Assembly # 009977-000

Battery ER 17505-/T

MATERIAL SAFETY DATA SHEET CONFORMS TO OSHA FORM OMB NO. 1218-0072

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Section I – Identification

1.1 Product

Product Name and Description:

Lithium Thionyl Chloride (Li-$SOCl_2$), Non-rechargeable, Non-venting batteries.

1.2 Supplier

Address (Number, Street, City, State and Zip Code)

BiPOWER CORP.
2560 Corporate Place, Suite D203
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USA

Telephone Numbers For Information

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Section II – Hazardous Ingredients

CHEMICAL NAME	CAS NUMBER	%	OSHA (PEL)	ACGIH (TLV)
Lithium Metal (Li)	7439-93-2	≤ 5%	N/A	N/A
Thionyl Chloride ($SOCl_2$)	7719-09-7	≤ 47%	5 mg/m^3	5 mg/m^3
Carbon (C)	1333-86-4	≤ 5%	3.5 mg/m^3	3.5 mg/m^3
Aluminum Chloride Anhydrous ($AlCl_3$)	7446-70-0	≤ 5%	N/A	2 mg/m^3

Section III — Physical/Chemical Characteristics

Melting Point: N/A
Boiling Point: N/A
Volatile by Volume %: N/A
Vapor Pressure (mm Hg): N/A
Evaporation Rate: N/A
Vapor Density (Air=1): N/A
Specific Gravity (H2O=1): N/A
Solubility in Water: N/A
Appearance and Odor: N/A

Section IV - Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A

Extinguishing Media:

CO_2 extinguishers or copious quantities of water or water-based foam can be used to cool down burning Li-$SOCl_2$ cells and batteries, as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed.
Do not use for this purpose sand, dry powder or soda ash, graphite powder or fire blankets.
Use only metal (Class D) extinguishers on fire involving raw lithium.

Special Fire Fighting Procedures:

Respiratory protection: In all fire situations, wear self-contained breathing apparatus and chemical apron.

Hand Protection: In the event of leakage, wear gloves.

Eye Protection: Safety glasses are recommended during handling.

Section V - Health Hazard Data

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion. The Lithium Thionyl Chloride batteries described in this Product Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

Under normal conditions of use, the electrode materials and liquid electrolyte they contain are not exposed to the outside, provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of rupture of the battery containers. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/explosion/fire may follow, depending upon the circumstances.

Route(s) of Entry: Eyes **Inhalation:** Yes **Skins:** Yes **Ingestion:** Yes

Health Hazards (Acute and Chronic):

$SOCl_2$ - Will burn and irritate eyes & skin, and irritate upper respiratory systems. Continuous inhalation of fumes may cause lung damage.

Carcinogenicity NTP: N/A **IARC Monographs:** N/A **OSHA Regulated:** N/A

Signs and Symptoms of Exposure: $SOCl_2$ - Eye and skin irritation, pungent odor and respiratory irritation.

Medical Conditions Generally Aggravated by Exposure: N/A

Emergency and First Aid Procedures:

If free ($SOCl_2$) is present, evacuate areas and provide ventilation, wash exposed area with soda ash or sodium bicarbonate solution. Seek medical attention.

Inhalation: Remove from exposure, rest and keep warm. In severe cases obtain medical attention.

Skin contact: Wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse. In severe cases obtain medical attention.

Eye contact: Irrigate thoroughly with water for at least 15 minutes. Obtain medical attention.

Ingestion: Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.

Further treatment: All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vaporous should be seen by a Doctor.

Section VI - Reactivity Data

Stability: The batteries are stable under normal operating conditions.

Hazardous Polymerization: will not occur.

Hazardous decomposition products:

Hydrogen (H_2) as well as Lithium oxide (Li_2O) and Lithium hydroxide (LiOH) dust are produced in case of reaction of *lithium metal* with water. Chlorine (Cl_2), Sulfur dioxide (SO_2) and Disulfur dichloride (S_2Cl_2) are produced in case of thermal decomposition of thionyl chloride above 140°C. Hydrochloric acid (HCl) and Sulfur dioxide (SO_2) are produced in case of reaction of thionyl chloride with water at room temperature. Hydrochloric acid (HCl) fumes, Lithium oxide, (Li_2O), Lithium hydroxide (LiOH) and Aluminum hydroxide ($Al(OH)_3$) dust are produced in case of reaction of Lithium tetrachloroaluminate ($LiAlCl_4$) with water.

