Safety Data Sheet: Manganese Dioxide (MnO_2) Powder

1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Identifier

- **Product Name:** Manganese Dioxide (MnO_2) Powder for Oxidizing Allylic and Benzylic Alcohols
- **Chemical Name:** Manganese Dioxide
- **Synonyms:** Manganese(IV) oxide, Pyrolusite, Black manganese oxide
- **CAS No.:** 1313-13-9
- **EC No.:** 215-202-6
- **REACH Registration No.:** (Information to be added if available)

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

- **Identified Uses:** Oxidizing agent in organic synthesis, particularly for allylic and benzylic alcohols; fine chemical synthesis; pharmaceutical intermediates; laboratory reagent.
- **Uses Advised Against:** Not for direct human consumption. Avoid contact with strong reducing agents.

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
- **Website:** manganesesupply.com

1.4 Emergency Telephone Number

- **Emergency Phone:** +8618273793022 (General)

2. Hazards Identification

2.1 Classification of the Substance or Mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

- Acute toxicity, Oral (Category 4) - H302
- Acute toxicity, Inhalation (Category 4) - H332
- Specific target organ toxicity - repeated exposure (Category 2) - H373 (Brain, if inhaled)

2.2 Label Elements

Pictograms:

- GHS07 (Exclamation Mark)
- GHS08 (Health Hazard)

Signal Word: Warning

Hazard Statements:

- H302: Harmful if swallowed.
- H332: Harmful if inhaled.
- H373: May cause damage to organs (Brain) through prolonged or repeated exposure (if inhaled).

Precautionary Statements:

- **Prevention:**
  - P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
  - P264: Wash face, hands and any exposed skin thoroughly after handling.
  - P270: Do not eat, drink or smoke when using this product.
  - P271: Use only outdoors or in a well-ventilated area.
- **Response:**
  - 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.
  - P312: Call a POISON CENTER/doctor if you feel unwell.
  - P314: Get medical advice/attention if you feel unwell.
  - P330: Rinse mouth.
- **Disposal:**

- P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other Hazards

(Other hazards not resulting in classification to be added after research)

3. Composition/Information on Ingredients

3.1 Substances

- **Chemical Name:** Manganese Dioxide
- **CAS No.:** 1313-13-9
- **EC No.:** 215-202-6
- **Purity:** 85–92% MnO_2
- **Impurities:** (Information to be added if available)

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:** Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. Call a POISON CENTER or doctor/physician if you feel unwell.
- **Skin Contact:** Wash off immediately with soap and plenty of water while removing contaminated clothing and shoes. Get medical attention if irritation develops and persists.
- **Eye Contact:** Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids. Consult a physician. Remove contact lenses, if present and easy to do. Continue rinsing.
- **Ingestion:** Rinse mouth with water. Do NOT induce vomiting. Call a POISON CENTER or doctor/physician if you feel unwell.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

- Harmful if swallowed or if inhaled. May cause damage to organs (Brain) through prolonged or repeated exposure (if inhaled). Symptoms may include irritation of the respiratory tract, cough, and shortness of breath. Prolonged or repeated exposure to manganese dusts or fumes may cause manganism, a neurological disorder.

4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed

- Treat symptomatically. For severe cases, seek immediate medical attention.

5. Firefighting Measures

5.1 Extinguishing Media

- **Suitable Extinguishing Media:** Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water spray, dry chemical, carbon dioxide (CO2), or foam.
- **Unsuitable Extinguishing Media:** None known.

5.2 Special Hazards Arising from the Substance or Mixture

- Non-flammable, non-combustible solid. Strong oxidizer, fire hazard when in contact with combustible materials. When heated to decomposition, may emit toxic fumes of manganese oxides.

5.3 Advice for Firefighters

- Wear self-contained breathing apparatus (SCBA) and full protective gear. Fight fire from a safe distance. Use standard firefighting procedures and consider the hazards of other involved materials.

6. Accidental Release Measures

6.1 Personal Precautions, Protective Equipment and Emergency Procedures

- Use personal protective equipment (PPE) as required. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes, and clothing. Do not breathe dust. Evacuate personnel to safe areas.

6.2 Environmental Precautions

- Do not allow product to enter drains, sewers, or watercourses. Prevent further leakage or spillage if safe to do so. If the product contaminates rivers, lakes, or drains, inform respective authorities.

