

Safety Data Sheet (SDS)

Product Name: Activated Manganese Dioxide for High-Drain Electronic Applications **Revision Date:** February 04, 2026
Version: 1.1

Section 1: Identification

1.1 Product Identifier

- Product Name:** Activated Manganese Dioxide for High-Drain Electronic Applications
- Chemical Name:** Manganese Dioxide
- CAS No.:** 1313-13-9
- EC No.:** 215-202-6

1.2 Relevant Identified Uses of the Substance or Mixture and Uses Advised Against

- Identified Uses:** High-drain primary batteries, consumer electronics, emergency and backup power devices, industrial electronic components.
- Uses Advised Against:** No specific uses advised against.

1.3 Details of the Supplier of the Safety Data Sheet

- Company Name:** BTLnewmaterial
- Address:** Room 706, No. 154, Wuyi East Road, Niezhou Residential Committee, Caizichi Sub-district Office, Leiyang City, Hengyang City, Hunan Province, China
- Email:** lixifirm@outlook.com
- Phone/WhatsApp:** +8618273793022

1.4 Emergency Telephone Number

- Emergency Phone:** +8618273793022 (Available during business hours)

Section 2: Hazards Identification

2.1 Classification of the Substance or Mixture

According to GHS (Globally Harmonized System) [1], [2], [3]:

- Acute Toxicity, Oral:** Category 4 (H302)
- Acute Toxicity, Inhalation:** Category 4 (H332)
- Specific Target Organ Toxicity - Repeated Exposure:** Category 2 (Brain, Central Nervous System) (H373)

2.2 GHS Label Elements

- Signal Word:** Warning
- Hazard Pictograms:**
 - GHS07 (Exclamation mark)

- GHS08 (Health hazard)

- **Hazard Statements:**

- **H302 + H332:** Harmful if swallowed or if inhaled.
- **H373:** May cause damage to organs (Brain, Central Nervous System) through prolonged or repeated exposure.

- **Precautionary Statements:**

- **P260:** Do not breathe dust/fume/gas/mist/vapours/spray.
- **P264:** Wash hands thoroughly after handling.
- **P270:** Do not eat, drink or smoke when using this product.
- **P271:** Use only outdoors or in a well-ventilated area.
- **P301 + P312:** IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
- **P304 + P340:** IF INHALED: Remove person to fresh air and keep comfortable for breathing.
- **P314:** Get medical advice/attention if you feel unwell.
- **P501:** Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other Hazards

- Dust may cause mechanical irritation to eyes and respiratory tract. Prolonged exposure to high concentrations of manganese dust may lead to Manganism, a neurological disorder [4].

Section 3: Composition/Information on Ingredients

3.1 Substances

Chemical Name	CAS No.	EC No.	Concentration (%)
Manganese Dioxide (MnO ₂)	1313-13-9	215-202-6	88% – 92%
Impurities/Others	N/A	N/A	Balance

Section 4: First Aid Measures

4.1 Description of First Aid Measures

- **General Advice:** Consult a physician. Show this safety data sheet to the doctor in attendance.
- **Inhalation:** If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.
- **Skin Contact:** Wash off with soap and plenty of water. Consult a physician.
- **Eye Contact:** Flush eyes with water as a precaution. If irritation persists, get medical attention.
- **Ingestion:** Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

- The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11. Acute exposure may cause respiratory irritation, eye irritation, and mild skin irritation. Chronic exposure may lead to neurological effects (Manganism) [4].

4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed

- Treat symptomatically. In case of doubt or if symptoms persist, seek medical attention.

Section 5: Firefighting Measures

5.1 Extinguishing Media

- **Suitable Extinguishing Media:** Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
- **Unsuitable Extinguishing Media:** None known.

5.2 Special Hazards Arising from the Substance or Mixture

- Manganese oxides. Not combustible. Has oxidizing properties; may intensify fire when in contact with combustible materials [9]. May emit hazardous fumes during combustion.

