



# MATERIAL SAFETY DATA SHEET

## 1. Product and Company Identification

**Material name** Tronox® Lithium Manganese Oxide  
**Version #** 01  
**Revision date** 09-29-2009  
**Product Code** Lithium manganese oxide  
**MSDS Number** B-5079  
**Product use** Cathode material for lithium ion batteries.  
**Manufacturer information** Tronox LLC  
3301 NW 150th Street  
Oklahoma City, OK 73134 US  
ChemProdSteward@tronox.com  
1-405-775-5000 (24-hours)  
**Emergency** CHEMTREC 1-800-424-9300

## 2. Hazards Identification

**Physical state** Solid.  
**Appearance** Powder.  
**Emergency overview** CAUTION

Dusts may irritate the respiratory tract, skin and eyes. Inhalation of manganese oxide dust/fumes may cause metal fume fever. The symptoms are shivering, fever, malaise and muscular pain. Not itself combustible but assists fire in burning materials.

**OSHA regulatory status** This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

### Potential health effects

**Routes of exposure** Inhalation. Ingestion. Eye contact. Skin contact.

**Eyes** Contact with eyes may cause irritation.

**Skin** Dust or powder may irritate the skin. Skin irritation occurs on contact with moist or wet skin.

**Inhalation** Dust may irritate throat and respiratory system and cause coughing. Inhalation of manganese oxide dust/fumes may cause metal fume fever. The symptoms are shivering, fever, malaise and muscular pain. Chronic exposure to breathing low levels of manganese dust or fume over a long period of time can result in "manganism," a disease of the central nervous system similar to Parkinson's Disease, gait impairment, muscle spasms and behavioral changes. Long term exposure by inhaling or swallowing can affect the central nervous system or kidneys.

**Ingestion** Symptoms are similar to those described under inhalation.

**Target organs** Eyes. Skin. Respiratory system. Central nervous system. Kidneys. Lungs.

**Chronic effects** Frequent or prolonged contact may defat and dry the skin, leading to discomfort and dermatitis. Frequent inhalation of fume/dust over a long period of time increases the risk of developing lung diseases.

**Signs and symptoms** Coughing. May cause irritation through mechanical abrasion.

**Potential environmental effects** The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

## 3. Composition / Information on Ingredients

Components	CAS #	Percent
Lithium manganese oxide	39457-42-6	>98

## 4. First Aid Measures

### First aid procedures

**Eye contact** Immediately rinse eyes with water. Remove any contact lenses, and continue flushing eyes with running water for at least 15 minutes. Hold eyelids apart to ensure rinsing of the entire surface of the eye and lids with water. Get immediate medical attention.

**Skin contact** Flush skin thoroughly with water. Get medical attention if irritation develops and persists.

<b>Inhalation</b>	Move to fresh air. Get medical attention if any discomfort continues.
<b>Ingestion</b>	Rinse mouth thoroughly. Do not induce vomiting without advice from poison control center. Never give anything by mouth to an unconscious person. If ingestion of a large amount does occur, call a poison control center immediately.
<b>Notes to physician</b>	Treat symptomatically.
<b>General advice</b>	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

## 5. Fire Fighting Measures

<b>Flammable properties</b>	Not itself combustible but assists fire in burning materials.
<b>Extinguishing media</b>	
<b>Suitable extinguishing media</b>	Use fire-extinguishing media appropriate for surrounding materials.
<b>Unsuitable extinguishing media</b>	None.
<b>Special protective equipment for fire-fighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for fire fighting: follow the general fire precautions indicated in the workplace.
<b>Specific methods</b>	Move container from fire area if it can be done without risk.
<b>Hazardous combustion products</b>	None known.

## 6. Accidental Release Measures

<b>Personal precautions</b>	Avoid inhalation of dust and contact with skin and eyes. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Use Personal Protective Equipment recommended in Section 8 of the MSDS.
<b>Environmental precautions</b>	Prevent further leakage or spillage if safe to do so. Do not contaminate water.
<b>Methods for containment</b>	Stop leak if you can do so without risk.
<b>Methods for cleaning up</b>	Collect powder using special dust vacuum cleaner with particle filter or carefully sweep into closed container. For waste disposal, see Section 13 of the MSDS.
<b>Other information</b>	Clean up in accordance with all applicable regulations.

