

MATERIAL SAFETY DATA SHEET

SANYO Batteries

SANYO Energy
2055 Sanyo Ave.
San Diego, CA 92154

Telephone No.: (619) 661-4888
www.sanyobatteries.com
In case of emergency contact:
CHEMTREC at (800) 424-9300

Date of Preparation: 6/23/03

Section I — Product Identification

Product Name: Nickel Cadmium Battery

Trade Name: CADNICA

Nominal Voltage: 1.2V

Chemical System: Nickel/Cadmium

Designated for Recharge:

Yes No

Section II — Composition / Information on Ingredients

IMPORTANT NOTE: The battery cell should not be opened or exposed to heat because exposure to the following ingredients contained within could be harmful under some circumstances.

Chemical Name	CAS No.	% ¹	PEL	TLV
Cadmium	7440-43-9	11-26	0.005 TWA ²	0.05 TWA
Cadmium hydroxide	21041-95-2	11-26	0.005 TWA	0.05 TWA
Nickel (powder)	7440-02-0	8-17	1 TWA	1 TWA
Nickel hydroxide	12054-48-7	5-12	1 TWA	1 TWA
Potassium hydroxide	1310-58-3	< 3	2 Ceiling	2 Ceiling
Nylon	N/A	< 2	N/A	N/A
Steel	N/A	12-13	N/A	N/A
Other	N/A	< 1	N/A	N/A
Total		100		

- Notes: 1. Concentrations vary depending on the state of charge or discharge.
2. TWA is the time weighted average concentration over an 8-hour period.

Section III — Physical Data

The product is a manufactured article as described in 29 CFR 1910.1200. The battery cell is contained in a hermetically-sealed case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, hazardous materials are fully contained inside the battery cell. However, if exposed to a fire, explosion, extreme abuse, misuse, or improper disposal that results in breaching of the battery cell case, hazardous materials may be released. The following physical data relating to the hazardous materials contained within the battery cell are provided for the user's information. (Also see Section IV — Fire and Explosion Hazards, and Section VIII — Precautions for Safe Handling and Use.)

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

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Cadmium: Melting point (°F): 610 Boiling point (°F): 1,407
% Volatile by Volume: Vapor Pressure (mm Hg):
Evaporation Rate: Vapor Density (Air =1):
Specific Gravity (H₂O): 8.65 @77°F
Solubility in Water: Insoluble
Appearance and Odor: Silver-white, blue-tinged, lustrous metal

Cadmium Hydroxide: Melting Point (°F): Boiling Point (°C):
% Volatile by Volume: Vapor Pressure (mm Hg):
Evaporation Rate: Vapor Density (Air =1):
Specific Gravity(H₂O): 4.79
Solubility in Water: Practically insoluble
Appearance and Odor: Powder

Nickel Powder: Melting point (°F): 2,831 Boiling point (°F): 5,134
% Volatile by Volume: Vapor Pressure (mm Hg):
Evaporation Rate: Vapor Density (Air =1):
Specific Gravity (H₂O): 8.90
Solubility in Water: Insoluble
Appearance and Odor: Powder

Nickel Hydroxide: Melting point (°F): * Boiling Point (°F):
% Volatile by Volume: Vapor Pressure (mm Hg):
Evaporation Rate: Vapor Density (Air = 1):
Specific Gravity (H₂O):
Solubility in Water: Insoluble
Appearance and Odor: Apple green powder

* Note: decomposes above 392°F into NiO and H₂O.

Potassium Hydroxide: Melting point (°F):* Boiling Point (°F):
% Volatile by Volume: Vapor Pressure (mm Hg):
Evaporation Rate: Vapor Density (Air =1):
Specific Gravity (H₂O):
Solubility in Water: Soluble in 0.9 part water, 0.6 part in boiling water
Appearance and Odor: White or slightly yellow

* Note: Potassium hydroxide is present as a liquid or paste and acts as the electrolyte in the battery cell.

