

## 1. Chemical product and company identification

<b>A. Product name</b>	<b>Tronox® Lithium Manganese Oxide</b>
<b>Product code</b>	Lithium manganese oxide
<b>B. Recommended use and Limitations on use</b>	
<b>Recommended use</b>	Cathode material for lithium ion batteries.
<b>Manufacturer/Importer/Distributor Information</b>	
<b>Manufacturer/Supplier</b>	
<b>Company name</b>	Tronox LLC 3301 NW 150th Street Oklahoma City, OK 73134
<b>Country</b>	USA
<b>Email</b>	ChemProdSteward@tronox.com
<b>Telephone</b>	+1-405-775-5000 (24-hours)
<b>Emergency telephone number</b>	+1-760-476-3960 (Access code 333318)
<b>MSDS number</b>	B-5079

## 2. Hazards identification

### A. Hazard category/Classification

<b>Physical hazards</b>	Not classified.
<b>Health hazards</b>	Not classified.
<b>Environmental hazards</b>	Not classified.

### B. Warning label items including precautionary statement

- **Pictogram** None.
- **Signal word** None.
- **Hazard statement** None.

#### • Precautionary statement

<b>Prevention</b>	Observe good industrial hygiene practices.
<b>Response</b>	Flush skin thoroughly with water.
<b>Storage</b>	Store away from incompatible materials.
<b>Disposal</b>	Dispose of waste and residues in accordance with local authority requirements.

### C. Other hazards not included in the hazard category criteria (e.g. dust explosion hazard)

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. 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.

## 3. Composition/information on ingredients

Chemical identity	Common and alternative names	CAS number	ID number	Content in percent (%)
Lithium manganese oxide		12057-17-9	2001-3-1827	95 - 100

**Composition comments** All concentrations are in percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

## 4. First aid measures

<b>A. In case of eye contact</b>	Do not rub eyes. Flush area with plenty of water. If irritation occurs, get medical assistance.
<b>B. In case of skin contact</b>	Flush skin thoroughly with water. Get medical attention if irritation develops and persists.
<b>C. In case of inhalation</b>	Move to fresh air. Get medical attention if any discomfort continues.
<b>D. In case of swallowing</b>	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>E. Note 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

### A. Suitable (and unsuitable) extinguishing media

<b>Suitable extinguishing media</b>	Use fire-extinguishing media appropriate for surrounding materials.
<b>Unsuitable extinguishing media</b>	No restrictions known.

**B. Specific hazards arising from the chemical (example: hazardous combustion products)** During fire, gases hazardous to health may be formed.

### C. Specific methods of fire-fighting

<b>Special protective equipment for firefighters</b>	Self-contained breathing apparatus and full protective clothing must be worn in case of fire. Selection of respiratory protection for firefighting: follow the general fire precautions indicated in the workplace.
<b>Special fire fighting procedures</b>	Move containers from fire area if you can do so without risk. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.
<b>General fire hazards</b>	Not itself combustible but assists fire in burning materials.

## 6. Accidental release measures

**A. Personal precautions, protective equipment and emergency measures** Avoid dust formation. 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** Prevent further leakage or spillage if safe to do so. Do not contaminate water.

**C. Methods and materials for containment and cleaning up** Stop leak if you can do so without risk. 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.

## 7. Handling and storage

**A. Precautions for safe handling** Use work methods which minimize dust production. 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. Conditions for safe storage (including any incompatibilities)** Store in tightly closed original container in a dry and cool place. Store away from incompatible materials (See Section 10).

## 8. Exposure controls/personal protection

### A. Exposure limit values, biological limit values, etc

Korea. OELs. Standards for Exposure to Chemical Substances and Physically Hazardous Factors

Components	Type	Value
Lithium manganese oxide (CAS 12057-17-9)	TWA	1 mg/m <sup>3</sup>

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
Lithium manganese oxide (CAS 12057-17-9)	TWA	0.1 mg/m <sup>3</sup>	Inhalable fraction.
		0.02 mg/m <sup>3</sup>	Respirable fraction.

**Biological limit values** No biological exposure limits noted for the ingredient(s).

**B. Appropriate engineering controls** Ventilate as needed to control airborne dust. Provide adequate ventilation. Observe Occupational Exposure Limits and minimize the risk of inhalation of dust.

### C. Personal protective equipment

- **Respiratory protection** In case of inadequate ventilation or risk of inhalation of dust, use suitable respiratory equipment with particle filter. Seek advice from local supervisor.
- **Eye protection** Wear dust-resistant safety goggles where there is danger of eye contact.
- **Hand protection** Wear protective gloves. Suitable gloves can be recommended by the glove supplier.
- **Body protection** Wear appropriate clothing to prevent repeated or prolonged skin contact.

**Hygiene measures** 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 and chemical properties

**A. Appearance** Powder.

Physical state	Solid.
Form	Powder.
Color	Black.
<b>B. Odor</b>	None.
<b>C. Odor threshold</b>	Not applicable.
<b>D. pH</b>	Not available.
<b>E. Melting point/freezing point</b>	
Melting point	> 1832 °F (> 1000 °C)
<b>F. Boiling point, initial boiling point, and boiling range</b>	Not available.
<b>G. Flash point</b>	Not available.
<b>H. Evaporation rate</b>	Not available.
<b>I. Flammability (solid, gas)</b>	Not available.
<b>J. Upper/lower limit on flammability or explosive limits</b>	
Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	Not available.
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.
<b>K. Vapor pressure</b>	Not applicable.
<b>L. Solubility</b>	
Solubility (water)	Insoluble in water.
<b>M. Vapor density</b>	Not applicable.
<b>N. Specific gravity</b>	4 - 5 at 20°C
<b>O. n-octanol/water partition coefficient</b>	Not applicable.
<b>P. Auto-ignition temperature</b>	Not available.
<b>Q. Decomposition temperature</b>	Not available.
<b>R. Viscosity</b>	Not applicable.
<b>S. Molecular weight</b>	Not available.
<b>Other data</b>	
Bulk density	78 lb/ft <sup>3</sup>

