

Lithium Battery Information Sheet

Section 1: Identification

Products Name: TLM, 4.0V primary lithium metal cell.

Non-rechargeable cells and batteries which include the following models:

TLM-1550ESM, TLM-1550SPM with all their finishing versions and batteries assembled from them, denoted by "/" followed up by letters or digits.

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

Tel. for information: 1-516-621-4980

Tel. for information 972-8-944-4503

Section 2: Hazards Identification

The batteries described in this Battery Information Sheet include hermetically sealed cells, which are not hazardous when used according to the recommendations of the manufacturer and provided that the integrity the cells is maintained.

Under normal conditions of use, the electrode materials and the liquid electrolyte they contain are non-reactive. Risk of exposure exists only in case of mechanical, electrical or thermal abuse. Thus, the batteries should not be short circuited, punctured, incinerated, crushed, immersed in water, recharged, force discharged, or exposed to temperatures above 100°C. In these cases, there is a risk of fire or explosion.

Section 3: Composition/Information on Ingredients

Component	CAS Number	%	ACGIH (TLV)*	OSHA (PEL)
Lithium Cobalt Nickel Manganese Oxide	346417-97-8	20-40	- 0.02 mg/m ³ as Co dust and fumes. - 0.1 mg/m ³ as Ni soluble compounds.	- 0.1mg/m ³ as Co dust, and fumes. - 0.015 mg/m ³ as Ni
Graphite (various carbons)	7782-42-5	<2	2 mg/m ³ as respirable dust.	2.5 mg/m ³ as respirable dust
Lithium Hexafluoro Phosphate (LiPF ₆)	21324-40-3	1-5	None Established	None Established
Ethylene Carbonate	96-49-1	3-12	None Established	None Established
Dimethyl Carbonate	616-38-6	3-12	None Established	None Established
Diethyl Carbonate	105-58-8	3-12	None Established	None Established
Polyvinylidene- difluoride (PVDF)	24937-79-9	<1	None Established	None Established
Copper (Cu)	7440-50-8	7-15	0.2 mg/m ³ , fume 1.0 mg/m ³ , dust and mist	0.1 mg/m ³ , fume. 1.0 mg/m ³ , dust and mist.
Li-PAA (Lithium Poly Acrylic acid): PAA & LiOH	9003-01-4 1310-65-2	<1	Not available	Not available
Aluminum (Al)	7429-90-5	<1 3-8	Not available 15.0 mg/m ³ as dust	Not available 2 mg/m ³ , as soluble salt.
Steel, nickel and inert components	Balance			

* TLV- Threshold Limit Value are the personal exposure limits determined by the ACGIH (American Council of Governmental Industrial Hygienists).

IMPORTANT NOTE: The above levels are not anticipated under normal use conditions.

Section 4: First aid measures

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

Eyes - First rinse with plenty of water for 15 minutes (remove contact lenses if easily possible), and then seek medical attention.

Skin - Remove contaminated clothes and rinse skin with plenty of water or shower for 15 min. Refer to medical attention.

Inhalation - Remove to fresh air, rest, and half-upright position, use artificial respiration if needed, and refer to medical attention.

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

Section 5: Fire - fighting measures

FLASH POINT: NA LOWER (LEL): NA

FLAMMABLE LIMIT IN AIR: NA UPPER (LEL): NA

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, CO₂, HALON, and DRY POWDER OR SODA ASH EXTINGUISHERS.
2. If the fire is in an adjacent area and the cells are either packed in their original containers or unpacked, the fire can be fought based on the 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.

AUTO-IGNITION: NA

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 may explode when subject to: excessive heat (above 100°C), recharged over 4.1V, over-discharged (discharge below 0V), punctured and crushed. Burning cells emits acrid smoke, irritating fume and toxic fumes of hydrogen fluoride (HF), oxides of carbon and nitrogen; and other toxic by-products (e.g., aluminum, aluminum oxide, cobalt oxide, copper, nickel oxide, copper oxide, phosphorus pentafluoride, etc.) can be formed.

Damaged or opened cells can result in rapid heating and release of flammable vapors.

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.

NEUTRALIZING AGENTS: in the event of battery rupture and leakage: contain the spill while wearing proper protective clothing and ventilate the area. Then, cover with sodium carbonate (Na₂CO₃) or 1:1 mixture of soda ash and slaked lime. Keep away from water, rain, and snow. Place in approved container (after cooling if necessary) and disposed according to the local regulations.

WASTE DISPOSAL METHOD: Product decomposed by water must be neutralized. If sufficiently diluted, it may be added to waste water if it is sufficiently diluted.

Section 7: Handling and Storage

Charging- The TLM cells are primary cells and, as such, are not designed to be recharged from external power source. Connecting to any other power supply can result in fire or explosion. The batteries should not be opened, destroyed or incinerated, since they may leak or rupture and release to the environment the ingredients that they normally contained in the hermetically sealed container.