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Section IV - Fire and Explosion Hazard Data

Flash point: NA Lower Explosive Limit: NA Upper Explosive Limit: NA

Extinguishing Media: Any class of extinguishing medium may be used on the batteries or their packing material.

Special Fire Fighting Procedures: Exposure to temperatures of above 212°F can cause evaporation of the liquid content of the potassium hydroxide electrolyte resulting in the rupture of the cell. Potential for exposure to cadmium fumes during fire; use self-contained breathing apparatus.

Section V - Health Hazard Data

Threshold Limit Values: See Section II

Effects of a Single (Acute) Overexposure:

Inhalation:

During normal use inhalation is an unlikely route of exposure due to containment of hazardous materials within the battery case. However, should the batteries be exposed to extreme heat or pressures causing a breach in the battery cell case, cadmium dusts and fumes may be emitted. Inhalation of cadmium dusts or fumes may cause throat dryness, respiratory irritation, headache, nausea, vomiting, chest pain, extreme restlessness and irritability, pneumonitis, and bronchopneumonia. In the case of high concentration exposures (e.g., above 1 to 5 mg/m³ during an eight hour period) death may occur within several days after the exposure.

Ingestion:

If the battery case is breached in the digestive tract, the electrolyte may cause localized burns. Ingestion of cadmium compounds may result in increased salivation, choking, nausea, persistent vomiting, diarrhea, abdominal pain, anemia, tenesmus, and kidney dysfunction.

Skin Absorption:

No evidence of adverse effects from available data.

Skin Contact:

Exposure to the electrolyte contained inside the battery may result in chemical burns. Exposure to nickel may cause dermatitis in some sensitive individuals.

Eye Contact:

Exposure to the electrolyte contained inside the battery may result in severe irritation and chemical burns.

Carcinogenicity:

Cadmium and nickel have been identified by the National Toxicology Program (NTP) as reasonably anticipated to be carcinogens. U.S. EPA classified cadmium as a "B1" probable human carcinogen. The International Agency for Research on Cancer (IARC) recommended that cadmium be listed as a "2A" probable human carcinogen, and the American Conference of Governmental Industrial Hygienists (ACGIH) has proposed listing cadmium as an A2 carcinogen.

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Other Effects of Repeated (Chronic) Exposure:

Repeated overexposures to cadmium may result in lung cancer; lung, kidney, and liver dysfunction; skeletal disease (e.g., osteoporosis) and reproductive toxicity. Chronic overexposure to nickel may result in cancer; dermal contact may result in dermatitis in sensitive individuals.

Medical Conditions Aggravated by Overexposure:

A knowledge of the available toxicology information and of the physical and chemical properties of the material suggests that overexposure is unlikely to aggravate existing medical conditions.

Emergency and First Aid Procedures:

Swallowing:

Do not induce vomiting. Seek medical attention immediately.

Skin:

If the internal cell materials of an opened battery cell comes into contact with the skin, immediately flush with water for at least 15 minutes.

Inhalation:

If potential for exposure to cadmium or nickel fumes or dusts occurs, remove immediately to fresh air and seek medical attention.

Eyes:

If the contents from an opened battery comes into contact with the eyes, immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention.

Section VI - Health Hazard Data

The batteries are stable under normal operating conditions.

Hazardous polymerization will not occur.

Hazardous decomposition products: oxides of cadmium and nickel.

Conditions to avoid: heat, open flames, sparks, and moisture.

Potential incompatibilities (i.e., materials to avoid contact with): The battery cells are encased in a non-reactive container; however, if the container is breached, avoid contact of internal battery components with acids, aldehydes, and carbamate compounds.

Section VII - Health Hazard Data

Spill and leaks are unlikely because cells are contained in an hermetically-sealed case. If the battery case is breached, don protective clothing that is impervious to caustic materials and absorb or pack spill residues in inert material. Dispose of as a hazardous waste in accordance with applicable state and federal regulations. Resultant spill residues may be characterized as D002 (caustic) and D006 (cadmium) pursuant to the federal Resource Conservation and Recovery Act (RCRA). See Section IV for response to fires or explosions.

