6. Accidental Release Measures

6.1 Internal cell materials, such as electrolyte leaked from battery cell, are carefully dealt with according to the followings.

* Personal precautions: Forbid unauthorized person to enter. Remove leaked materials with protective equipment written in Section 8.
* Environmental precautions: Do not throw out into the environment.
* Method of recovery and neutralization: Dilute the leaked electrolyte with water and neutralize with diluted sulfuric acid. The leaked solid is moved to a container. The leaked place is fully flushed with water.

7. Handling and Storage

7.1 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 tube.
* Specific safe handling advice: Never throw out cells in a fire or expose to high temperatures. Do notsoak cells in water and seawater. Do not expose to strong oxidizers. Do not give a strong mechanicalshock or throw down. Never disassemble, modify or deform. Do not connect the positive terminal tothe negative terminal with electrically conductive material. In the case of charging, use only dedicatedcharger or charge according to the conditions specified by FDK.

7.2 Storage

* Technical measures:

Storage conditions (suitable to be avoided): Avoid direct sunlight, high temperature, high humidity.Store in cool place (temperature: -20 ~ 30 degree C, humidity: from 40 to 80%).

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

8.1 Engineering measures:

No engineering measure is necessary during normal use. In case of internal cell materials'

leakage, the information below will be useful.

8.2 Control parameters:

Common chemical name / General name	ACGIH(2011)	
	TLV-TWA	BEI
Nickel, Nickel Compounds	(As Ni) Metal : 1.5mg/m^3 Solublecompounds : 0.1mg/m^3 Insoluble compounds : 0.2mg/m^3	-
Cobalt Compounds	(As Co) 0.02mg/m^3	In urine : 15 micro g/l In blood : 1 micro g/l
Manganese Compounds	(As Mn) 0.2mg/m^3	-
Aluminum Compounds	(As Al) 1mg/m^3(Flammable powder)	-
Zinc oxide	2mg/m^3	-
Carbon Black	3mg/m^3	-
Potassium Hydroxide	-	-
Sodium Hydroxide	-	-
Lithium Hydroxide	-	-

ACGIH: American Conference of Governmental Industrial Hygienists, Inc.
TLV-TWA: Threshold Limit Value-time weighted average concentration
BEI: Biological Exposure Indices

8.3 Personal protective equipment
* Respiratory protection: Protective mask
* Hand protection: Protective gloves
* Eye protection: 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

9.1 Appearance
* Physical state: Solid
* Form: Cylindrical and Prismatic
* Color: Metallic color (without tube/label)
* Odour: No odour

9.2 pH : NA

9.3 Specific temperatures/temperature ranges at which changes in physical state occur :

- There is no useful information for the product as a mixture.

9.4 Flash point : NA

9.5 Explosion properties : NA

9.5 Density : around 1.5 ~ 6.0g/cm^3

9.6 Solubility ,with indication of the solvent(s) : Insoluble in water

10 Stability and Reactivity

10.1 Stability : Stable under normal use

10.2 Hazardous reactions occurring under specific conditions

10.3 By misuse of a battery cell or the like, oxygen or hydrogen accumulates in the cell and the internal pressure rises. These gases may be emitted through the gas release vent. When fire is near, these gases may take fire.

10.4 When a battery cell is heated strongly by the surrounding fire, acrid or harmful fume may be emitted.

10.5 Conditions to avoid : Direct sunlight, high temperature and high humidity

10.6 Materials to avoid : Conductive materials, water, seawater, strong oxidizers and strong acids

10.7 Hazardous decomposition products: Acrid or harmful fume is emitted during fire.

11 Toxicological Information

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

11.1 Nickel, Nickel Compounds

*Acute toxicity:

oral	GHS: out of Category.
skin	Unknown.
inhalation（ gas）	GHS: exempt from a classification.
inhalation（ steam）	Unknown.
inhalation（ mist）	Unknown.

* Skin corrosivity : Unknown.

* Serious damage and irritant property for eyes: Unknown.