5.3 Advice for Firefighters

- Wear self-contained breathing apparatus for firefighting if necessary. Wear full protective clothing.
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Section 6: Accidental Release Measures

6.1 Personal Precautions, Protective Equipment and Emergency Procedures

- Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Avoid breathing dust. Evacuate unnecessary personnel.

6.2 Environmental Precautions

- Do not let product enter drains, surface water, or groundwater. If contamination of rivers, lakes or drains occurs, inform appropriate authorities.

6.3 Methods and Materials for Containment and Cleaning Up

- Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal. Avoid dust generation.

6.4 Reference to Other Sections

- For disposal see section 13. For personal protective equipment see section 8.
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Section 7: Handling and Storage

7.1 Precautions for Safe Handling

- Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Handle in a well-ventilated area. Wash thoroughly after handling.

7.2 Conditions for Safe Storage, Including Any Incompatibilities

- Store in a cool, dry place. Keep container tightly closed in a dry and well-ventilated place. Keep away from combustible materials and strong reducing agents. Store away from moisture and high temperatures.
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Section 8: Exposure Controls/Personal Protection

8.1 Control Parameters

- **Occupational Exposure Limits:**
 - **Manganese (as Mn):**
 - **ACGIH TLV:** TWA 0.02 mg/m³ (respirable fraction); 0.1 mg/m³ (inhalable fraction) [10].
 - **OSHA PEL:** Ceiling 5 mg/m³ (as Mn) [11].
 - **NIOSH REL:** TWA 1 mg/m³; STEL 3 mg/m³ (as Mn) [12].

8.2 Exposure Controls

- **Appropriate Engineering Controls:** Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday. Use local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits. Ensure eyewash stations and safety showers are available in the work area.
 - **Personal Protective Equipment:**
 - **Eye/Face Protection:** Safety glasses with side-shields conforming to EN166 or equivalent national standards.
 - **Skin Protection:** Handle with impervious gloves (e.g., nitrile, PVC). Gloves must be inspected prior to use. Wear appropriate protective clothing to prevent skin exposure.
 - **Body Protection:** Complete suit protecting against chemicals, depending on the concentration and quantity of the hazardous substance at the workplace.
 - **Respiratory Protection:** For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection, use a respirator with an assigned protection factor (APF) appropriate for the anticipated exposure levels, conforming to national standards.
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Section 9: Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Property	Value/Description
Appearance	Black or dark brown powder
Odour	Odourless
pH (5% slurry)	3.5 – 5.5
Melting Point	535 °C (decomposes) [1]
Boiling Point	Not applicable (decomposes before boiling)
Bulk Density	0.7 – 1.1 g/cm ³
Relative Density (Water = 1)	5.026 g/cm ³ (theoretical) [13]
Solubility in Water	Insoluble
Flash Point	Not applicable
Evaporation Rate	Not applicable
Flammability (solid, gas)	Non-flammable
Upper/Lower Flammability or Explosive Limits	Not applicable
Vapor Pressure	Not applicable
Vapor Density	Not applicable
Partition Coefficient: n-octanol/water	Not applicable
Auto-Ignition Temperature	Not applicable
Decomposition Temperature	> 535 °C [1]
Viscosity	Not applicable (solid)
Explosive Properties	Not explosive
Oxidizing Properties	Oxidizing solid [9]
MnO ₂ Purity	88% – 92%
BET Surface Area	40 – 80 m ² /g
Particle Size (D50)	5 – 20 µm
Crystal Form	γ-MnO ₂ dominant

Section 10: Stability and Reactivity

10.1 Reactivity

- Stable under recommended storage conditions. Oxidizing agent [9].

10.2 Chemical Stability

- Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

- Reacts with strong reducing agents. May react violently with easily oxidizable substances or organic matter, especially when heated [9].

10.4 Conditions to Avoid

- Avoid dust formation, moisture, and high temperatures. Avoid contact with incompatible materials.

10.5 Incompatible Materials

- Strong acids, strong reducing agents, organic materials, combustible materials [9].