6.3 Methods and Material 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 formation. Do not use combustible materials like sawdust for absorption. Clean contaminated surface thoroughly. Refer to Section 13 for disposal considerations.

6.4 Reference to Other Sections

- For disposal information, see Section 13. For personal protective equipment, see Section 8.

7. Handling and Storage

7.1 Precautions for Safe Handling

- **Advice on Safe Handling:** Avoid dust formation. Provide appropriate exhaust ventilation at places where dust is formed. Avoid contact with skin and eyes. Do not ingest. Wear personal protective equipment.
- **Hygiene Measures:** Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

7.2 Conditions for Safe Storage, Including Any Incompatibilities

- **Storage Conditions:** Store in a dry, sealed container at room temperature. Keep container tightly closed in a dry and well-ventilated place. Avoid prolonged exposure to moisture or strong reducing agents.
- **Incompatible Materials:** Strong reducing agents, strong acids.

7.3 Specific End Use(s)

- **Specific End Use(s):** Refer to Section 1.2.

8. Exposure Controls/Personal Protection

8.1 Control Parameters

- **Occupational Exposure Limits (as Mn):**
  - **OSHA PEL (Total Dust):** 5 mg/m^3 (TWA)
  - **NIOSH REL (Respirable Fraction):** 0.02 mg/m^3 (TWA)
  - **ACGIH TLV (Respirable Fraction):** 0.02 mg/m^3 (TWA)

    - **ACGIH TLV (Inhalable Fraction):** 0.1 mg/m^3 (TWA)
- **Biological Limit Values:** No biological exposure limits noted for the ingredient(s).

8.2 Exposure Controls

- **Appropriate Engineering Controls:** Handle in accordance with good industrial hygiene and safety practice. Use only with adequate ventilation. Provide appropriate exhaust ventilation at places where dust is formed. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
- **Individual Protection Measures, Such as Personal Protective Equipment (PPE):**
    - **Eye/Face Protection:** Safety glasses with side-shields conforming to EN166 or equivalent. Use equipment for eye protection tested and approved under appropriate government standards.
    - **Skin Protection:** Wear protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
    - **Hand Protection:** Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands. Recommended glove materials: Nitrile rubber, Neoprene, PVC.
    - **Body Protection:** Impervious clothing, flame retardant antistatic protective clothing. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.
    - **Respiratory Protection:** For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator. For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).
- **Environmental Exposure Controls:** Do not let product enter drains. Prevent further leakage or spillage if safe to do so.

9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

- **Appearance:** Black powder
- **Odor:** Odorless
- **Odor Threshold:** Not applicable
- **pH:** Not applicable (insoluble in water)

- **Melting Point/Freezing Point:** 535 °C (decomposes)
- **Initial Boiling Point and Boiling Range:** Not applicable (decomposes before boiling)
- **Flash Point:** Not applicable (inorganic solid)
- **Evaporation Rate:** Not applicable (inorganic solid)
- **Flammability (solid, gas):** Non-flammable
- **Upper/Lower Flammability or Explosive Limits:** Not applicable
- **Vapor Pressure:** Not applicable (inorganic solid)
- **Vapor Density:** Not applicable (inorganic solid)
- **Relative Density:** 5.026 g/cm^3 at 20 °C
- **Bulk Density:** 0.45–0.65 g/cm^3
- **Solubility(ies):** Insoluble in water. Soluble in hydrochloric acid with evolution of chlorine; soluble in sulfuric acid with evolution of oxygen; soluble in oxalic acid.
- **Partition Coefficient: n-octanol/water:** Not applicable (inorganic substance)
- **Auto-ignition Temperature:** Not applicable
- **Decomposition Temperature:** > 535 °C (decomposes to Mn_2O_3 and O_2)
- **Viscosity:** Not applicable (solid)
- **Explosive Properties:** Not explosive
- **Oxidizing Properties:** Oxidizing agent

9.2 Other Information

- **Particle Size:** 5–30 µm
- **Surface Area:** 60–120 m^2/g
- **Crystal Phase:** Predominantly γ-MnO_2

10. Stability and Reactivity

10.1 Reactivity

- **Reactivity:** Oxidizing agent. Reacts with strong reducing agents.

10.2 Chemical Stability

- **Chemical Stability:** Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

- **Hazardous Reactions:** Reacts violently with strong reducing agents. Decomposes at high temperatures, releasing oxygen.

10.4 Conditions to Avoid

- **Conditions to Avoid:** Moisture, high temperatures, incompatible materials.