Reverse Polarity- avoid reversing polarity of a cell within the battery pack. This can cause the cell to leak.

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- is preferably done in cool (below 30°C), 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- Applying pressure and deforming the battery may lead to disassembly followed by eye skin and throat irritation.

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

Follow manufacturer recommendations regarding maximum recommended current and operating temperature range. The batteries should not be charged beyond 4.1V or beyond manufacturer recommendation for charging temperatures, opened or incinerate, since they may leak or rupture and release to the environment the ingredients that they contained.

Section 8: Exposure controls / 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 or 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 flammable.

Section 9: Physical and chemical properties

Boiling point (760 mm Hg)	NA, unless individual components exposed
Vapor Pressure (mm Hg, 25°C)	NA, unless individual components exposed
Vapor Density (air=1)	NA, unless individual components exposed
Density (gr/cc)	> 1 gr/cc
Volatile by Volume (%)	NA
Evaporation Rate (butyl acetate=1)	NA, unless individual components exposed
Physical State	Solid
Solubility in Water (% by weight)	NA, unless individual components exposed

PH	NA, unless individual components exposed
Appearance	Geometric Solid Object
Odor	If leaking, gives off pungent corrosive odor

Section 10: Stability and reactivity

<u>STABLE OR NOT STABLE</u>	Stable
<u>INCOMPATIBILITY (MATERIAL TO AVOID)</u>	Strong mineral acids, water and alkali solutions.
<u>HAZARDOUS</u>	1. Reaction of electrolyte with water: Hydrogen fluoride (HF).
<u>DECOMPOSITION PRODUCTS</u>	2. Thermal decomposition over 150°C: oxides of carbon and nitrogen (mainly CO and other VOC's), phosphorous fluoride, and hydrofluoric acid and other toxic by-products.
	3. Electrolyte with water: Hydrofluoric acid (HF).
<u>DECOMPOSITION TEMPERATURE (°F)</u>	NA
<u>HAZARDOUS POLYMERIZATION:</u>	May Occur _____ Will Not Occur <u>X</u>
<u>CONDITIONS TO AVOID</u>	Avoid mechanical abuse and electrical abuse such as short-circuiting, overcharge, over-discharge, (voltage reversal) and heating.

Section 11: Toxicological information

Toxicity information for cell ingredients is given in Section 3, "Composition/Information on Ingredients". This information is generally not applicable to the intact batteries normally used in application. Internal components of the cell are irritants and sensitizers. Exposure to the internal contents can occur only if the cells in the battery are being ruptured.

1. Irritancy- in event of exposure to internal content, corrosive fumes are can result in irritation to skin, eyes and mucous membranes. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation.
2. Sensitation-. no information is available at this time for the cells.
3. Carcinogenicity- no information is available at this time for the cells. Cobalt and Nickel compounds are listed as a possible carcinogen by the International Agency for Research on Cancer (IARC).
4. Teragenocity- no information is available at this time for the cells.
5. Reproductive toxicity- no information is available at this time for the cells
6. Acute toxicity- not applicable to intact cell.

MEDICAL CONDITION AGGRAVATED BY EXPOSURE: Preexisting skin dermatitis, asthma and respiratory diseases are generally aggravated by exposure to liquid electrolyte vapors or liquid.

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. For further information, refer to section 4.

Section 12: Ecological information

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

Section 13: Disposal Considerations

Dispose in accordance with the applicable regulations in country and state.

Disposal should be performed by permitted, professional disposal firms knowledgeable in Federal, State or Local requirements of hazardous waste treatment and hazardous waste transportation. The battery should have its terminal insulated in order to prevent short circuit during the transportation to the disposal site.

Incineration should never be performed by battery users, but eventually by trained professional in an authorized facility with proper gas and fume treatment.

Battery recycling should be done in authorized facility.

Section 14: Transport information

Shipping Name:

- UN 3090: Lithium Metal Batteries
- UN 3091: Lithium Metal Batteries contained in equipment, or
Lithium Metal Batteries packed with equipment.

Hazard Classification: Class 9

Special provisions and packing instructions:

IATA (66th revised edition)/ICAO (Packing Instructions: PI 968, PI 969, PI 970).

IMDG Code: SP188, SP230, SP310, SP360, SP376, SP377, SP384, P903, P908, P909, P910, P911, LP903, LP904, LP905, LP906.

SP188, SP230, SP310, SP360, SP376, SP377, SP387, SP390, SP636, SP670, P903, P908, P909, P910, P911, LP903, LP904, LP905, LP906.

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

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. ACGIH and OSHA- see exposure limits of the internal ingredients of the battery in Section 3.

Section 16: Other information

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 attempt to self-assemble battery packs. It is preferable that any battery using lithium cells be assembled by TADIRAN to ensure proper battery design and construction. A full assembly service is available from TADIRAN who can be contacted for further information. If for any reason, this is not possible, TADIRAN can review the pack design in confidentiality to ensure that the design is safe and capable of meeting the stated performance requirements.