Conditions to avoid: Heat, open flames, water and moisture and temperature above 100°C (212°F) for standard cells and 150°C (302°F) for high temperature cells.

Materials to avoid: Oxidizing agents, alkalis, water. Avoid electrolyte contact with aluminum or zinc.

Section VII - Spill and Leak Procedures

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 slime. Keep away from water, rain, and snow. Placed in approved container (after cooling if necessary) and disposed according to the local regulations.

Section VIII - Safe Handling and Use

Steps to be taken in Case Material is Released or Spilled:

Avoid contact if vent rupture or explosion has occurred.

Protect from heat, short circuit of terminals, and an accumulation of shorted batteries, which may cause dangerous elevated temperatures.

Waste Disposal Method:

Dispose of waste according to federal EPA, state and local regulations.

Precautions to be taken in Handling and Storing:

Do not short circuit, heat above the declared operating temperature range of the product, force chare or recharge, disassemble, incinerate or expose to water.

Accidental Release Procedures:

Remove personnel from area until fumes dissipate. Do not breathe vapors or touch liquid with bare hands.

If the skin has come into contact with the electrolyte, it should be washed thoroughly with water.

Sand or earth should be used to absorb any exuded material. Seal leaking battery and contaminated absorbent material in plastic bag and dispose of as Special Waste in accordance with local regulations.

Section IX- Precautions for Safe Handling and Use

Storage:

Store preferably in cool (below 30°C (90°F)), 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. Do not store batteries in high humidity environment for long periods.

Handling:

Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non conductive (i.e. plastic) trays.

Section X - Recycling and Disposal

1. Waste disposal must be in accordance with the applicable regulations and laws.
2. Disposal of the Lithium batteries should be performed by permitted, professional 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.
4. Recycling of battery can be done in authorized facility, through licensed waste carrier.

Section XI - Transportation

The regulations that govern the transport of primary lithium (metal) and rechargeable lithium ion (including polymer) cells and batteries include the International Civil Aviation Organization (ICAO) Technical Instructions and corresponding International Air Transportation Association (IATA) Dangerous Goods Regulations and International Maritime Dangerous Goods (IMDG) Code. Some lithium batteries and cells of all types and equipment containing or packed with lithium batteries or cells of all types are regulated as Class 9 (Miscellaneous) hazardous material in the US in accordance with Part 49 of the Code of Federal Regulations (49-CFR 171-180) of the US Hazardous Materials Regulations (HMR). Sections 173.185 and the Special Provisions contained in 172.102 provide information on exceptions and packaging based on details of weight, tests and classifications. The Office of Hazardous Materials Safety, which is within the Department Of Transportation (DOT) Pipeline and Hazardous Materials Safety Administration (HMSA) is responsible for writing the regulations that govern the transportation of hazardous materials (also known as dangerous goods) by air, rail, highway and water and drafting the regulations that govern such materials. These regulations are based on UN Recommendation on the Transport Dangerous Goods Model Regulations and UN Manual of Tests and Criteria.

Small lithium cells and multi cell battery packs are Excepted from regulations. No Class 9 Label or markings and specification packaging are required.

Medium lithium single cells and multi cell battery packs are Excepted from regulations, when transported by motor vehicle or rail car. No Class 9 Label or markings and specification packaging are required.

Medium lithium single cells and multi cell battery packs are regulated as Class 9 Miscellaneous, when transported by air.

Large lithium single cells and multi cell battery packs are regulated as Class 9 Miscellaneous for transportation.

The HMR requires lithium batteries to be tested in accordance with a series of tests in Section 38.3 of the UN Test Manual.

Use Class 9 Miscellaneous and UN Identification labels for transportation of lithium cells/batteries which are regulated as Class 9.

Lithium cells/batteries classifications:

Lithium metal batteries:	UN number 3090
Lithium metal batteries contained in equipment:	UN number 3091
Packing class:	ICAO 903 for air transport
IMDG:	9033 for sea transport
ADR Class:	Class 9 for road transport