10.5 Incompatible Materials

- **Incompatible Materials:** Strong reducing agents, strong acids.

10.6 Hazardous Decomposition Products

- **Hazardous Decomposition Products:** Manganese oxides (e.g., Mn_2O_3), oxygen.

11. Toxicological Information

11.1 Information on Toxicological Effects

- **Acute Toxicity:**
  - **Oral LD50:** > 3478 mg/kg (Rat) [1]
  - **Inhalation LC50:** 1.6 mg/L (Dust/Mist, 4h, Rat) [2]
  - Harmful if swallowed or if inhaled.
- **Skin Corrosion/Irritation:** May cause skin irritation. Based on available data, not classified as a skin corrosive/irritant.
- **Serious Eye Damage/Irritation:** May cause eye irritation. Based on available data, not classified as an eye irritant.
- **Respiratory or Skin Sensitization:** Not expected to be a respiratory or skin sensitizer.
- **Germ Cell Mutagenicity:** Available information suggests that manganese dioxide may be weakly mutagenic in vitro and possibly clastogenic in vivo [3].
- **Carcinogenicity:** No reliable standard study is available for carcinogenicity. Not classified as a human carcinogen by IARC, NTP, or OSHA. However, some studies suggest that due to very high doses, manganese would not represent a significant carcinogenic risk [4].
- **Reproductive Toxicity:** Investigated as a reproductive effector. Some studies indicate that manganese dioxide nanoparticles can cause significant changes in spermatogonia, sex hormones, and histology of male testis [5].
- **STOT-Single Exposure:** May cause respiratory irritation.

- **STOT-Repeated Exposure:** May cause damage to organs (Brain) through prolonged or repeated exposure (if inhaled). Prolonged or repeated exposure to manganese dusts or fumes may cause manganism, a neurological disorder.
- **Aspiration Hazard:** Not considered an aspiration hazard.

12. Ecological Information

12.1 Toxicity

- **Toxicity:** Manganese is an essential micronutrient but can be toxic at high concentrations to aquatic organisms. Studies indicate that MnO_2 nanosheets can induce mitochondrial toxicity in fish gill epithelial cells [6]. Specific quantitative toxicity data (e.g., LC50, EC50) for Manganese Dioxide (CAS 1313-13-9) to aquatic organisms is generally not readily available in standard MSDS documents, often reported as “No data available” or “Harmful to aquatic life with long lasting effects” for similar manganese compounds. Avoid release to the environment.

12.2 Persistence and Degradability

- **Persistence and Degradability:** As an inorganic compound, manganese dioxide is not readily biodegradable. It can undergo chemical transformations in the environment, such as reduction to other manganese oxides or dissolution under certain conditions. It is known to catalyze the degradation of various organic pollutants [7, 8].

12.3 Bioaccumulative Potential

- **Bioaccumulative Potential:** Manganese can bioaccumulate in organisms, particularly in aquatic environments, but the bioaccumulation potential of manganese dioxide specifically is generally considered low due to its insolubility. However, bioavailability can increase under certain environmental conditions.

12.4 Mobility in Soil

- **Mobility in Soil:** Manganese dioxide has low mobility in most soils due to its low solubility and strong adsorption to soil particles. However, its mobility can increase in acidic or anaerobic conditions where it may be reduced to more soluble forms of manganese.

12.5 Results of PBT and vPvB Assessment

- **PBT/vPvB Assessment:** This substance is not considered to be persistent, bioaccumulating nor toxic (PBT). This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

12.6 Other Adverse Effects

- **Other Adverse Effects:** No other adverse environmental effects are expected from this product.

13. Disposal Considerations

13.1 Waste Treatment Methods

- **Product:** Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Offer surplus and non-recyclable solutions to a licensed disposal company. Do not dispose of with household waste. Do not allow product to enter drains. Dispose of contents/container in accordance with local/regional/national/international regulations.
- **Contaminated Packaging:** Dispose of as unused product. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport Information

14.1 UN Number

- **UN Number:** UN1479

14.2 UN Proper Shipping Name

- **UN Proper Shipping Name:** OXIDIZING SOLID, N.O.S. (Manganese Dioxide)

14.3 Transport Hazard Class(es)

- **Transport Hazard Class:** 5.1 (Oxidizer)

14.4 Packing Group

- **Packing Group:** III

14.5 Environmental Hazards

- **Environmental Hazards:** Not classified as an environmental hazard for transport purposes.