* Respiratory or skin sensitization:

Respiratory sensitization: GHS: Category 1

The allergy, asthma or breathing difficulties might be caused when in haling.Skin sensitization:

GHS: Category 1.The allergic skin reaction might be caused.

- Germline mutagenicity:

GHS: It is not possible to classify it due to data deficiency.

- Carcinogenicity:

GHS: Category 2

ACGIH: (Metal) A5 – Not suspected as a human carcinogen

ACGIH: (water-soluble compounds) A4 – Not classified as a human carcinogen obviously

ACGIH: (Insoluble compounds) A1 – Confirmed human carcinogen

NIOSH: Potential occupational carcinogen
NTP: Reasonably anticipated to be human carcinogen
IARC: (Metal) Group 2B Possibly carcinogenic to human
IARC: (Compounds) Group 1 carcinogenic to human

- Reproduction Toxicity:
  GHS: It is not possible to classify it due to data deficiency.
- Certain target organ/ Systemic toxicity (single exposure):
  GHS: Category 1(respiratory organ and kidney).
  The disorder of the respiratory organ and the kidney is caused.
- Certain target organ/ Systemic toxicity (repeated exposure):
  GHS: Category 1(respiratory organ).
  The disorder of the respiratory organ is caused by long-term or repeated exposure.

11.2 Cobalt Compounds

- Acute toxicity:

oral GHS: out of Category.
skin Unknown.
inhalation（ gas） GHS: exempt from a classification.
inhalation（ steam） Unknown.
inhalation（ mist） GHS: It is not possible to classify it due to data deficiency.
Skin corrosivity : Unknown.
Serious damage and irritant property for eyes: Unknown.
Respiratory or skin sensitization:
Respiratory sensitization: GHS: Category 1
The allergy, asthma or breathing difficulties might be caused when inhaling.
Skin sensitization: GHS: Category 1
The allergic skin reaction might be caused.

* Germline mutagenicity: Unknown.
* Carcinogenicity :
GHS: Category 2
ACGIH: A3 –Confirmed animal carcinogen but relevance to human carcinogen is unknown.
IARC: Group 2B Possibly carcinogenic to human.
The cancer might be caused.

- Reproduction Toxicity :

GHS: Category 2.
The adverse effect on reproductive competence or the fetus might occur.

- Certain target organ/ Systemic toxicity (single exposure):
  GHS: Category 3(respiratory tract irritating properties).
  The respiratory organ might be stimulated.
- Certain target organ/ Systemic toxicity (repeated exposure):
  GHS: Category 1(respiratory organ).
  The disorder of the respiratory organ is caused by long-term or repeated exposure.

11.3 Manganese compounds

- Acute toxicity:
  oral GHS:out of Category.
  skin Unknown.
  inhalation（ gas） GHS: exempt from a classification.
  inhalation（ steam, mist）Unknown.
- Skin corrosivity : GHS: Category 3. Slight skin stimulation.
- Serious damage and irritant property for eyes: GHS: Category 2B. eye stimulation.
- Respiratory or skin sensitization:
  Respiratory sensitization: Unknown.
  Skin sensitization: Unknown.
- Germline mutagenicity: GHS: It is not possible to classify.
- Carcinogenicity :GHS: out of Category
- Reproduction Toxicity :
  GHS: Category 2.
  The adverse effect on reproductive competence or the fetus might occur.
- Certain target organ/ Systemic toxicity (single exposure):
  GHS: Category 1(respiratory organ).
  The disorder of the respiratory organ is caused
- Certain target organ/ Systemic toxicity (repeated exposure):
  GHS: Category 1(respiratory organ, nerve).
  The disorder of the respiratory organ and nerve system is caused by long-term or repeatedinhalation exposure.

11.4 Aluminum Compounds

- Acute toxicity:
  oral GHS: inhalation(steam, dust) Unknown.
- Skin corrosivity : Unknown.
- Serious damage and irritant property for eyes: Unknown.
- Respiratory or skin sensitization:
  Respiratory sensitization: Unknown.
  Skin sensitization: Unknown.
- Germline mutagenicity: Unknown.
- Carcinogenicity : Unknown.
- Reproduction Toxicity : Unknown.
- Certain target organ/ Systemic toxicity (single exposure): Unknown.
- Certain target organ/ Systemic toxicity (repeated exposure):
  GHS: Category 1 and 2.
  The disorder of the pulmonary is caused by long-term or repeated inhalation exposure.(Category 1)
  The disorder of the nerve system by long-term or repeated oral exposure might be caused.(Category 2).

