
MATERIAL SAFETY INFORMATION: MANGANESE OXIDE

Provided in accordance with Article 18(2) of Regulation (EC) No 1272/2008

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Substance name: Manganese Oxide
Other names: MnO
EC No.: 215-695-8
CAS No.: 1344-43-0
Molecular Formula: MnO
REACH Registration number: **[If applicable]**
Unique formula identifier (UFI): Not applicable for this substance

1.2 Relevant identified uses of the Substance/Mixture and uses advised against

PC 1: Adhesives, sealants.
PC 9a: Coatings and paints, thinners, paint removes.
PC 12: Fertilisers.
PC 14: Metal surface treatment products.
PC 21: Laboratory chemicals.
PC 38: Welding and soldering products, flux products.
PC 0: Other: Animal feed.
Add or delete the above to suit your company's needs.
No known uses advised against.

1.3 Suppliers details (including address, phone number etc): Complete as required.

1.4 Emergency Telephone: Complete as required CIAV # of receiving country.

SECTION 2: HAZARD(S) IDENTITIFCATION

2.1 Classification of the substance or mixture:

Classification according to Regulation (EC) No. 1272/2008 [EU CLP] and the UN GHS
Not classified based on data on its individual constituents/ingredients.
Not classified according to the UN GHS

2.2 Labelling/Pictograms:

Not applicable as the substance is not classified.

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2.3 Other Hazards:

The substance is an inorganic metallic salt. Based on available information, the substance does not meet the criteria for classification as persistent, bioaccumulative and toxic or very persistent and very bioaccumulative.

Endocrine disrupting properties have not been identified from existing acute or chronic data. Data lacking.
May form explosible dust-air mixture if dispersed. It is advisable to avoid generating dust as all fine particles have the potential to explode. Include other hazards if known.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substance(s) [Amend as appropriate]

Manganese Oxide is an inorganic mono-constituent substance. Its impurities are negligible and do not influence the overall classification.

Chemical name	EC No.	CAS number	Concentration % w/w	REACH Registration No.
Manganese Oxide	215-695-8	1344-43-0	Complete as per your product	xx-xxxxxxxxxxx-xx-xxxx
Impurity 1: Aluminium oxide	215-691-6	1344-28-1	Complete as per your product	-
Impurity 2: Silicon oxide	231-545-4	11126-22-0	Complete as per your product	-
Impurity 3: Iron oxide	215-168-2	1345-25-1	Complete as per your product	-
Add other impurities as per your product				

3.2 Mixtures: The substance is not a mixture.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures:

4.1.1 General Information

Not anticipated to cause any harm if in contact with clothing, skin or eyes. However, in case of accident or unwellness, seek medical advice immediately.

4.1.2 Following Inhalation: Do not inhale. Wear an appropriate mask. Coughing can be expected as an immediate effect, delayed effects are not expected.
move exposed individual to fresh air. Include information based on your company's procedures.

4.1.3 Following Skin Contact: Wear appropriate protective equipment for good industrial hygiene purposes. Include information based on your company's procedures.

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4.1.4 Following Eye Contact: Eye protection is encouraged to avoid dust entering eyes. Include information based on your company's procedures.

4.1.5 Following Ingestion: For good industrial hygiene purposes do not ingest. Include information based on your company's procedures.

4.1.6 Self protection of the first aider: No known concern Include information based on your company's procedures.

4.2 Most important symptoms and effects, both acute and delayed: None anticipated – the substance is not classified as hazardous. However, breathing difficulties may occur immediately in the event of excessive dustiness due to lung overload. Include any useful/relevant information.

4.3 Indication of any immediate medical attention and special treatment needed: Include information based on your company's procedures.

SECTION 5: FIRE-FIGHTING MEASURES:

5.1 Suitable extinguishing media:

Include information based on your company's procedures.

5.2 Specific hazards arising from the chemical/mixture/preparation:

The substance can produce decomposition products – mainly metallic oxides. Include any other relevant information.

5.3 Special protective equipment and precautions for fire-fighters:

Include information based on your company's procedures.

SECTION 6: ACCIDENTAL RELEASE MEASURES:

6.1 Personal precautions, protective equipment and emergency procedures:

6.1.1 For non-emergency personnel:

a) Dusk mask, goggles and overalls are encouraged for good industrial hygiene. See section 8 for more details.

b) Must have dust control and sufficient ventilation. Avoid all ignition sources.

c) In the event of any accidental release, evacuate the area and consult trained personnel's – Amend as per your company procedures**.**

6.1.2 For emergency responders: Remove persons to safety. Isolate hazard area and deny entry. Ventilate closed spaces before entering. Use personal protective equipment, specify which to use/which not to use, see section 8.

