

**Spectrum Batteries Inc.**

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Emergency Telephone Number

1-800-255-3924: Within USA, Canada, Puerto Rico,
US Virgin Islands
1-813-248-0585: Outside North America Continent (call collect)

MATERIAL SAFETY DATA SHEET

Updated: 6/7/2005

Section 1- IDENTIFICATION

Product Name: LITHIUM THIONYL CHLORIDE CELLS AND BATTERIES

Hermetically-Sealed Lithium Thionyl Chloride Cells & Batteries. All Lithium Thionyl Chloride 100, 150, 150/165MR, 180/180MR, 200/200MR series, QTC, MWD, VHT Cells and Batteries

Section 2 – COMPOSITION / INFORMATION ON INGREDIENTS

Thionyl Chloride 7719-09-7	OSHA: 1.0 ppm (5.0 mg/m ³) ceiling ACGIH: 1.0 ppm (5.0 mg/m ³) ceiling
Lithium 7439-93-2	TLV/PEL N/A
Carbon 1333-86-4	ACGIH: 3.5 mg/m ³ TLV/TWA

Section 3 - HAZARDS IDENTIFICATION

****DANGER**** INTERNAL CONTENTS ARE EXTREMELY HAZARDOUS. LEAKING FLUID IS CORROSIVE AND DANGEROUS UPON INHALATION. BATTERY MAY BE EXPLOSIVE AT HIGHER TEMPERATURES.

Do not expose to temperatures above the maximum rated temperature as specified by the manufacturer due to leak hazard.

If cell or battery leaks or vents

Primary Routes of Entry: Inhalation

Carcinogenicity: Not listed by NTP, IARC, or regulated by OSHA.

Health Hazards: Acute - Vapors are very irritating to skin, eyes, and mucous membranes. Inhalation of thionyl chloride or sulfuryl chloride vapors may result in pulmonary edema.

Chronic - Overexposure can cause symptoms of non-fibrotic lung injury

Signs and Symptoms of Exposure: Eye and mucous membrane irritation.

Medical Conditions Generally Aggravated by Exposure: Asthma, other respiratory disorders, skin allergies, and eczema.

Section 4 - FIRST AID MEASURES

Eye Contact: Flush with running water for at least 15 minutes. Hold eyelids apart. Seek immediate medical attention. Contact results in acidic burns.

Skin Contact: Rinse with large amounts of running water. Avoid hot water and rubbing skin. If burns develop, seek medical attention. Contact results in acidic burns.

Inhalation: Remove to fresh air. If breathing is difficult, administer oxygen. If not breathing, give artificial respiration. May result in pulmonary edema.

Ingestion: Drink copious amounts of water (or milk if available). Do not induce vomiting. NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. Immediately seek medical attention.

Section 5 - FIRE FIGHTING MEASURES

Flash Point: N/A

Auto-Ignition Temp: N/A

Flammable Limits: N/A

Danger - Do not use water

Extinguisher Media: Lith-X powder, Class D fire extinguisher, Dry Lithium Chloride, Graphite Powder, Pyrene G-I.

Special Fire Fighting Procedures: Cover with Lith- X powder, Class D fire extinguisher, dry lithium chloride, or graphite powder. DO NOT USE WATER, moist sand, CO₂, Class ABC, or soda ash extinguisher. Wear protective breathing apparatus; a positive pressure Self Contained Breathing Apparatus (SCBA), or Air Purifying Respirator (APR).

Unusual Fire and Explosion Hazards: Do not short circuit, recharge, over discharge (discharge below 0.0 Volts), puncture, crush or expose to temperatures above the maximum rated temperature as specified by the manufacturer. Cell may leak, vent, or explode. If a bright white flame is present, lithium content is exposed and on fire; use a Class D fire extinguisher, Do not use water.

Section 6 - ACCIDENTAL RELEASE MEASURES

Accidental Releases: Do not breathe vapors or touch liquid with bare hands (see section 4).

Waste Disposal Methods: Evacuate area. If possible, a trained person should attempt to stop or contain the leak by neutralizing spill with soda lime or baking soda. A NIOSH Approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus should be worn.

Seal leaking battery and soda lime or baking soda in a plastic bag and dispose of as hazardous waste.