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Section VIII - Safe Handling and Use (Personal Protective Equipment)

Ventilation Requirements: Not required under normal use.

Respiratory Protection: Not required under normal use.

Eye Protection: Not required under normal use.

Gloves: Not required under normal use.

Section IX- Precautions for Safe Handling and Use

Storage:

Store in a cool place, but prevent condensation on cell or battery terminals. Elevated temperatures may result in reduced battery life. Optimum storage temperatures are between -31°F and 95°F.

Mechanical Containment:

If there are special encapsulation or sealing requirements, consult your SANYO Energy Corp. representative about possible cell hazard precautions or limitations.

Handling:

Accidental short circuit will bring high temperature elevation to the battery as well as shorten the battery life. Be sure to avoid prolonged short circuit since the heat can burn attendant skin and even rupture the battery cell case. Batteries packaged in bulk containers should not be shaken. Metal covered tables or belts used for assembly of batteries into devices can be the source of short circuits; apply insulating material to assembly work surface.

Soldering/welding:

If soldering or welding to the case of the battery is required, consult your Sanyo Energy Corp. representative for proper precautions to prevent seal damage or external short circuit.

Charging:

This battery is designed for recharging. A loss of voltage and capacity of batteries due to self-discharge during prolonged storage is unavoidable. Charge battery before use. Observe the specified charge rate since higher rates can cause a rise in internal gas pressure which may result in damaging heat generation or cell rupture and or venting.

Section X- Recycling and Disposal

SANYO encourages battery recycling. Our Nickel Cadmium batteries are recyclable through the Rechargeable Battery Recycling Corporation's (RBRC) **Charge Up to Recycle! Program**. For information call 1-800-8-BATTERY or see their website at www.rbrc.org. Ni-Cd batteries must be handled in accordance with all applicable state and federal laws and regulations.



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DO NOT INCINERATE or subject battery cells to temperatures in excess of 212 F. Such treatment can vaporize the liquid electrolyte causing cell rupture. Incineration may result in cadmium emissions.

Section XI- Transportation

SANYO sealed Nickel Cadmium batteries are considered to be "dry cell" batteries and are not subject to dangerous goods regulation for the purpose of transportation by the U.S. Department of Transportation (DOT), the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA) or the International Maritime Dangerous Goods regulations (IMDG). The only DOT requirement for shipping Nickel Cadmium batteries is Special Provision 130 which states: "Batteries, dry are not subject to the requirements of this subchapter only when they are offered for transportation in a manner that prevents the dangerous evolution of heat (for example, by the effective insulation of exposed terminals)." IATA requires that batteries being transported by air must be protected from short-circuiting and protected from movement that could lead to short-circuiting. Nickel Cadmium batteries are classified as a D006 hazardous waste because of the presence of cadmium. This waste code is assigned because of toxicity, not corrosiveness. These batteries do not meet the definition of a corrosive waste.

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Material Safety Data Sheet

24-HOUR EMERGENCY CONTACT
(336) 650-7245/7257
CHEMTREC (800) 424-9300

HMIS Hazard Rating

HEALTH	3
FLAMMABILITY	1
REACTIVITY	2

0 Minimal Hazard
1 Slight Hazard
2 Moderate Hazard
3 Serious Hazard
4 Severe Hazard

PREPARED BY: A.L. Csontos, Director-Environmental Engineering
MANUFACTURER: Douglas Battery Manufacturing Company
Product Information (800) 368-4527

Date Prepared: 5/05
500 Battery Drive, Winston-Salem, NC 27107
Internet Address: www.douglasbattery.com

THE INFORMATION BELOW IS BELIEVED TO BE ACCURATE AND REPRESENTS THE BEST INFORMATION CURRENTLY AVAILABLE TO US. HOWEVER, WE MAKE NO WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, WITH RESPECT TO SUCH INFORMATION, AND WE ASSUME NO LIABILITY RESULTING FROM ITS USE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION FOR THEIR PARTICULAR PURPOSES.