10.6 Hazardous Decomposition Products

- Hazardous decomposition products formed under fire conditions: Manganese oxides [1].
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Section 11: Toxicological Information

11.1 Information on Toxicological Effects

- **Acute Toxicity:**
 - **LD50 Oral (Rat):** > 3478 mg/kg [1](#)
 - **LC50 Inhalation (Rat):** > 1.5 mg/l (4h) [1] or > 1500 mg/m³ (4h) [6](#)
 - **LD50 Dermal (Rat):** > 2000 mg/kg bw [6], [7]
 - **Skin Corrosion/Irritation:** May cause mild skin irritation [8].
 - **Serious Eye Damage/Irritation:** May cause eye irritation [8].
 - **Respiratory or Skin Sensitisation:** No data available for sensitization [1].
 - **Germ Cell Mutagenicity:** No data available [1].
 - **Carcinogenicity:** IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC [1].
 - **Reproductive Toxicity:** No data available [1].
 - **STOT - Single Exposure:** No data available [1].
 - **STOT - Repeated Exposure:** May cause damage to organs (Brain, Central Nervous System) through prolonged or repeated exposure (Manganism) [1], [4]. Symptoms include languor, sleepiness, and weakness in the legs [14].
 - **Aspiration Hazard:** No data available [1].
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Section 12: Ecological Information

12.1 Toxicity

- **Ecotoxicity:** Not regarded as dangerous for the environment in general [15]. However, special attention should be given to aquatic organisms [16].
 - **Fish (LC50):** No specific data available for MnO₂. Manganese compounds can be toxic to fish at certain concentrations.
 - **Daphnia and other aquatic invertebrates (EC50):** No specific data available for MnO₂.
 - **Algae (EC50):** No specific data available for MnO₂.

12.2 Persistence and Degradability

- Manganese dioxide is an inorganic compound and is not readily biodegradable [1]. It is persistent in the environment.

12.3 Bioaccumulative Potential

- Manganese is an essential trace element, but excessive levels can bioaccumulate in organisms. No specific bioaccumulation factor (BAF) or bioconcentration factor (BCF) data available for MnO₂ [1].

12.4 Mobility in Soil

- Insoluble in water, therefore low mobility in soil. However, manganese can be mobilized under certain environmental conditions (e.g., changes in pH or redox potential) [17].

12.5 Results of PBT and vPvB Assessment

- PBT/vPvB assessment not available as chemical safety assessment not required/not conducted for this substance [1].

12.6 Other Adverse Effects

- No data available [1].
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Section 13: Disposal Considerations

13.1 Waste Treatment Methods

- **Product:** Offer surplus and non-recyclable solutions to a licensed disposal company. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Waste is classified as hazardous waste [15].
 - **Contaminated Packaging:** Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal.
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Section 14: Transport Information

14.1 UN Number

- **ADR/RID:** -
- **IMDG:** -
- **IATA:** -

14.2 UN Proper Shipping Name

- **ADR/RID:** Not dangerous goods
- **IMDG:** Not dangerous goods
- **IATA:** Not dangerous goods

14.3 Transport Hazard Class(es)

- **ADR/RID:** -
- **IMDG:** -
- **IATA:** -

14.4 Packaging Group

- ADR/RID: -
- IMDG: -
- IATA: -

14.5 Environmental Hazards

- ADR/RID: No
- IMDG Marine pollutant: No
- IATA: No

14.6 Special Precautions for User

- No data available.

14.7 Transport in Bulk According to Annex II of MARPOL ⁷³/₇₈ and the IBC Code

- Not applicable.

Section 15: Regulatory Information

15.1 Safety, Health and Environmental Regulations/Legislation Specific for the Substance or Mixture

- This safety data sheet complies with the requirements of Regulation (EC) No. ¹⁹⁰⁷/₂₀₀₆ (REACH) and GHS standards. Specific national regulations may apply.

Section 16: Other Information

16.1 Further Information

- The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. BTLnewmaterial shall not be held liable for any damage resulting from handling or from contact with the above product.

