

MSDS No.- TLP-202, 3_6V, SH-NEP (Revision -A)

MATERIAL SAFETY DATA SHEET

SECTION 1- CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Manufacturer Name- Tadiran Batteries Ltd.

Address- 2 Seaview Blvd. Port Washington NY 11050, (www.tadiranbat.com)

Emergency Telephone No – CHEMTREC: 1-800-424-9300

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

Tel. for information 972-8-944-4503

Chemical Systems- a PulsePlus battery that includes Lithium/Thionyl Chloride cell and Hybrid Layer Capacitor (HLC) cell. Both types are hermitically sealed.

Products Name: Primary (non-rechargeable) lithium metal battery models: TLP-93311/A/SH23, TLP-93311/A/SH17, TLP-92111/A/SH16, TLP-93311/A/SH15, TLP-93311/A/SH13 and TLP-93311/A/SH10. Battery designations may come with additional suffix letter, for example: TLP-93311/A/SH13A.

SECTION 2- COMPOSITION, INFORMATION ON INGREDIENTS

Ingredient Name	CAS #	%	ACGIH (TLV)	OHSA (PEL)
Lithium Metal (Li)	7439-93-2	<5%	Not Established	None
Thionyl Chloride (SOCl ₂)	7719-09-7	<40%	1 ppm (5 mg/m ³)	5 mg/m ³
Graphite and Carbon (C)	7782-42-5 1333-86-4	<10%	3.5 mg/m ³ TWA for carbon	2.0 mg/m ³ as respirable fraction (dust)
Aluminum Chloride (AlCl ₃)	7446-70-0	<5%	2 mg/m ³ (Al salt, soluble)	
Lithium Chloride (LiCl)	7447-41-8	<2%	Not Established	
Lithium Cobalt- Nickel Aluminum Oxide	193214-24-3	<3%	- 0.02 mg/m ³ as Co dust and fumes. - 0.1 mg/m ³ as soluble Ni	- 0.1mg/m ³ as Co dust, and fumes. - 0.015 mg/m ³ as Ni
Lithium Hexafluoro-Phosphate (LiPF ₆)	21324-40-3	<1%	None Established	None Established
Ethylene Carbonate	96-49-1	<3%	None Established	None Established
Dimethyl Carbonate	616-38-6	<3%	None Established	None Established
Diethyl Carbonate	105-58-8	<3%	None Established	None Established
PVDF	24937-79-9	<1	None Established	None Established
Copper (Cu)	7440-50-8	<4%	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
Aluminum (Al)	7429-50-5	<2%	10.0 mg/m ³ as dust	2 mg/m ³ , as soluble salt
Solidify Epoxy, casting resin and hardener (Loctite Hysol)		<30%	None for epoxy resin or hardener components	None for epoxy resin or hardener components
Steel, nickel and inert components	Balance			

ACGIH: American Council of Governmental Industrial Hygienists.

TLV- Threshold Limit Value is personal exposure limits determined by ACGIH.

IMPORTANT NOTE: The above levels are not anticipated under normal consumer use conditions. Thus, the batteries should not be opened or exposed to water and heat.

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SECTION 3 - HAZARD IDENTIFICATION

The battery described in this MSDS includes hermetically sealed cells, which are not hazardous when used according to the recommendations of the manufacturer and provide that the integrity the cells is maintained.

Emergency overview: Do not short circuit, crush, immerse in water, charge, force discharge (reverse voltage of the component cells) or expose to temperature above the declared operation temperature range of the product.

Potential health effects: Under normal conditions of use, the materials contained in the cells are not exposed to the outside, provided the battery integrity is maintained and seal remained intact. The risk of exposure to the internal ingredients occurs only in case of physical (mechanical) thermal or electrical abuses.

Acute exposure- electrolyte may irritate skin and eyes

SECTION 4 – FIRST AID MEASURES

General introduction- the chemical ingredients are contained in a hermitically sealed can. Thus, adequate hazard warning is included on the battery package. Practically, there is no exposure to these ingredients unless cell leaks, or opened when exposed to high temperature, opened mechanically or electrically abused.

On contact with eyes – is not anticipated under normal use. If cell within the battery leaks and material contacts eyes, flush with copious amounts of tepid water for at least 15 minutes (remove contact lenses if easily possible). Get medical attention at once.

On contact with skin – not anticipated under normal use. If cell within battery leaks and material contacts the skin, flush immediately with copious amounts of tepid water and wash affected area with soap and water. In a severe case, obtain medical attention.

If inhaled – is not anticipated under normal use. If cell within the battery leaks, remove to fresh air. Avoid inhaling any vented gases. If irritation persists, obtain medial attention.

On ingestion – is not anticipated under use. If cell is removed from the battery and leaks, rinse mouth and surrounding area with tepid water for at least 15 minutes. Give plenty of water to drink. Obtain medical attention.

Further Treatment- All cases of eye contamination, persistent skin irritation, breathing of vapors and swallowed internal ingredients, should be seen by a Doctor.

