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MATERIAL SAFETY DATA SHEET

SECTION 1 – IDENTIFICATION

Product Name: LITHIUM/THIONYL CHLORIDE BATTERIES
Chemical Reaction: $4\text{Li} + 2\text{SOCl}_2 \rightarrow 4\text{LiCl} + \text{S} + \text{SO}_2$

SECTION 2 – COMPOSITION, INFORMATION ON INGREDIENTS

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

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 sulfur 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-1.

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 AND 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)
Solubility in Water:	Thionyl Chloride: Decomposes violently on contact with water.
Specific Gravity:	Thionyl Chloride: 1.63 g/cm3
Melting Point:	Thionyl Chloride: -105 °C
Evaporation Rate:	No Data
Water Reactive:	Thionyl Chloride hydrolyzes to form SO ₂ and HCl gasses and strongly acidic wastewater.
Appearance & Odor:	Thionyl Chloride – Colorless to pale yellow; sharp, pungent odor.
Other:	N/A

SECTION 10 – STABILITY AND 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 Sulfuryl Chloride

LC50 (Inhalation): 500 ppm (rat 1-hr) **LC50 (Inhalation):** 130-250 ppm (rat 1-hr)

LD50: N/A **LD50:** N/A

Eye Effects: Corrosive **Eye Effects:** Corrosive

Skin Effects: Corrosive **Skin Effects:** Corrosive

SECTION 12 – ECOLOGICAL INFORMATION

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

This product **does not** contain white lead, asbestos, mercury, tin or other heavy metal preservatives.

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.

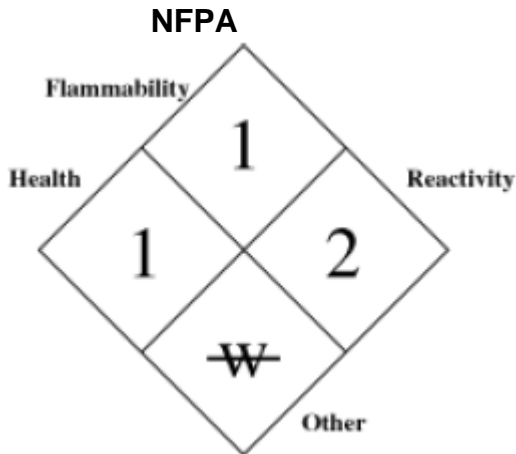
SECTION 14 – TRANSPORT INFORMATION

US DOT (per 49 CFR 172.101) and IATA/ICAO
Proper Shipping Name: LITHIUM METAL BATTERIES
UN Number: UN 3090 (UN 3091 for *Lithium Metal 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

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

SECTION 16 – OTHER INFORMATION



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

PREPARED: August 25th, 2010

RATING