SECTION 1 – IDENTITY

Common Name: LEAD/ACID STORAGE BATTERY
Chemical Name: Lead/Acid Storage Battery **Chemical Family:** Electric Storage Battery
DOT Shipping Name: Battery, Wet, Filled With Acid, 8, UN 2794, PG III

SECTION 2 – HAZARDOUS INGREDIENTS

Principal Hazardous Component(s) (chemical & common name(s))	C.A.S.	Hazard Category	%	ACGIH TLV	OSHA PEL/TWA
Lead/Lead Oxide/Lead Sulfate	7439-92-1	Acute-Chronic	60 - 70%	0.15 mg/m ³	0.05 mg/m ³
Antimony	7440-36-0	Chronic	0.5 - 2.5%	0.5 mg/m ³	0.5 mg/m ³
Arsenic	7440-38-2	Acute-Chronic	< 0.1%	0.2 mg/m ³	0.01 mg/m ³
Sulfuric Acid (Battery Electrolyte)	7664-93-9	Reactive-Oxidizer Acute-Chronic	10 - 38%	1.0 mg/m ³	100 mg/m ³
Calcium	7440-70-2	Reactive	< 0.15%	Not Applicable	Not Applicable

This Product description or Tradename contains toxic chemicals subject to reporting requirements under Section 313 of Title III the "Superfund Amendments and Reauthorization Act" of 1986 and 40 CFR 372 and California Proposition 65.

PROPOSITION 65 WARNING: Battery Posts, terminals, and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

SECTION 3 – PHYSICAL & CHEMICAL CHARACTERISTICS (Fire & Explosion Data)

Boiling Point Electrolyte Approx. 275° F **Vapor Pressure** Electrolyte 1 mm Hg @ 145.8°F **Specific Gravity** Electrolyte (H₂O = 1) 1.080-1.400 **pH** Electrolyte <1

Percent Volatile by Volume (%) Not Applicable **Vapor Density** Hydrogen (Air = 1):0.069
Electrolyte (Air = 1) :3.4 **Evaporation Rate** Not Applicable

Appearance and Odor *Battery:* Polypropylene or hard rubber case, solid.
Lead: gray, metallic, solid.
Electrolyte: Liquid, colorless, oily fluid; acid odor when hot or charging battery.

Flash Point Not Applicable **Flammable Limits in Air% by Volume** Hydrogen (H₂) 4.1% **Lower** 4.1% **Upper** 74.2% **Extinguisher Media** Halon, dry chemical
Polypropylene Auto-Ignition Temperature 675°F

Special Fire Fighting Procedures Lead/Acid batteries do not burn, or burn with difficulty. Extinguish fire with agent suitable for surrounding combustible materials. Cool exterior of battery if exposed to fire to prevent rupture. The acid mist and vapors generated by heat or fire are corrosive. Wear respiratory protection (SCBA) and protective clothing.

Unusual Fire and Explosion Hazards Hydrogen gas and sulfuric acid vapors are generated upon overcharging. Hydrogen gas may be flammable or explosive when mixed with air, oxygen, or chlorine. Ensure adequate ventilation of charging areas consistent with OSHA (29 CFR 1910 & 1926), National Fire Code, ACGIH and other relevant standards.

MSDS – 009 (rev.2)

SECTION 4 – PHYSICAL HAZARDS

Stability	Stable	Conditions to Avoid	Avoid overcharging. Do not allow smoking, sparks, or open flame near batteries while charging.
Incompatibility (Materials to Avoid)	Keep battery case away from strong oxidizers.		
Hazardous Decomposition Products	An explosive hydrogen/oxygen mixture within the battery may occur during charging.		
Hazardous Polymerization	Will Not Occur	Do not overcharge.	