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 batteries are directly involved in a fire **DO NOT USE:** WATER, SAND, CO₂, HALON, DRY POWDER OR SODA ASH EXTINGUISHER.

2. If fire is in adjacent area and batteries 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 employ sprinkler system with cold water.

FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus to avoid breathing of irritant fumes (NIOSH approved SCBA & full protective equipment). Wear protective clothing 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. DO NOT re-enter the area until it has been thoroughly ventilated (purged) of the fire vapors and extinguishing agent.

UNUSUAL EXPLOSION AND FIRE EXPLOSION: Battery may explode when subject to: excessive heat (above 100°C), recharged, over-discharged (discharge below 0V), punctured and crushed. Burning cells emits acrid smoke, irritating fume and toxic fumes of chlorine (Cl₂), hydrogen chloride (HCl), sulfur dioxide (SO₂) oxides of carbon and nitrogen; hydrofluoric acid, ammonia and other toxic by-products (e.g., lithium oxide, aluminum, aluminum oxide, cobalt oxide, copper, copper oxide, phosphorus pentafluoride, etc.) can be formed. Damaged or opened cells can result in rapid heating and release of flammable vapors.

SECTION 6- SPILL OR LEAKAGE PROCEDURES

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

NEUTRALIZING AGENT: 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. Placed in approved container (after cooling if necessary) and disposed according to the local regulations.

WASTE DISPOSAL METHOD: Product decomposed by water must be neutralized. It may be added to waste water in sufficiently diluted form.

SECTION 7- HANDLING AND STORAGE

Charging- the TLP batteries are primary 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

Disassembly- the batteries should never be disassembled, or mechanically abused.

Should a cell unintentionally crushed or opened, thus releasing its content, rubber gloves should be used to handle all cell components. The inhalation of any vapor that may be emitted should be avoided. In event of inhalation, eye and skin exposure to the electrolyte, refer to Section 4 "First Aid Measures".

Short Circuiting- as with any battery, short circuit causes heating. In addition, short circuit reduces the life of the cell and can lead to ignition of surrounding materials. Physical contact with the short-circuited battery can cause skin burns.

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

Storage- stored preferably in cool (below 30°C), dry and ventilated area, which is subject to little temperature change. Elevated temperatures may result in shortened cell life and degrade performance. Temperatures above 85°C may result in leakage.

Batteries should not be placed near heating equipment, or expose to direct sunlight for long period. It is preferred to keep batteries in original packaging until use and do not jumble them in order to prevent short circuit. Batteries should be stored separately from other materials and in non-combustible well-ventilated and sprinkler-protected structure with sufficient clearance between walls and packages.

Labeling

If the Tadiran label or package warning is not visible, it is important to provide the cell sleeve or device a label stating:

Warning: Do not short circuit, charge, puncture, incinerate, crush, immerse in water, force discharge, or expose to temperatures above the temperature range of the battery or battery. Risk of fire and explosion.

Others

The battery should not be immersed in water or disposed of in fire, exposed to high temperature, deforming the battery by applying a pressure can lead to disassembly followed by electrolyte leakage.

Follow manufacturer recommendations regarding maximum recommended current and operating temperature range. The batteries should not be charged, 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

ENGINEERING CONTROLS: Handling of undamaged battery requires no engineering controls. The battery should be kept away from heat and open flame and stored in a cool dry place. When a cell within a battery is being damaged or in the event of fire than:

OCCUPATIONAL EXPOSURE STANDARD: The occupational exposure limits according to ACGIH and OSHA are given in Section 2, "Composition and Information on Ingredients" along with CAS number and their percentage range. For all ingredients no available Biological Exposure Indices (BEI) exists.

RESPIRATORY PROTECTION: None necessary under normal use. In case electrolyte leakage from cells, protect hand with chemical resistant rubber gloves. If cells are burning, leave the area immediately. In all fire situations, use NIOSH approved Acid Gas Filter Mask or Self-Contained Breathing Apparatus.

VENTILATION: Not necessary under normal use. In case of abuse, use adequate mechanical ventilation (local exhaust) for cell that vents gas or fumes.

PROTECTIVE GLOVES: None necessary under normal use. In case of electrolyte spill from the cell, use PVC or Nitrile gloves of 15 mils (0.015 inch) or thicker.

EYE PROTECTION: None required under normal conditions. Use safety glasses with side shields if handling a leaking or ruptured cell or battery (ANSI approved chemical worker safety goggles or face).

SKIN AND BODY PROTECTION: Not necessary under normal use. Use chemical apron and protective gloves working in case of handling of a ruptured or leaking cell or battery.

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 chemical hygiene practice.