6.2 Environmental precautions:

The substance is not considered an environmental hazard based on the available studies. However, it is advisable to keep away from drains as large quantities could clog drains. Include other information based on your company's procedures.

6.3 Methods and material for containment and cleaning up:

Collect contaminated material and put in appropriate containers for disposal. Dispose of as special waste in compliance with local and national regulations.

6.3.1 For containment: Collect in closed and suitable containers for disposal or reuse. Include other information based on your company's procedures.

6.3.2 For cleaning up: Clean contaminated objects and areas thoroughly observing environmental regulations Amend as per company procedures-Include cleaning and vacuuming techniques.

6.3.3 Other information: None

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6.4 Reference to other sections: For Personal protective equipment and appropriate disposal: see section 8 and 13.

Section 7: HANDLING AND STORAGE:

7.1 Precautions for safe handling:

7.1.1 Recommendations:

a) Use only in well-ventilated areas. Avoid generating dust. Wear personal protective clothing (see Section 8). Include other information based on your company's procedures.

b) Avoid handling with incompatible substances/mixtures. (List incompatible substances if known)

c) Avoid dust generating operations or must be carried out in properly ventilated areas while wearing appropriate PPE.

d) Capture dust, if possible, if generated, vacuum dust and compress into pellets to minimize environmental exposure and recycle if possible- Amend as per company procedures

7.1.2 Advice on general occupational hygiene:

a) Do not eat, drink or smoke in work areas.

b) Wash hands before and after use and keep them dry.

c) Remove contaminated clothing and personal protective equipment before entering eating areas - Include other information based on your company's procedures.

7.2 Conditions for safe storage, including any incompatibilities:

7.2.1 Specific storage requirements:

a) Risk management associated to physical and chemical properties

i) Explosive atmospheres: The substance is not explosive, however, store the substance away from explosive materials

ii) Corrosive conditions: The substance does not corrode metal, hence no adverse corrosive effects are expected

iii) Flammability hazard: The substance is not flammable, however, keep away from flammable materials

iv) Incompatible substances or mixtures: None known (List if known)

v) Evaporative conditions: The substance does not evaporate. Avoid storage around organic evaporative materials/substances.

vi) Potential ignition sources: Keep away from ignition sources

b) How to control effects from environmental conditions: (i) Weather conditions, (ii) ambient pressure, (iii) varying temperatures, (iv) sunlight, (v) humidity and (vi) vibration do not affect the integrity of the substance. However, storage environments should not be very humid **–** Amend as per your company's procedures.

c) How to maintain the integrity of the substance: (i) Stabilisers and (ii) antioxidants are not required. The substance is very stable under normal conditions of use. It does not decompose or disintegrate.

d) Other advise.

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i) **Ventilation requirements:** Ensure adequate ventilation and store at room temperature.

ii) **Specific designs for storage:** Keep/store only in original container/packaging. Include other information based on your company's procedures.

iii) **Quantity limits under storage conditions:** There is no limitation as the substance does not pose any physical and chemical hazards.

iv) **Packaging compatibility:** Store in original/similar packaging. Protect container/packaging against damage – Amend as per company's procedures.

7.3 Specific end uses(s):

Recommendations: Observe instructions for use.

SECTION 8: EXPOSURE CONTROLS/ PERSONAL PROTECTION:

8.1 Control Parameters:

8.1.1 Occupational exposure limits: The EU SCOEL OEL values for Manganese and its inorganic compounds are 0.2mg/m3 – inhalable and 0.05mg/m3 respirable.

8.1.1.1 National limits: Include other relevant country specific workplace limits.

8.1.1.2 Union limits: 0.2mg/m3 inhalable and 0.05mg/m3 respirable

8.1.1.3 Any other national exposure limit values: Include if available.

8.1.1.4 Union Biological limit values: No Union biological limit values exist for Inorganic manganese and its compounds.

8.1.1.5 Any other national biological limit values: Include if available.

8.1.2 Monitoring Procedures: Dust monitoring is recommended, provide methodology as per national laws/company procedures.

8.1.3 Formation of air contaminates: The substance does not produce air contaminants under normal conditions of use. OEL/BLV are therefore not provided Amend as per your company's use.