## 7. Handling and Storage

<b>Handling</b>	Avoid inhalation of dust and contact with skin and eyes. Use only with adequate ventilation. Use Personal Protective Equipment recommended in section 8 of the MSDS. Wash thoroughly after handling.
<b>Storage</b>	Store in tightly closed original container in a dry and cool place. Store away from incompatible materials.

## 8. Exposure Controls / Personal Protection

### Occupational exposure limits

#### ACGIH

Components	Type	Value
Lithium manganese oxide (39457-42-6)	TWA	0,2 mg/m3

#### U.S. - OSHA

Components	Type	Value
Lithium manganese oxide (39457-42-6)	Ceiling	5 mg/m3

#### Canada - Alberta

Components	Type	Value
Lithium manganese oxide (39457-42-6)	TWA	1 mg/m3

#### Canada - British Columbia

Components	Type	Value
Lithium manganese oxide (39457-42-6)	TWA	0,2 mg/m3

**Canada - Ontario**

Components	Type	Value
Lithium manganese oxide (39457-42-6)	TWA	0,2 mg/m3

**Canada - Quebec**

Components	Type	Value	Form
Lithium manganese oxide (39457-42-6)	TWA	5 mg/m3	Dust.

**Mexico**

Components	Type	Value
Lithium manganese oxide (39457-42-6)	TWA	0,2 mg/m3

<b>Engineering controls</b>	Ventilate as needed to control airborne dust. Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of dust.
<b>Personal protective equipment</b>	
<b>Eye / face protection</b>	Wear dust-resistant safety goggles where there is danger of eye contact.
<b>Skin protection</b>	Wear suitable protective clothing. Wear suitable gloves.
<b>Respiratory protection</b>	When engineering controls are not sufficient to lower exposure levels below the applicable exposure limit, use a NIOSH approved respirator for dusts. A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever work place conditions warrant a respirator's use. Seek advice from local supervisor.
<b>General hygiene considerations</b>	Do not breathe dust. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

**9. Physical & Chemical Properties**

<b>Appearance</b>	Powder.
<b>Color</b>	Black.
<b>Odor</b>	None.
<b>Odor threshold</b>	Not available.
<b>Physical state</b>	Solid.
<b>Form</b>	Powder.
<b>pH</b>	Not available.
<b>Melting point</b>	> 1832 °F (> 1000 °C)
<b>Freezing point</b>	Not available.
<b>Boiling point</b>	Not available.
<b>Flash point</b>	Not available.
<b>Evaporation rate</b>	Not available.
<b>Flammability</b>	Not available.
<b>Flammability limits in air, upper, % by volume</b>	Not available.
<b>Flammability limits in air, lower, % by volume</b>	Not available.
<b>Vapor pressure</b>	Not available.
<b>Vapor density</b>	Not available.
<b>Specific gravity</b>	4 - 5 @ 20 °C
<b>Solubility (water)</b>	Insoluble.
<b>Partition coefficient (n-octanol/water)</b>	Not available.
<b>Auto-ignition temperature</b>	Not available.
<b>Decomposition temperature</b>	Not available.
<b>Bulk density</b>	78 lb/ft <sup>3</sup>

## 10. Chemical Stability & Reactivity Information

<b>Chemical stability</b>	Stable under normal temperature conditions.
<b>Conditions to avoid</b>	Avoid incompatible materials and intense heat. When subjected to intense heat, it will release oxygen which would increase the intensity of a fire.
<b>Incompatible materials</b>	Organic material. Combustible material. Strong reducing agents. Strong oxidizing agents. Halogens.
<b>Hazardous decomposition products</b>	No hazardous decomposition products are known.
<b>Possibility of hazardous reactions</b>	Hazardous polymerization does not occur.