SECTION 5 – HEALTH HAZARDS

Threshold Limit Value (TLV)	Permissible exposure limit (PEL)	Sulfuric Acid	TLV 1.0 mg/m ³ (milligram per cu. meter)
		Lead	TLV 0.15 mg/m ³ PEL 0.05 mg/m ³
Signs and Symptoms of Exposure			
1. Acute Exposure	Signs of exposure include prickling or burning sensation to skin, eyes or mucus membranes. Battery electrolyte can cause irritation of eyes, nose and throat. Short term liquid or vapor contact may result in irritation and acid burns to the exposed area. Ingestion of electrolyte may cause severe injury.		
2. Chronic Overexposure	Repeated contact with battery electrolyte (sulfuric acid) may cause drying of the skin which may result in irritation and dermatitis. Prolonged inhalation of a mist of sulfuric acid can cause inflammation of the upper respiratory tract. Ingestion of lead can result in symptoms of lead toxicity including anemia, fatigue, loss of appetite, cramping, and affects to neurological system.		
Medical Conditions Generally Aggravated by Exposure	Exposures to acid mist may irritate pre-existing respiratory diseases. Acid exposure may aggravate skin diseases. Chronic exposure to lead and its compounds may aggravate some forms of kidney, liver and neurological diseases.		
Routes of Entry	Electrolyte: ingestion, inhalation	Lead: Ingestion; lead and compounds not absorbed through skin	
Chemical Listed as carcinogen or Potential Carcinogen	No Info. Found	National Toxicology Program	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> I.A.R.C. Monographs Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> OSHA Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> EPA CAG Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Human Health Effects	The international Agency for Research on cancer (IARC) has classified "strong inorganic acid mist containing sulfuric acid" as a Category 1 carcinogen, a substance that is carcinogenic to humans. This classification does not apply to liquid forms of sulfuric acid or sulfuric acid solutions contained within the battery. Inorganic acid mist (sulfuric acid mist) is not generated under normal use of this product. Misuse of the product, such as overcharging, may however result in the generation of sulfuric acid mist.		

Emergency and First Aid Procedures

Sulfuric Acid (Battery Electrolyte)

1. Inhalation	Move to Ventilated Area. Obtain medical attention.
2. Eyes	Wash the eyes with copious quantities of running water for 15 minutes. Obtain medical attention.
3. Skin	Flush area with large amounts of running water. Remove contaminated clothing and obtain medical attention.
4. Ingestion	Wash out mouth with running water. Do not induce vomiting. Call Physician.

SECTION 6 – SPECIAL PROTECTION INFORMATION

Respiratory Protection (Special Type)	Sulfuric Acid Mist – Full face or half mask respirator with acid mist filter or SCBA.		
Ventilation	Change air every 15 min.	Local Exhaust	No Mechanical (General) No Information Found
Protective Gloves	Acid resistant rubber or plastic	Eye Protection: Splash resistant goggles or safety glasses with face shield	
Other Protective Clothing or Equipment	Acid resistant rubber or plastic apron, boots and protective clothing.		

SECTION 7 – SPECIAL PRECAUTIONS AND SPILL / LEAK PROCEDURES

Precautions to Be Taken	Store batteries in a cool, dry, well-ventilated area. Do not short circuit battery terminals or remove vent caps during storage or charging. Avoid rough handling which could result in spills or leaks. Do not smoke or use open flames in charging areas. Wash thoroughly after handling product.
Other Precautions	Avoid prolonged overcharging or combustion which could liberate hazardous gases and liquids including hydrogen, sulfuric acid, sulfuric acid mist, sulfur dioxide, sulfur trioxide, arsine, or stibine gas. Materials should be kept on site for spill neutralization and containment.
Steps to Be Taken in Case Material Is Released or Spilled	Wear protective clothing. Ventilate enclosed areas. Dike to contain contaminated materials and liquids. Limit site access to qualified emergency responders. Neutralize acid spills with sodium bicarbonate (soda ash), calcium carbonate, agricultural lime or equivalent commercial product. Collect all material for proper disposal.
Waste Disposal Methods	Return whole scrap batteries to distributor, manufacturer, or lead smelter for recycling. For neutralized spills, place residue into plastic containers with sorbent material, sand, or earth for disposal. Contact local and/or state environmental officials for proper disposal requirements.