11.5 Zinc oxide

11.6 Acute toxicity:

oral: rat LD_{50}> 5000mg/kg.

inhalation（dust, mist） rat LC_{50}> 5.7mg/l The harmful might be caused when inhaling.

11.7 Skin corrosivity :GHS: out of Category.

11.8 Serious damage and irritant property for eyes: GHS: out of Category.

11.9 Respiratory or skin sensitization:

Respiratory sensitization: Unknown.

Skin sensitization: GHS: out of Category.

- Germline mutagenicity: Unknown.
- Carcinogenicity :GHS: out of Category
- Reproduction Toxicity :GHS: out of Category
- Certain target organ/ Systemic toxicity (single exposure):

  GHS: Category 1.

  The disorder of the whole body.
- Certain target organ/ Systemic toxicity (repeated exposure):

  GHS: Category 1.

  The disorder of the pulmonary is caused by long-term or repeated inhalation exposure.

11.10 Carbon Black

11.11 Acute toxicity:

oral: rat LD_{50}>15400mg/kg.

skin: Unknown.

inhalation（dust） Unknown.

11.12 Skin corrosivity : Unknown.

11.13 Serious damage and irritant property for eyes: Unknown.

11.14 Respiratory or skin sensitization:

Respiratory sensitization: Unknown.

Skin sensitization: Unknown.

- Germline mutagenicity: Unknown.
- Carcinogenicity :

  GHS: Category 2

  ACGIH: A3 –Confirmed animal carcinogen but relevance to human carcinogen is unknown.

  IARC: Group 2B Possibly carcinogenic to human.

  The cancer might be caused.
- Reproduction Toxicity : Unknown.
- Certain target organ/ Systemic toxicity (single exposure): Unknown.
- Certain target organ/ Systemic toxicity (repeated exposure):

  GHS: Category 1.

  The disorder of the pulmonary is caused by long-term or repeated inhalation exposure.

11.15 Potassium Hydroxide

11.16 Acute toxicity:

oral GHS: Category 3. Harmful if swallowed.

skin GHS: It is not possible to classify.

inhalation（steam） GHS: It is not possible to classify.

inhalation（dust） GHS: It is not possible to classify.

11.17 Skin corrosivity : GHS: Category 1B.

Serious chemical wound of the skin and damage of eyes is caused.

11.18 Serious damage and irritant property for eyes: GHS: Category 1.

11.19 Respiratory or skin sensitization:

Respiratory sensitization: GHS: It is not possible to classify.

Skin sensitization: GHS: out of Category.

* Germline mutagenicity: GHS: out of Category.

* Carcinogenicity : GHS: It is not possible to classify.

* Reproduction Toxicity : GHS: It is not possible to classify.

* Certain target organ/ Systemic toxicity (single exposure):

GHS: Category 1.

The disorder of the respiratory system is caused.

*Certain target organ/ Systemic toxicity (repeated exposure):

GHS: It is not possible to classify.

11.20 Sodium Hydroxide

11.21 Acute toxicity:

oral GHS: It is not possible to classify.

skin GHS: It is not possible to classify.

inhalation（gas） GHS: out of Category.

inhalation（steam） Unknown.

inhalation（dust） Unknown.

11.22 Skin corrosivity : GHS: Category 1.

Serious chemical wound of the skin and damage of eyes is caused.

11.23 Serious damage and irritant property for eyes:

GHS: Category 1. Serious damage of eyes is caused

11.24 Respiratory or skin sensitization:

Respiratory sensitization: GHS: It is not possible to classify.

Skin sensitization: GHS: out of Category.