8.1.4 Derived No Effects Limits (DNELs)/Predicted No Effects Concentrations (PNECs):

Hazard Assessment conclusion for Workers: DNELS

Route	Type of effect	Hazard conclusion	Most sensitive endpoint
Inhalation	Systemic effects - Long-term	DNEL (Derived No Effect Level) 0.2mg/m³	
Inhalation	Systemic effects - Acute	no-threshold effect and/or no dose-response information available.	
Inhalation	Local effects - Long-term	no hazard identified.	

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Inhalation	Local effects - Acute	no hazard identified.	
Dermal	Systemic effects - Long-term	DNEL (Derived No Effect Level) 0.004mg/kg bw/day	
Dermal	Systemic effects - Acute	no-threshold effect and/or no dose-response information available.	
Dermal	Local effects - Long-term	no hazard identified.	
Dermal	Local effects - Acute	no hazard identified.	
Eyes	Local effects	no hazard identified.	

Hazard Assessment conclusion for the Environment: PNECs

Compartment	Hazard conclusion	Remarks/Justification
Freshwater	PNEC aqua (freshwater): 0.008mg/L Intermittent releases: 0.011mg/L	Assessment factor: 50 Extrapolation method: assessment factor PNEC aqua (freshwater) Two chronic NOEC values in algae and Daphnia. NOEC = 0.41 mg/l PNEC intermittent release hazard assessment conclusion: PNEC aqua (intermittent releases) PNEC intermittent release assessment factor: 100.0 PNEC intermittent release extrapolation method: assessment factor PNEC intermittent release justification:

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		Lowest L(E)C50 value from fish, daphnia and algal studies. EyC50 = 1.1 mg/l
Marine water	PNEC aqua (marine water): 0.001mg/L Intermittent releases:	Assessment factor: 500 Extrapolation method: assessment factor PNEC aqua (marine water) Two chronic NOEC values in algae and Daphnia, with further 10 x factor for freshwater to marine. NOEC = 0.41 mg/l
Sediments (freshwater)	PNEC sediment (freshwater): 8.18mg/kg sediment dw	Assessment factor: 500 Extrapolation method: assessment factor PNEC sediment (freshwater) Equilibrium partitioning based on freshwater aquatic PNEC and Kd value of 994 ml/g. The tenfold safety factor is added to account for ingestion of compound bound to sediment
Sediments (marine water)	PNEC sediment (marine water): 0.82mg/kg sediment dw	Assessment factor: 5000 Extrapolation method: assessment factor PNEC sediment (marine water) Equilibrium partitioning based on marine aquatic PNEC and Kd value of 994 ml/g. The tenfold safety factor is added to account for ingestion of compound bound to sediment
Sewage treatment plant	PNEC STP: 100mg/L	Assessment factor: 10 Extrapolation method: assessment factor PNEC STP Activated sludge Respiration/inhibition test. NOEC -= 1000mg/l

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Soil	PNEC soil: 8.15mg/kg soil dw	Assessment factor: 50 Extrapolation method: assessment factor PNEC soil Equilibrium partitioning based on aquatic PNEC and Kd value of 994
Air	no hazard identified:	
Secondary poisoning	no potential for bioaccumulation:	Bioaccumulation of MnO is not expected to occur. Hence no secondary poisoning risk exists.

8.1.5 Control banding: A control banding approach is not used to decrease risk management measure during the use of this substance for the uses specified in section 1.2.

8.2 Exposure controls:

8.2.1 Appropriate engineering controls: Dust is trapped and recycled where possible. Waste- water is collected for treatment and recycled. Amend as per your company's procedures.

8.2.2 Individual protective measures: Overalls, goggles and masks are not mandatory during use but are encouraged.

8.2.2.1 Other non-personal protection: Good industrial hygiene is a must. Keep and use in well-ventilated areas. See section 5 for more information Amend as per your company's procedures.