Other: Follow North American Emergency Response Guide (NAERG) #138 for cells involved in an accident, cells that have vented, or have exploded.

Section 7 - HANDLING & STORAGE

Storage: Cells should be stored at room temperature, approx. 21°C (70°F). Do not store batteries in high humidity environments for long periods. High Temperature storage will degrade performance.

Precautions: Do not short circuit or expose to temperatures above the maximum rated temperature as specified by the manufacturer. Do not recharge, over discharge, puncture or crush.

Other Conditions: Do not store cells in close proximity of other combustible / flammable materials.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

WHEN HANDLING INTERNAL COMPONENTS:

Respiratory Protection: NIOSH Approved Acid Gas Filter Mask, or Self-Contained Breathing Apparatus.

Protective Gloves: Nitrile or PVC, Gloves should be 15 ml (0.015 in), or thicker.

Eye Protection: Chemical Worker Safety Glasses or face shield.

Ventilation To Be Used: Negative pressure chemical fume hood.

Other Protective Clothing & Equipment: Chemical Laboratory Safety Glasses, Protective Apron, Acid Resistant Protective Clothing, and face shield.

Hygienic Work Practices: Use good chemical hygiene practice. Do not eat or drink when handling contents. Avoid unnecessary contact.

Section 9 - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Point: Thionyl Chloride: 77°C

Vapor Pressure: Thionyl Chloride: 92mm @ 20°C

Vapor Density: Thionyl Chloride: 4.1 (air = 1)

Evaporation Rate: No Data

Specific Gravity: Thionyl Chloride: 1.63 g/cm³

Melting Point: Thionyl Chloride: -105°C

Solubility in Water: Thionyl Chloride: Decomposes violently on contact with water.

Water Reactive: Thionyl Chloride hydrolyzes to form SO₂ and HCl gasses and strongly acidic wastewater.

Appearance & Odor: Thionyl Chloride - Colorless to pale yellow; sharp, pungent odor.

Other: N/A

Section 10 - STABILITY & REACTIVITY

Stability: Stable **Incompatibility:** N/A **Hazardous Polymerization:** Will not occur.

Conditions to Avoid: Temperatures above the maximum rated temperature as specified by the manufacturer due to leak hazard. High humidity for extended periods.

Hazardous Decomposition Products: Sulfur Dioxide (g), Hydrogen Chloride (g), Hydrogen (g)

Section 11 - TOXICOLOGICAL INFORMATION

Acute Toxicity (as applicable):

Thionyl Chloride

LC₅₀ (Inhalation): 500 ppm (rat 1-hr)

LD₅₀: NA

Eye Effects: Corrosive

Skin Effects: Corrosive

Sulfuryl Chloride

LC₅₀ (Inhalation): 130-250 ppm (rat 1-hr)

LD₅₀: N/A

Eye Effects: Corrosive

Skin Effects: Corrosive

Section 12 - ECOLOGICAL INFORMATION

Aquatic Toxicity: Do not let internal components enter marine environments. A void releases into waterways, wastewater or groundwater.

Section 13 - DISPOSAL CONSIDERATIONS

Proper Shipping Name: Waste Lithium Batteries

UN Number: 3090

Hazard Classification: Class 9 (Misc.)

Packing Group: II

Labels Required: MISCELLANEOUS, HAZARDOUS WASTE

Waste Disposal Code: D003

Other: All lithium thionyl chloride batteries should be disposed of by a certified hazardous waste disposal facility.

Section 14 - TRANSPORT INFORMATION

US DOT (per 49 CFR 172.101) and IATA/ICAO

Proper Shipping Name: Lithium Batteries

UN Number: UN 3090 (UN 3091 for *Lithium Batteries in Equipment*)

Hazard Classification: Class 9 (Misc.)

Packing Group: II

Labels Required: MISCELLANEOUS HAZARD CLASS 9

Other: CARGO AIRCRAFT ONLY (Forbidden as cargo aboard passenger aircraft)

Shipping Requirements:

DOT: Lithium batteries and cells are subject to shipping requirements exceptions under 49 CFR 173.185.