SECTION 9- PHYSICAL DATA

BOILING POINT (760 mm Hg)	NA, unless individual components exposed
MELTING AND BOILING POINTS	Not applicable
VAPOR PRESSURE (mm Hg, 25°C)	NA, unless individual components exposed
VAPOR DENSITY (air=1)	NA, unless individual components exposed
DENSITY (gr/cc)	> 1.5 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	No odor. If leaking, gives off pungent odor
FLAMMABILITY	Not applicable
IGNITION TEMPERATURE	Not applicable
FLASH POINT	Not applicable
EXPLOSION PROPERTIES	Not applicable

SECTION 10- STABILITY AND REACTIVITY

STABLE OR NOT STABLE Battery is stable under normal use and storage as described in Section 7.

INCOMPATIBILITY (MATERIAL TO AVOID) None during normal operation conditions. Avoid exposure to heat, open flame and corrosives.

HAZARDOUS DECOMPOSITION PRODUCTS

1. Reaction of lithium with water: Hydrogen (H₂), Lithium hydroxide (LiOH).
2. Thermal decomposition over 150°C: Sulfur oxides, (SO₂, SO₃), Sulfur chlorides (SCl₂, S₂Cl₂), Chlorine (Cl₂), Lithium oxide (Li₂O), oxides of carbon and nitrogen (mainly CO and other VOC's), phosphorous, and hydrofluoric acid and other toxic by-products
3. Electrolyte with water: Hydrogen Chloride (HCl) and SO₂ and Hydrofluoric acid (HF).

DECOMPOSITION TEMPERATURE (°F) NA

HAZARDOUS POLYMERIZATION: May Occur _____ Will Not Occur X

CONDITIONS TO AVOID Mechanical abuse such as crushing, piercing and disassembly
Electrical abuse such as short-circuiting, charging, over-

discharge, (voltage reversal), heating above 85°C and exposure to open flame and incineration

SECTION 11 – TOXICOLOGICAL INFORMATION

Toxicity information for cell ingredients is given in Section 2, “Composition and 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 compounds are listed as possible carcinogen by the International Agency for Research on Cancer (IARC).
4. Teragenocytivity- 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.

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 since some materials within the cells are bio-accumulative. When properly used and disposed, cells and batteries do not present environmental hazard.

SECTION 13- DISPOSAL CONSIDERATIONS

Waste disposal must be in accordance with the applicable Federal, State and the Local regulations. Disposal of cells and batteries should be performed by permitted, professional disposal company knowledgeable in Federal, State or Local requirements

of hazardous waste treatment and hazardous waste transportation. The cell 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.

TLP batteries contain recyclable materials. Recycling options should be considered when disposing of this product, through licensed waste carrier.

RCRA Waste Code- Nonregulated.

SECTION 14- TRANSPORTATION /SHIPPING

Shipping name: Lithium metal cells and batteries, they are considered as Dangerous Goods, e.g., UN-3090 for cells and batteries and UN-3091 for cells or batteries in equipment or with equipment.

Shipping information- the batteries have been successfully passed the tests defined in “UN Manual of Tests and Criteria”, Section 38.3 (the UN tests).

Hazard Classification:

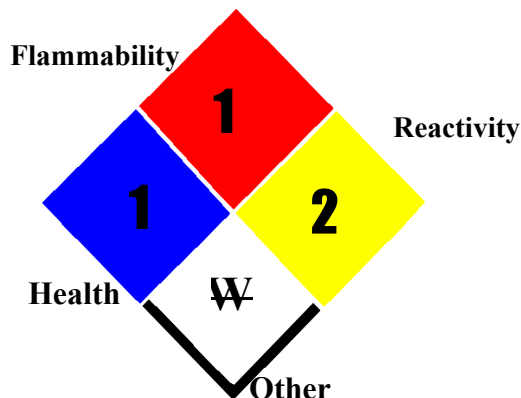
1. Worldwide besides the United State- the batteries are subject to the Dangerous Goods Regulation, e.g., it is defined as Class 9. The batteries or equipment with batteries must be packed in accordance with the Packing Instructions of the applicable code, e.g., IATA/ICAO (P968, P969 and P970), IMO (SP188, SP230 and P903) and ADR (SP188, SP230 and P903).

2. Transportation within, to and from the US- are governed by the US DOT CFR 49, Parts 171, 172, 173 and 175. Special Provision 188 (in Part 172.102) defines the batteries as “*medium lithium cells and batteries*”. The batteries cannot be shipped, within, to, and from the US by passenger aircraft. Air shipments of batteries can be done only by cargo aircrafts.

Identification and labeling in compliance with the product drawing should include the 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. 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.



3. The internal component (Thionyl chloride) is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1920.1200.
4. ACGIH and OSHA- see exposure limits of the internal ingredients of the battery in Section 2.
5. The transport of the lithium batteries is regulated by the United Nations, "Model Regulations on Transport of Dangerous Goods".
6. Within the US the Lithium batteries and cells are subject to shipping requirements under 49 CFR 173.185.
7. Shipping of lithium batteries in aircrafts are regulated by the International Civil Aviation Organization (ICAO) and the International Air Transport Association (IATA) requirements in UN 3090 or UN 3091.
8. Shipping of lithium batteries on sea are regulated the International Maritime Dangerous Goods (IMDG) requirements of UN 3090 or UN 3091.

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.