8.2.2.2 CEN stand requirement for protective equipment: (Please state the quality/standard/thickness of the personal protective equipment used by your organisation)

a) Eye/face protection: complete as per your company procedures e.g type of goggles

b) Skin protection: Overalls, gloves and boots are not mandatory; however, they are encouraged for good industrial hygiene (Please specify type of overall, gloves, boots including the thickness of material)

c) Respiratory protection: N95 Mask (Amend as per your company procedures)

d) Thermal hazards: Not applicable

8.2.3 Environmental exposure controls: The substance is not harmful to the environment. (Please include environmental controls employed by your company)

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES: [the information below is based on available literature and studies]

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9.1 General information	
Appearance	Green Powder
Odour	Odourless
Odour threshold	Does not apply, as substance is odourless
pH	Not applicable
Boiling point	Melting pt >300°C, hence study not applicable
Melting point (Mpt) / Freezing point	>723 K (>450°C), Regulation (EC) No. 440/2008, Annex, A1
Boiling point/Boiling range	Melting pt >300°C, hence study not applicable
Flash Point	Not required for inorganic substances
Evaporation rate	Not applicable
Flammability of solids	Not flammable, Regulation (EC) No. 440/2008, Method A10
Explosive properties	Predicted to be non-explosive
Oxidizing properties	Predicted to be non-oxidizing
Vapour pressure	Study not conducted as Mpt >300°C
Vapour density	Not applicable
Relative density	5.28 at 21°C, Regulation(EC) No. 440/2008, Annex, A3
Water Solubility	Sparingly soluble: 6.6 x 10-4 g/L, Regulation (EC) No. 440/2008, Annex A6
Partition Coefficient/n_octanol/water	Not applicable for inorganic substances
Auto-ignition & decomposition temperature	Not applicable
Viscosity	No data available, testing not technically possible
Self Ignition	Not self-igniting
Dissociation constant	Cannot dissociate due to lack of relevant functional groups
Surface tension	Substance is not surface active
Stability in organic solvents and identity of relevant degradation groups	Not applicable for inorganic substances
9.2 Other information	No additional information relevant to the safe use of the substance

SECTION 10: STABILITY AND REACTIVITY: [Amend information below to conform to your company information]

10.1 Reactivity: No specific test data related to reactivity available for this substance.

10.2 Chemical stability: The substance is chemically stable under recommended conditions of storage, use and temperature.

10.3 Possibility of hazardous reaction: No hazardous reaction when handled and stored according to provisions.

10.4 Conditions to avoid: Include information based on your company's procedures.

10.5 Incompatible materials: Include other information based on your company's procedures.

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10.6 Hazardous decomposition products: Does not decompose when used for intended uses. Include other information based on your company's procedures.

SECTION 11: TOXICOLOGICAL INFORMATION: [The information in this section is from experimental data and other available literature]

11.1 Information on toxicological effects:

Acute toxicity:

Acute oral toxicity: No adverse effect observed (LD50 >2000 mg/kg bw)
Acute dermal toxicity: No study available. No concerns predicted.
Acute inhalation toxicity: No adverse effects observed (LD50 >5000 mg/m3)

Skin corrosion/irritation:

Not irritating in rabbits (one study according to OECD guideline 404 and EU method B.4, GLP), applied to the intact skin for 24 hours and 72 hours post dosing. Primary dermal irritation index for all animals = 0. No effects were noted during the study.

Serious eye damage/irritation:

Not irritating in the rabbit (one study according to OECD guideline 405 and EU method B. 5, GLP); undiluted test material applied to the right eye of three animals. Maximum mean total score of 10.7 of max. Slightly irritating to the eyes - not classified under GHS. Fully reversible within 48hrs.

Respiratory or skin sensitization:

Not a skin sensitizer in the mouse (One study to OECD guideline 429 and EU method B.42, Local lymph node assay, GLP). There is not information available for respiratory sensitization. However, it is predicted not to be a respiratory sensitizer.

Germ cell mutagenicity:

Negative in all tests conducted using a MnCl2 – a very soluble salt considered as a worse-case evaluation:

- Ames test with S. typhimurium TA 98, TA 100, TA 1535, TA 1537, E coli WP2 uvrA (Met. act.: with and without) (OECD TG 471, EU method B13 and GLP); No toxicity was observed up a concentration of 5000 ug/plate.
- Mammalian cell gene mutation assay with mouse lymphoma L5178Y cells (met. act.: with and without) (OECD 476 and GLP); Negative for mouse lymphoma Cytoxicity: Yes, induced toxicity was not at the highest dose.
- In-vitro mammalian chromosome aberration test with human lymphocytes (Met. act.: with and without) (OECD guideline 473 and GLP). Negative for lymphocytes. Cytotoxicity: Yes

Carcinogenicity:

There are no specific studies on carcinogenicity for this substance. However, since all in-vitro genotoxicity test on a more bioavailable manganese salt were negative and an expert report (Jenkinson, 2009) as well as a literature review on carcinogenicity for Mn and its inorganic compounds (Assem et al, 2011) concluded – no concerns, carcinogenicity in humans is not expected.

