MSDS No.- S-39-01 (Revision- G)

MATERIAL SAFETY DATA SHEET

SECTION 1- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer Name- Tadiran Batteries Ltd., P. O. Box 1, Kiryat Ekron, Israel 70500.

US office address- 2001 Marcus Avenue, Suite 125E, Lake Success, NY 11040

Emergency Telephone No. – CHEMTREC: 1-800-424-9300
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Products Name: Primary (Non-rechargeable), Lithium metal Sulfuryl Chloride (Li/SO_2Cl_2) cells and batteries. This MSDS covers the 3.9V cell series and the batteries assembled from them. Cells sizes covered by this MSDS are: TL-6902, TL-6903, TL-6955, TL-6920, TL-6930, and TL-6937, with all their finishing versions and batteries assembled from them.

SECTION 2- COMPOSITION, INFORMATION ON INGREDIENTS

Each cell consists of hermetically sealed metallic container (nickel plated steel) containing a number of chemical and materials. Below are the mchemials which could be potentially hazardous upon release from the cell on abuse. Quantities of chemicals vary upon cell size.

Ingredient Name	*CAS #*	*%*	*ACGIH (TLV)*	*OHSA (PEL)*
Lithium Metal (Li)	7439-93-2	4-6%	Not Established	None
Sulfuryl Chloride (SO_2Cl_2)	7791-25-5	35-45%	N/A	N/A
Thionyl Chloride ($SOCl_2$)	7719-09-7	3-5%	1 ppm ($5\ mg/M^3$)	$5\ mg/m^3$
Carbon (C)	1333-86-4	3-6%	$3.5\ mg/m^3$	$3.5\ mg/m^3$
Aluminum Chloride ($AlCl_3$)	7446-70-0	4-6%	$2\ mg/m^3$ (Al salt, soluble)	
Lithium Chloride (LiCl)	7447-41-8	1-2%	Not Established	
Glass		<1%	Not Established	
PVC	9002-86-2	<1%	Not Established	
PTFE	9002-84-0	<1%	Not Established	

SECTION 3 - HAZARD IDENTIFICATION

The lithium Sulfuryl Chloride cells described in this MSDS are hermetically sealed units, which do not cause hazard when used according to the recommendations of the manufacturer.

Under normal condition of use of the batteries, the electrode materials and the liquid electrolyte they contained are non-reactive provided the battery integrity is maintained. Risk of exposure exists only in case of mechanical, electrical or thermal abuse. Thus the batteries should not short circuit, recharge, puncture, incinerate, crush, immerse in water, force discharge, or expose to temperatures above the temperature range of the cell or battery. In these cases there is risk of fire or explosion.

SECTION 4- FIRST AID MEASURES

In case of battery rupture, explosion, or major leakage, evacuate personnel from contaminated area and provide good ventilation to clear out corrosive fumes, gases or the pungent odor.

Eyes – Check for and remove any contact lenses. Do not use an eye ointment. Rinse with plenty of water for 15 minutes and then seek medical attention. Contact results in acidic burns.

Skin - Remove contaminated clothes and rinse skin with plenty of water or shower for 15 min. Avoid hot water and rubbing skin. If burns develop, seek medical attention. Contact results in acidic burns

Inhalation - Remove to fresh air and rest in well-ventilated area, use artificial respiration if needed, and seek medical attention. Can result in pulmonary edema.

Ingestion - rinse mouth, ***DO NOT*** induce vomiting, give plenty of water to drink, and seek medical attention.

SECTION 5- FIRE FIGHTING MEASURES

FLASH POINT:	N/A	AUTO-IGNITION:	N/A
FLAMMABLE LIMIT IN AIR	N/A		

EXTINGUISHING MEDIA:

1. Lith- X (Class D extinguishing media) is the **only** effective on fires involving a few lithium batteries. If the cells are directly involved in a fire **DO NOT USE:** WATER, SAND, CO_2, HALON, and DRY POWDER OR SODA ASH EXTINGUISHERS.