16.2 References

- [1] Sigma-Aldrich. (2025, November 6). *Safety Data Sheet: Manganese(IV) oxide*. Retrieved from <https://www.sigmaaldrich.com/US/en/sds/aldrich/529664> [2] UIC Inc. (2019, November). *Safety Data Sheet Manganese Dioxide*. Retrieved from <https://www.uicinc.com/wp-content/uploads/2019/11/CM300-009-Manganese-Dioxide-SDS-V1.0.pdf> [3] Home Science Tools. *SAFETY DATA SHEET*. Retrieved from <https://www.homesciencetools.com/content/reference/UN-MNO2.pdf> [4] Alpha Resources. *Manganese Dioxide Safety Data Sheet (SDS)*. Retrieved from <https://www.alpharesources.com/documents/MSDS/manganesedioxidesds30.pdf> [5] Fisher Scientific. *Safety Data Sheet*. Retrieved from <https://www.fishersci.com/store/msds?partNumber=S25420A&productDescription=MANGANESE+DIOXIDE+PWD+500G+LG&vendorId=VN00115888&countryCode=US&lan> [6] OECD. (2007). *SIDS INITIAL ASSESSMENT PROFILE*. Retrieved from <https://hpvchemicals.oecd.org/UI/handler.axd?id=d9820a59-9dbc-44c5-bdee-cccff8daf4ac> [7] Industrial Chemicals. (2018, June 29). *Manganese oxides: Human health tier II assessment*. Retrieved from https://www.industrialchemicals.gov.au/sites/default/files/Manganese%20oxides_Human%20health%20tier%20II%20assessment [8] Materion. *SDS US*. Retrieved from [https://www.materion.com/en/resources/environmental-health-safety/safety-data-sheets/DownloadSds?sdsId=1WS_MANGANESE%20OXIDE%20\(MNO2\)_SDS-US_English.pdf](https://www.materion.com/en/resources/environmental-health-safety/safety-data-sheets/DownloadSds?sdsId=1WS_MANGANESE%20OXIDE%20(MNO2)_SDS-US_English.pdf) [9] Flinn Scientific. *Manganese Dioxide*

Safety Data Sheet (SDS). Retrieved from https://www.flinnsci.com/sds_489-manganese-dioxide/sds_489/ [10] ACGIH. *Threshold Limit Values (TLVs) for Chemical Substances and Physical Agents & Biological Exposure Indices (BEIs)*. (Refer to latest edition for specific values). [11] OSHA. *Permissible Exposure Limits (PELs)*. (Refer to latest regulations for specific values). [12] NIOSH. *Recommended Exposure Limits (RELs)*. (Refer to latest recommendations for specific values). [13] PubChem. *Manganese dioxide / MnO₂ / CID 14801*. Retrieved from <https://pubchem.ncbi.nlm.nih.gov/compound/Manganese-dioxide> [14] Sigma-Aldrich. (2025, November 6). *SAFETY DATA SHEET*. Retrieved from https://www.sigmaaldrich.com/US/en/sds/aldrich/529664?srltid=AfmBOoqJMIYDVEDIubx1yWrU0Qt2d7RhVEFdX_sKIMISosE_P09YO37s [15] Irwin Aggregates. *MANGANESE DIOXIDE SAFETY DATA SHEET*. Retrieved from <https://irwin-aggregates.com/site/wp-content/uploads/2020/01/Manganese-Dioxide-Safety-data-sheet.pdf> [16] PubChem. *Manganese dioxide / MnO₂ / CID 14801*. Retrieved from <https://pubchem.ncbi.nlm.nih.gov/compound/Manganese-dioxide> [17] Books.google.com. *Manganese and its compounds: environmental aspects*. Retrieved from <https://books.google.com/books?hl=en&lr=&id=3nQ0DgAAQBAJ&oi=fnd&pg=PP1&dq=Manganese+Dioxide+MnO2+ecological+data+GHS&ots=Wla2fWCifL&sig=eDD/>