IATA: Shipping of lithium batteries in aircrafts are regulated by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) requirements in Special Provision "A45"

Section 15 - REGULATORY INFORMATION

OSHA Status: This product is considered an "Article" and the internal component (thionyl chloride / sulfuryl chloride) is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1920.1200.

Section 16 - OTHER INFORMATION

Lithium Battery Safety: With proper use and handling, lithium batteries have demonstrated an excellent safety record. The success and wide use of lithium batteries is partially due to the fact that they contain more energy per unit weight than conventional batteries. However, the same properties that result in a high energy density also contribute to potential hazards if the energy is released at a fast uncontrolled rate. In recognition of the high-energy content of lithium systems, safety has been incorporated into the design and manufacture of all lithium batteries. However, abuse or mishandling of lithium batteries can still result in hazardous conditions. The information provided here is intended to give users some guidelines to safe handling and use of lithium batteries.

CELL ABUSE

In general, the conditions that cause damage to cells and jeopardize safety are summarized on the label of each cell. These conditions include:

- Short Circuit
- Forced Over discharge
- Crush, puncture or disassembly
- Very rough handling or high shock and vibration could also result in cell damage.
- Charging
- Excessive heating or incineration

CELL HANDLING AND INSPECTION GUIDELINES

The most frequent forms of cell abuse can easily be identified and controlled in the workplace. It is our experience that inadvertent short circuits are the largest single cause of field failures.

PROBLEMS ASSOCIATED WITH SHORTING: As well as other hazardous conditions can be greatly reduced by observing the following guidelines:

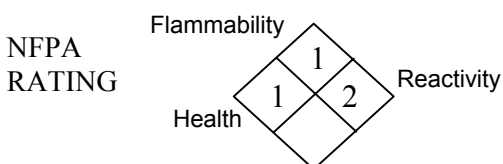
- Cover all metal work surfaces with an insulating material.
- The work area should be clean and free of sharp objects that could puncture the insulating sleeve on each cell.
- Never remove the shrink-wrap from a cell or battery pack.
- All persons handling cells should remove jewelry items such as rings, wristwatches, pendants, etc., that could come in contact with the battery terminals.
- If cells are removed from their original packages for inspection, they should be neatly arranged to preclude shorting.
- Cells should be transported in plastic trays set on pushcarts. This will reduce the chances of cells being dropped on the floor, causing physical damage.
- All inspection tools (calipers, rulers, etc.) should be made from non-conductive materials, or covered with a non-conductive tape.
- Cells should be inspected for physical damage. Cells with dented cases or terminal caps should be inspected for electrolyte leakage. If any is noted, the cell should be disposed of in the proper manner.

CELL STORAGE: Cells should be stored in their original containers. Store cells in a well ventilated, cool, dry area. Store cells in an isolated area, away from combustible materials. Never stack heavy objects on top of boxes containing lithium batteries to preclude crushing or puncturing the cell case.

HANDLING DURING PRODUCT ASSEMBLY

All personnel handling batteries should wear appropriate protective equipment such as safety glasses.

- Do not solder wires or tabs directly to the battery. Only solder to the leads welded to the cell by the manufacturer.
- Never touch a cell case directly with a hot soldering iron. Heat sinks should be used when soldering to the tabs, and contact with the solder tabs should be limited to a few seconds.
- Cells should not be forced into (or out of) battery holders or housings. This could deform the cell causing an internal short circuit, or fracturing the glass to metal hermetic seal.
- All ovens or environmental chambers used for testing cells or batteries should be equipped with an over-temperature controller to protect against excessive heat.
- Only precision convection ovens should be used for cell testing. Lesser ovens may exhibit uneven heating and hot spots that can exceed the rated temperature of the battery.
- Do not connect cells or batteries of different chemistries together.
- Do not connect cells or batteries of different sizes together.
- Do not connect old and new batteries together.
- Consult Spectrum Batteries before encapsulating batteries during discharge. Cells may exceed their maximum rated temperature if insulated.
- Although we have provided a general overview of lithium battery safety and handling, we urge you to call us with any questions. Our technical services staff will be pleased to assist you with your questions.



For cells or battery packs involved in an accident, cells that have vented, or exploded, follow the North American Emergency Response Guide (NAERG) #138.