2. If the fire is in adjacent area and the cells that are either packed in their original containers or unpacked, the fire can be fought based on fueling material, e.g., paper and plastic products. In these cases the use of copious amounts of **cold** water is effective extinguishing media. Storage area may also employ sprinkler system with cold water.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus to avoid breathing of irritant fumes (NIOSH approved SCBA & full protective equipment). Wear protective clothing and equipment to prevent body contact with electrolyte solution.

Fire may be fought, but only from safe fire-fighting distance. Evacuate all persons from immediate area of fire.

UNUSUAL EXPLOSION AND FIRE EXPLOSION: Battery or cells may explode when subject to: excessive heat (above 150ºC), recharged, over-discharged (discharge below 0V), punctured and crushed. During thermal decomposition generation of chlorine (Cl_2), hydrogen chloride (HCl), Hydrogen (H_2), Sulfuric acid (H_2SO_4) and sulfur dioxide (SO_2) can be formed.

SECTION 6- ACCIDENTAL RELEASE MEASURES

PROCEDURES TO CONTAIN AND CLEAN UP LEAKS OR SPILLS: The material contained within the battery would only be released under abusive conditions.

In the event of battery rapture and leakage: contain the spill while wearing proper protective clothing and ventilate the area. Then, cover with sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked lime. Keep away from water, rain, and snow. Placed in approved container (after cooling if necessary) and disposed according to the local regulations.

NEUTRALIZING AGENT: Sodium carbonate (Na_2CO_3) or 1:1 mixture of soda ash and slaked lime.

WASTE DISPOSAL METHOD: Product may be decomposed by water thus it should not be disposed in water.

PRECAUTIONS IN HANDLING AND STORING; avoid short-circuiting, over-charging and heating to high temperatures. Store the batteries in dry and cool area and keep container dry and tightly closed in well-ventilated area. Store the cells and batteries away from food and drink.

OTHER PRECAUTIONS; Never attempt to disassemble, machine, or otherwise modify batteries or injury may result.

SECTION 7- HANDLING AND STORAGE

The batteries should not be opened, destroyed or incinerate, since they may leak or rupture and release to the environment the ingredients that they normally contained in the hermetically sealed container.

HANDLING- Do not short circuit terminals, or expose to temperatures above the temperature rating of the battery, over charge the battery, forced over-discharge (voltage below 0.0V), throw to fire.

Do not crush or puncture the battery, or immerse in liquids.

STORAGE- preferably in cool (below 30ºC), dry and ventilated area which is subject to little temperature change.

Do not place the battery near heating equipment, nor expose to direct sunlight for long periods. Elevated temperatures can result in shortened battery life and degrade performance.

Keep batteries in original packaging until use and do not jumble them.

Do not store batteries in high humidity environment for long periods.

OTHER- cells and batteries are not rechargeable batteries and should not be charged.

Applying pressure and deforming the battery may lead to disassembly followed by eye skin and throat irritation.

Follow manufacturer recommendations regarding maximum recommended current and operating temperature range.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

GENERAL- The following safety measures are not necessary in normal use. They need only be applied if there is a risk that, in use or handling, the recommendations, as outlined in Section 3, have not been followed.

RESPIRATORY PROTECTION: In case of abuse and leak of liquid or fumes, use NIOSH approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus.

VENTILATION: In case of abuse, use adequate mechanical ventilation (local exhaust) for battery that vents gas or fumes.

PROTECTIVE GLOVES: In case of spill use PVC or Nitrile gloves of 15 mils (0.015 inch) or thicker.

EYE PROTECTION: Use ANSI approved chemical worker safety goggles or face shield.

OTHER PROTECTIVE EQUIPMENT: In case needed, chemical resistance clothing is recommended along with eye wash station and safety shower should be available meeting ANSI design criteria.

WORK HYGIENIC PRACTICES: Use good hygiene practice. Wash hands after use and before drinking, eating or smoking. Launder contaminated cloth before reuse.