## 11. Toxicological Information

<b>Acute effects</b>	Inhalation of manganese oxide dust/fumes may cause metal fume fever. The symptoms are shivering, fever, malaise and muscular pain.
<b>Local effects</b>	Inhalation of dusts may cause respiratory irritation. May irritate eyes and skin.
<b>Sensitization</b>	Not a skin sensitizer.
<b>Chronic effects</b>	Chronic exposure to breathing low levels of manganese dust or fume over a long period of time can result in "manganism," a disease of the central nervous system similar to Parkinson's Disease, gait impairment, muscle spasms and behavioral changes. Long term exposure by inhaling or swallowing can affect the central nervous system or kidneys. Frequent inhalation of dust over a long period of time increases the risk of developing asthma, chronic lung diseases, and skin irritation.
<b>Carcinogenicity</b>	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
<b>Epidemiology</b>	Pre-existing skin and respiratory conditions including dermatitis, asthma and chronic lung disease might be aggravated by exposure.
<b>Mutagenicity</b>	Knowledge about mutagenicity is incomplete.
<b>Neurological effects</b>	No data available for this product.
<b>Reproductive effects</b>	Knowledge about reproductive effects is incomplete.
<b>Teratogenicity</b>	No data available.
<b>Further information</b>	No other specific acute or chronic health impact noted.

## 12. Ecological Information

<b>Ecotoxicity</b>	The product is not expected to be hazardous to the environment.
<b>Environmental effects</b>	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
<b>Persistence and degradability</b>	The degradability of the product has not been stated.
<b>Bioaccumulation / Accumulation</b>	No data available on bioaccumulation.
<b>Mobility in environmental media</b>	The product is insoluble in water.

## 13. Disposal Considerations

<b>Waste codes</b>	Not regulated.
<b>Disposal instructions</b>	Dispose of this material and its container to hazardous or special waste collection point. Do not allow this material to drain into sewers/water supplies.
<b>Waste from residues / unused products</b>	Dispose of in accordance with local regulations.
<b>Contaminated packaging</b>	Since emptied containers may retain product residue, follow label warnings even after container is emptied.

## 14. Transport Information

### DOT

Not regulated as dangerous goods.

### IATA

Not regulated as dangerous goods.

### IMDG

Not regulated as dangerous goods.

**TDG**

Not regulated as dangerous goods.

**15. Regulatory Information****US federal regulations****US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration**

Lithium manganese oxide (CAS 39457-42-6) 1.0 % N450

**US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance**

Lithium manganese oxide (CAS 39457-42-6) N450 Listed.

**CERCLA (Superfund) reportable quantity (lbs)**

None

**Superfund Amendments and Reauthorization Act of 1986 (SARA)**

**Hazard categories** Immediate Hazard - No  
 Delayed Hazard - Yes  
 Fire Hazard - No  
 Pressure Hazard - No  
 Reactivity Hazard - No

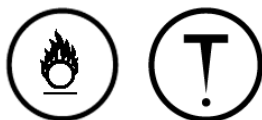
**Section 302 extremely hazardous substance** No

**Section 311 hazardous chemical** Yes

**Drug Enforcement Agency (DEA)** Not controlled

**WHMIS status** Controlled

**WHMIS classification** C - Oxidizing  
 D2B - Other Toxic Effects-TOXIC

**WHMIS labeling****Inventory status**

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	No
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

\*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

**State regulations****US - California Hazardous Substances (Director's): Listed substance**

Lithium manganese oxide (CAS 39457-42-6) Listed.

**US - New Jersey Community RTK (EHS Survey): Reportable threshold**

Lithium manganese oxide (CAS 39457-42-6) 500 LBS

**US - New Jersey RTK - Substances: Listed substance**

Lithium manganese oxide (CAS 39457-42-6) Listed.

## 16. Other Information

### HMIS® ratings

Health: 1  
Flammability: 1  
Physical hazard: 1  
Personal protection: B

### NFPA ratings

Health: 1  
Flammability: 1  
Instability: 1  
Special hazards: OX

### Disclaimer

The information in the sheet was written based on the best knowledge and experience currently available.

### Issue date

09-29-2009