## 10. Stability and reactivity

<b>Reactivity</b>	The product is stable and non-reactive under normal conditions of use, storage and transport.
<b>A. Stability and hazardous reaction potential</b>	
Stability	Stable under normal temperature conditions.
Hazardous reaction potential	Hazardous polymerization does not occur.
<b>B. Conditions to avoid (e.g. static discharge, shock or vibration, etc)</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>C. Incompatible materials</b>	Organic material. Combustible material. Strong reducing agents. Strong oxidizing agents. Halogens.
<b>D. Hazardous decomposition products</b>	No hazardous decomposition products are known.

## 11. Toxicological information

<b>A. Information on likely routes of exposure</b>	
• <b>Respiratory organs</b>	Dust irritates the respiratory system, and may cause coughing and difficulties in breathing. Inhalation of manganese oxide dust/fumes may cause metal fume fever. The symptoms are shivering, fever, malaise and muscular pain.
• <b>Skin</b>	Dust may irritate skin. Skin irritation occurs on contact with moist or wet skin.
• <b>Eyes</b>	May cause eye irritation on direct contact.
• <b>Mouth</b>	May cause discomfort if swallowed.

## B. Information on health hazards

- **Acute toxicity (list all possible routes of exposure)** May cause discomfort if swallowed.
- **Corrosivity or irritation to the skin** Dust may irritate skin. Skin irritation occurs on contact with moist or wet skin.
- **Serious eye damage/eye irritation** May cause eye irritation on direct contact.
- **Respiratory sensitization** No data available.
- **Skin sensitization** Not a skin sensitizer.
- **Carcinogenic properties /Carcinogenicity** No data available.
- **Mutagenic properties /Mutagenicity** Knowledge about mutagenicity is incomplete.
- **Reproductive toxicity** Knowledge about reproductive effects is incomplete.
- **Specific target organ toxicity - single exposure** No data available.
- **Specific target organ toxicity - repeated exposure** No data available.
- **Aspiration hazard** Due to the physical form of the product it is not an aspiration hazard.

## 12. Ecological information

### A. Ecotoxicity

- Hazardous to the aquatic environment, acute hazard** No negative effects on the aquatic environment are known.
- Hazardous to the aquatic environment, long-term hazard** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

**B. Persistence/degradability** The degradability of the product has not been stated.

**C. Bioaccumulative potential** No data available on bioaccumulation.

**D. Mobility in soil** The product is insoluble in water.

**E. Other adverse effects** An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

## 13. Disposal considerations

**A. Method of disposal** Dispose of waste and residues in accordance with local authority requirements.

**B. Disposal considerations (including disposal of contaminated containers or packaging)** Since emptied containers may retain product residue, follow label warnings even after container is emptied.

**Waste code** Not regulated.

## 14. Transport information

### IATA

- A. UN number** Not applicable.
- B. UN proper shipping name** Not applicable.
- C. Transport hazard class(es)**
  - Class** Not applicable.
  - Subsidiary risk** -
- D. Packing group** Not applicable.
- E. Environmental hazards** No.
- F. Special precautions for user** Not applicable.

### IMDG

- A. UN number** Not applicable.
- B. UN proper shipping name** Not applicable.
- C. Transport hazard class(es)**
  - Class** Not applicable.
  - Subsidiary risk** -
- D. Packing group** Not applicable.

#### E. Environmental hazards

Marine pollutant No.

EmS Not applicable.

F. Special precautions for user Not applicable.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not applicable.

### 15. Regulatory information

#### A. Restrictions under the Industrial Safety and Health Law

##### Harmful Substances Prohibited from Manufacturing

Not regulated.

##### Harmful Substances Requiring Permission for Manufacture or Use

Not regulated.

##### Controlled Hazardous Substances

Lithium manganese oxide (CAS 12057-17-9)

##### Harmful Substances Requiring Special Medical Examination

Lithium manganese oxide (CAS 12057-17-9)

##### Workplace Environmental Monitoring Harmful Materials

Lithium manganese oxide (CAS 12057-17-9)

##### Occupational Exposure Limit

Lithium manganese oxide (CAS 12057-17-9)

#### B. Restrictions under the Toxic Chemicals Control Law

##### Accidental Release Prevention Substances

Not regulated.

##### Banned Toxic Chemicals

Not regulated.

##### Observational Chemicals

Not regulated.

##### Restricted Chemical Substances

Not regulated.

##### Toxic Chemicals

Not regulated.

#### C. Restrictions under the Dangerous Substance Safety Management Act

#### D. Restrictions under the Wastes Control Act

##### Halogenated Materials in Waste Organic Solvents

Not regulated.

##### Hazardous Substances

Not regulated.

#### E. Restrictions under other foreign or domestic laws

##### Clean Air Conservation Act

###### Air Pollutants

Lithium manganese oxide (CAS 12057-17-9)

###### Specific Air Pollutants

Not regulated.

#### Inventory status

##### Country(s) or region

Korea

##### Inventory name

Existing Chemicals List (ECL)

##### On inventory (yes/no)\*

Yes

\*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).

A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

### 16. Other information

#### A. Source of information

HSDB® - Hazardous Substances Data Bank  
IARC Monographs. Overall Evaluation of Carcinogenicity (Volumes 1-106)

#### B. Issue date

27-March-2015

#### C. Number of revisions and date of most recent revision

09-February-2015 (01 revision)

**D. Other  
Disclaimer**

Not available.

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