Panasonic

Panasonic Industrial Company
Division of Matsushita Electric
Corporation of America

Two Panasonic Way
Secaucus, New Jersey 07094
201.348.7000
Fax: 201.392.4782

Battery Sales Group

May 24, 1996

ISCO Inc.
P.O. Box 82531
Lincoln, NE 68501-2531

Material Safety Data Sheets (MSDS) are a subrequirement of the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard 29 CFR Subpart 1910.1200. This Hazard Communication Standard does not apply to various subcategories including anything defined by OSHA as an "article". OSHA has defined "article" as a manufactured item: (i) which is formed to a specific shape or design during manufacture; (ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and (iii) which does not release, or otherwise result in exposure to, a hazardous chemical, under normal conditions of use. OSHA then goes on to define "hazardous chemical" and "exposure".

Because all of our batteries are defined as "articles", they are exempt from the requirements of the Hazard Communication Standard, 29 CFR 1910.1200, hence a MSDS is not required.

The following components are found in a Panasonic sealed lead acid battery:

		Weight Range
Sulfuric Acid - Electrolyte	H ₂ SO ₄	10 - 20%
Lead - Negative Electrode	Pb	30 - 60%
Lead Dioxide - Positive Electrode	PbO ₂	5 - 25%
Lead Sulfate - Positive Electrode	PbSO ₄	1 - 25%

Concentrations of components depend on the state of charge or discharge and battery size. The hazardous waste code for lead acid batteries is D008. Please dispose of properly. If one of our batteries should leak electrolyte, wash the area with copious amounts of water.

Sincerely,

Battery Sales Group
Panasonic Industrial Company

产品中有毒有害物质或元素的名称及含量

Name and amount of Hazardous Substances or Elements in the product

部件名称 Component Name	有毒有害物质或元素 Hazardous Substances or Elements					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二联苯 (PBDE)
电池 Battery	O	O	X	O	O	O

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

O: 表示该有毒有害物质在该部件所有均质材料中的含量均在ST/ 标准规定的限量要求以下。

O: Represent the concentration of the hazardous substance in this component's any homogeneous pieces is lower than the ST/ standard limitation.

X：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出ST/ 标准规定的限量要求。

(企业可在此处，根据实际情况对上表中打“X”的技术原因进行进一步说明。)

X: Represent the concentration of the hazardous substance in this component's at least one homogeneous piece is higher than the ST/ standard limitation.

(Manufacturer may give technical reasons to the “X”marks)

环保使用期由经验确定。

The Environmentally Friendly Use Period (EFUP) was determined through experience.

生产日期被编码在系列号码中。前三位数字为生产年(207 代表 2007 年)。随后的一个字母代表月份：

A 为一月，B 为二月，等等。

The date of Manufacture is in code within the serial number. The first three numbers are the year of manufacture (207 is year 2007) followed by a letter for the month. "A" is January, "B" is February and so on

产品中有毒有害物质或元素的名称及含量

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部件名称 Component Name	有毒有害物质或元素 Hazardous Substances or Elements					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二联苯 (PBDE)
变压器 Transformer	X	O	O	O	X	O
线路板 Circuit Board	X	O	O	O	O	O
接头 Connectors	O	O	X	O	O	O
主电源线 Line Cord	O	O	O	O	X	O

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

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电池 Battery	X	O	O	O	O	O

产品中有毒有害物质或元素的名称及含量：Name and amount of Hazardous Substances or Elements in the product

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