14.6 Special Precautions for User

- **Special Precautions for User:** Refer to sections 6, 7, and 8 for handling, storage, and exposure controls.

14.7 Transport in Bulk According to Annex II of MARPOL $^{73}/_{78}$ and the IBC Code

- **Transport in Bulk:** Not applicable.

15. Regulatory Information

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

- **EU Regulations:**
  - **EC No.:** 215-202-6
  - **REACH Status:** Active Registration (as of May 30, 2018) [9]
- **US Federal Regulations:**
  - **TSCA (Toxic Substances Control Act):** Listed on the TSCA Inventory.
  - **CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):** Not listed as a hazardous substance.
  - **SARA (Superfund Amendments and Reauthorization Act) Title III:**
    - **Section 302 (Extremely Hazardous Substances):** No
    - **Section $^{311}/_{312}$ (Hazard Categories):** Acute Health Hazard, Specific Target Organ Toxicity (Repeated Exposure)
    - **Section 313 (Toxic Chemical Release Inventory):** Manganese compounds are subject to reporting requirements.
- **State Regulations:** (Specific state regulations may vary, refer to local authorities for details.)

15.2 Chemical Safety Assessment

- **Chemical Safety Assessment:** A Chemical Safety Assessment has been carried out for this substance (e.g., under REACH regulation).

16. Other Information

16.1 Date of Preparation/Last Revision

- **Date:** 2026-03-06

16.2 Abbreviations and Acronyms

- **GHS:** Globally Harmonized System of Classification and Labelling of Chemicals
- **CAS:** Chemical Abstracts Service
- **EC:** European Community
- **REACH:** Registration, Evaluation, Authorisation and Restriction of Chemicals
- **PPE:** Personal Protective Equipment
- **STOT:** Specific Target Organ Toxicity
- **PBT:** Persistent, Bioaccumulative and Toxic
- **vPvB:** very Persistent and very Bioaccumulative

16.3 Key Literature References and Sources for Data

[1] Sigma-Aldrich. (2025, November 6). *Safety Data Sheet: Manganese(IV) oxide*. Retrieved from https://www.sigmaaldrich.com/US/en/sds/aldrich/529664 [2] PENTA. (2025, July 10). *Safety Data Sheet: Manganese(IV) oxide*. Retrieved from https://www.pentachemicals.eu/data/Bezpecnostni_listy/en/Manganese(IV)%20oxide_1249_3.0.pdf [3] Assem, F. L. (2011). The Mutagenicity and Carcinogenicity of Inorganic Manganese. *Critical Reviews in Toxicology*, 41(9), 745-758. https://www.tandfonline.com/doi/abs/10.1080/10937404.2011.615111 [4] Gerber, G. B. (2002). Carcinogenicity, mutagenicity and teratogenicity of manganese. *Mutation Research/Reviews in Mutation Research*, 512(1), 1-18. https://www.sciencedirect.com/science/article/abs/pii/S1040842801001780 [5] Yousefalizadegan, N., et al. (2019). Reproductive toxicity of manganese dioxide in forms of micro and nano particles in male Wistar rats. *Toxicology Reports*, 6, 689-696. https://pmc.ncbi.nlm.nih.gov/articles/PMC6653491/ [6] Wang, J., et al. (2021). Manganese Dioxide Nanosheets Induce Mitochondrial Toxicity in Fish Gill Epithelial Cells. *Environmental Science & Technology Letters*, 8(3), 241-246. https://pmc.ncbi.nlm.nih.gov/articles/PMC8026737/ [7] Husnain, S. M., et al. (2020). Recent trends of MnO_2-derived adsorbents for water and wastewater treatment. *New Journal of Chemistry*, 44(10), 3959-3978. https://pubs.rsc.org/en/content/articlelanding/2020/nj/c9nj06392g [8] Li, H., et al. (2019). Treatment of high-nitrate wastewater mixtures from MnO_2 industry by Chlorella vulgaris. *Bioresource Technology*, 290, 121765. https://www.sciencedirect.com/science/article/pii/S0960852419310661 [9] ECHA CHEM. (2018, May 30). *Manganese dioxide*. Retrieved from https://chem.echa.europa.eu/100.013.821/dossier-

view/9e710ab8-0215-44f2-a2b3-34ac0d973693/42580d79-1a55-47b4-aff2-91313a778f29_7043f201-e324-4867-a6b6-cae979f870a5

16.4 Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.