SUPPLEMENTARY SAFETY AND HEALTH DATA: If the battery is broken or leaked the main hazard is the electrolyte. The electrolyte is mainly solution of Aluminum Chloride in Sulfuryl Chloride (SO_2Cl_2) and Thionyl Chloride ($SOCl_2$).

Fires may be fought but only from safe fire fighting distance, evacuate all persons from immediate area of fire.

Prevent heating of the battery, charging the battery, discharge to predetermined limit, do not crush, disassemble, incinerate or short circuit.

SECTION 9- PHYSICAL AND CHEMICAL CHARACTERISTICS

TASTE	NA, unless individual components exposed
SPECIFIC GRAVITY (GR/CC)	> 1 gr/cc
BOILING POINT (760 mm Hg)	NA, unless individual components exposed
MELTING POINT	NA, unless individual components exposed
VAPOR PRESSURE (mm Hg, 20ºC)	NA, unless individual components exposed
VAPOR DENSITY	NA, unless individual components exposed
VOLATILE BY VOLUME (%)	NA, unless individual components exposed
EVAPORATION RATE (butyl acetate=1)	NA, unless individual components exposed
PHYSICAL STATE	Solid
SOLUBILITY IN WATER (% by weight)	NA, unless individual components exposed
PH (1% solution in water)	NA, unless individual components exposed
APPEARANCE	Geometric Solid Object.
ODOR	If leaking, gives off pungent corrosive odor

SECTION 10- STABILITY AND REACTIVITY

STABLE OR NOT STABLE — Stable

INCOMPATIBILITY (MATERIAL TO AVOID) — Strong mineral acids, water and alkali solutions.

HAZARDOUS DECOMPOSITION PRODUCTS

1. Reaction of lithium with water: Hydrogen (H_2), Lithium hydroxide (LiOH).
2. Thermal decomposition over 150ºC: Sulfur oxides, (SO_2, SO_3), Sulfur chlorides (SCl_2, S_2Cl_2), Chlorine (Cl_2), Lithium oxide (Li_2O).
3. Electrolyte with water: Hydrogen Chloride (HCl), Sulfuric acid (H2SO4), Chlorine (Cl_2) and SO_2

DECOMPOSITION TEMPERATURE (ºF) — NA

HAZARDOUS POLYMERIZATION: May Occur____ Will Not Occur __X__

CONDITIONS TO AVOID — Avoid mechanical abuse and electrical abuse such as short-circuiting, overcharge, over-discharge, (voltage reversal) and heating.

SECTION 11- TOXICOLOGICAL INFORMATION

THRESHOLD LIMIT VALUE (TLV) AND SOURCE: NA

ACUTE TOXICITY OF INTERNAL COMPONENTS:

Sulfuryl Chloride	LC50 inhalation, rat, 1 hour- 131-242 ppm	LD50- N/A
Thionyl Chloride	LC50 inhalation, rat, 1 hour- 500 ppm	LD50- N/A

HEALTH HAZARD ACUTE AND CHRONIC: Inhalation, skin contact, eye contact and ingestion are not likely by exposure to sealed battery.

Inhalation, skin contact and eye contact are possible when the battery is opened. Exposure to internal contents, the corrosive fumes will be very irritating to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.

Carcinogenicity- NTP: No

Carcinogenicity- IARC: No

Carcinogenicity- OSHA: No

Risk Phrases for Sulfuryl Chloride are: R14, R23, R24, R25, R34 and R37

Safety Phrases for Sulfuryl Chloride are: S26, S36, S37, S39 and S45.

SIGNS AND SYMPTOMS OF OVEREXPOSURE: Exposure to leaking electrolyte from ruptured or leaking battery can cause:

Inhalation- Burns and irritation of the respiratory system, coughing, wheezing, and shortness of breath.

Eyes- Redness, tearing, burns. The electrolyte is corrosive to all ocular tissues.