- Germline mutagenicity: GHS: out of Category.
- Carcinogenicity : GHS: It is not possible to classify.
- Reproduction Toxicity : GHS: It is not possible to classify.
- Certain target organ/ Systemic toxicity (single exposure):

  GHS: Category 1 (respiratory system).

  The disorder of the respiratory organ is caused.
- Certain target organ/ Systemic toxicity (repeated exposure):

  GHS: It is not possible to classify.

11.25 Lithium Hydroxide

11.26 Acute toxicity:

oral GHS: Category 3. Harmful if swallowed.

skin Unknown.

inhalation（steam） Unknown.

inhalation（dust） GHS: Category 3. Harmful if swallowed.

11.27 Skin corrosivity : GHS: Category 1.

Serious chemical wound of the skin and damage of eyes is caused.

11.28 Serious damage and irritant property for eyes: GHS: Category 1.

11.29 Respiratory or skin sensitization:

Respiratory sensitization: GHS: It is not possible to classify.

Skin sensitization: GHS: It is not possible to classify.

- Germline mutagenicity: Unknown.
- Carcinogenicity : Unknown.
- Reproduction Toxicity : Unknown.
- Certain target organ/ Systemic toxicity (single exposure):
  GHS: Category 1.
  The disorder of the respiratory system is causedby inhalation exposure.
- Certain target organ/ Systemic toxicity (repeated exposure):
  GHS: Category 1&2.
  The disorder of the respiratory system is caused by long-term or repeated inhalationexposure.
  The disorder of the liver and the hematopoietic system by long-term or repeatedoral exposure might be caused.

12.Ecological Information

12.1Persistence/degradability

Since a battery cell and the internal materials remain in the environment, do not bury or throw out intothe environment.

12 Disposal Considerations

13.1Recommended 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 leakedfrom a battery cell contaminates them, dispose them as industrial wastes subject to special control.

14.Transport Information

14.1 This battery does not require the following items.

- TECHNICAL INSTRUCTIONS FOR THE SAFE TRANSPORT OF DANGEROUS GOODS BY AIR(ICAO)
- IATA Dangerous Goods Regulations - 57th Edition Effective 1st January 2016 (IATA)
- code of federal regulations (U.S.DOT)
- This battery requires the following items.
- INTERNATIONAL MARITIME DANGEROUS GOODS CODE(IMO)

From the 1st January 2012, Nickel-Metal Hydride Batteries is classed as Dangerous Goods,

Class 9 in accordance with United Nations Recommendations on the Transport of Dangerous Goods and will have thefollowing UN Number:

UN No.	Proper Shipping Name	Class ordivision	Packinggroup	Specialprovisions
3496	BATTERIES, NICKEL-METAL HYDRIDE	9 	-	117 963

Instructions and contents of Special Provisions (117 and 963) for this UN number include:

- Specifying it is only regulated when transported by sea,
- Ni-MH button cells are not subject to the provisions of this code.
- Ni-MH cells or batteries packed with or contained in equipment are not subject to the provisions of this code.
- All other Ni-MH cells or batteries shall be securely packed and protected from short circuit. They are not subject to other provisions of this code provided they are loaded in a cargo transport unit in a total quantity of less than 100 Kg gross mass.

Prior to transportation, confirmation that there is no leakage and no spillage from a container is necessary.Cargo must be handle without falling, dropping or breakage. Care must be taken to prevent the collapse of cargo piles or saturation by rain. Containers must be handled carefully. Packaging is constructed to prevent short-circuiting and/or electric shock. The product is handled as Non-Dangerous Goods by based on IATA(Special Provision A199) for air shipment.

Disclaimer: This Safety Data Sheet was prepared in accordance with criteria and requirements of the Hazardous Products Act and theControlled Products Regulations (Canada), SafeWork Australia (Australia), European Union Commission Directives (EU/EC), JapaneseIndustrial Standard (JIS), Taiwan Bureau of Metrology and Inspection (BSMI), China Regulation GB/T 16483-2008 and theOccupational Safety and Health Administration (OSHA) using information provided by the manufacturer and other sources. Theinformation in the Safety Data Sheet is offered for your consideration and guidance when exposed to these products.