Skin- The electrolyte is corrosive and causes skin irritation and burns.

Ingestion- The electrolyte solution causes tissue damage to throat and gastro/ respiratory track.

MEDICAL CONDITION AGGRAVATED BY EXPOSURE: Preexisting skin, asthma and respiratory diseases are generally aggravated by exposure to liquid electrolyte vapors or liquid. For further information refer to section 4.

SECTION 12- ECOLOGICAL INFORMATION

1. When properly used or disposed the battery does not present environmental hazard.
2. Cells do not contain mercury, cadmium, or lead.
3. Do not let internal components enter marine environment. Avoid release to waterways, wastewater or ground water.

SECTION 13- DISPOSAL CONSIDERATIONS

1. Dispose in accordance with the applicable regulations in country and state.
2. Disposal should be performed by permitted, professional disposal firms knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation.
3. Incineration should never be performed by battery users, but eventually by trained professional in authorized facility with proper gas and fume treatment.

In Europe, incineration and land field disposal are not permitted.

4. Recycling of battery can be done in authorized facility.

SECTION 14- TRANSPORTATION /SHIPPING

Shipping name:

UN 3090: Lithium Metal Cells and Batteries

UN 3091: Lithium Metal Cells and Batteries contained in equipment, or
Lithium Metal Cells and Batteries packed with equipment

Shipping information: the cells and batteries have passed successfully the tests defined in "UN Manual of Tests and Criteria", Section 38.3 (the UN tests). Shipping of cells alone or with/in equipment must be packed in accordance with the Special Provisions and Packing Instructions of the applicable code, e.g., IATA/ICAO (PI 968, PI 969 and PI 970), IMO (SP188) and ADR (SP188).

Transportation within, to and from the US: are governed by the US DOT CFR 49, Parts 171, 172, 173 and 175. They details the required packaging and labels and transportation mode of cells transported separately or in equipment. The battery cannot be shipped, within, to, and from the US by passenger aircraft. Air shipments of cells can be done only by cargo aircraft.

Hazard Classification: Class 9

Packing Group: II

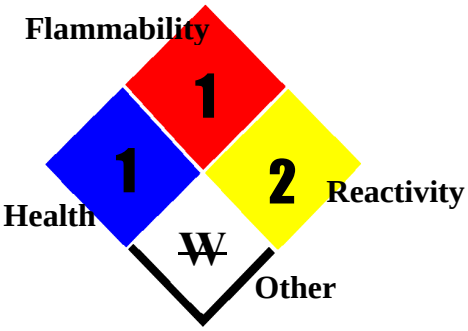
Battery label: Identification and labeling should be in compliance with the applicable regulations. In addition, it should also include cell/battery title, nominal voltage, lot number and warning.

SECTION 15- REGULATORY INFORMATION

1. All the cells and batteries are defined as "articles" and thus are exempt from the requirements of the Hazard Communication Standard".

2. The internal component (Thionyl chloride) is hazardous under the criteria of the Federal OHSA Hazard Communication Standard 29 CFR 1920.1200.

3. NFPA rating- Lithium batteries are not included in the NFPA material list. Below is the NFPA rating for lithium metal. Lithium metal is an internal component, enclosed by hermetically sealed metallic can. Under normal application is not exposed.



SECTION 16- OTHER INFORMATION/DISCLAIMER

The information and the recommendations set forth are made in good faith and believed to be accurate at the date of preparation. The present file refers to normal use of the product in question. Tadiran Batteries makes no warranty expressed or implied.

Assembly of battery packs:

The design and assembly of battery packs require special skills, expertise and experience. Therefore it is not recommended that the end user will attempt to self-assemble battey packs. It is preferable that any battery using lithium cells will be assembled by TADIRAN to ensure proper battery design and construction. A full assembly service is available from TADIRAN who can be contact for further information. If for any reason, this is not possible, TADIRAN can review the pack design in confidential to ensure that the design is safe and capable of meeting the stated performance requirements.