Reproductive toxicity:

Two-Generation Reproductive toxicity study on the male/female rats using a very soluble Mn salt ($MnCl_2$) via inhalation (OECD guideline 416, GLP): Not toxic to reproduction (McGough & Jardine, 2016)

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Specific target organ toxicity (Single exposure):
Based on available data the classification criteria are not met.
Specific target organ toxicity (repeated exposure):
Based on published literature the substance is not expected to cause harm via oral and inhalation exposure route. However, some Mn-based substances have been reported to harm if inhaled over a long period of time at exposure levels higher than those stipulated in section 8.
Aspiration hazard:
Data lacking

SECTION 12: ECOLOGICAL INFORMATION:

12.1 Ecotoxicity: No environmental concerns

Acute (short-term) toxicity:

Aquatic vertebrates:

a) **Fish:** OECD guideline 203, EU method C1 and GLP. LD50 (96h) for freshwater fish: >1.2 mg/L; NOEC 1.2 mg/L

Aquatic invertebrates:

a) **Crustacean:** OECD guideline 202, EU method C2 and GLP. EC50/LC50 (48h) for freshwater invertebrates: 4.0 mg/L: NOEC (48h) 4 mg/L
b) **Algae/aquatic plants:** OECD 201, EU method C3 and GLP. EC50/LC50 (72h): >1.3 mg/L. NOEC (72h): 0.41 mg/L
c) **ASRI (Activated sludge respiratory inhibition):** OECD guideline 209, EU method C11 and GLP. EC50: 9.7 mg/L; NOEC (>3h) : >1000 mg/L
d) **Chronic (long-term) toxicity:**

Crustacean- Daphnia reproductive test: OECD guideline 211 and GLP. NOEC (8d): 1.3 mg/L.

Based on available studies conducted at different trophic levels, the substance is not harmful to aquatic life.

12.2 Persistence and degradation	No potential for persistence	According to the Guidance on information requirements and chemical safety assessment, Chapter R.11: PBT assessment, "the PBT and vPVB criteria of Annex XIII to the regulation do not apply to inorganic substances". Therefore, MnO is not considered to require any further assessment of PBT properties.
12.3 Bioaccumulative potential	No potential for bioaccumulation	According to the Guidance on information requirements and chemical safety assessment, Chapter R.11: PBT assessment, "the PBT and vPVB criteria of Annex XIII to the regulation do not apply to inorganic substances". Therefore, MnO is not considered to require any further assessment of PBT properties.
12.4 Mobility in soil	No potential to move into ground water	Data lacking

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12.5 Results of PBT and vPvB assessment:

According to the Guidance on information requirements and chemical safety assessment, Chapter R.11: PBT assessment, "the PBT and vPVB criteria of Annex XIII to the regulation do not apply to inorganic substances". Therefore, MnCl2 is not considered to require any further assessment of PBT properties.

12.6 Endocrine disrupting properties:

The substance is not considered an endocrine disruptor based on available literature – Data lacking.

12.7: Other adverse effects: None known

SECTION 13: DISPOSAL CONSIDERATIONS: Include other information based on your company's procedures.

13.1 Waste treatment methods: Waste disposal in accordance with local and national laws covering waste and dangerous waste. Include other information based on your company's procedures.

13.1.1 Product/packaging disposal: Waste must be disposed of in line with local regulations. Waste codes should be assigned by the user, preferably in discussion with the waste authorities.

13.1.2 Waste treatment-relevant information: Include other information based on your company's procedures,

13.1.3 Sewage disposal-relevant information: Include other information based on your company's procedures,

13.1.4 Other disposal recommendations: Handle contaminated packages in the same way as the substance itself. Include other information based on your company's procedures,

SECTION 14: TRANSPORT INFORMATION:

Transport may take place according to national regulations or land transport (ADR/RID), sea transport (IMDG) or Air transport (ICAO-TI/IATA-DGR).

14.1 UN Number: Include number or not applicable.

14.2 UN proper shipping name: Include name or not applicable.

14.3 Transport hazard class: Not hazardous

14.4 Packaging group: Include packaging group or not applicable.

14.5 Environmental hazard: Not hazardous to the environment

14.6 Special precautions for users: Always transport in close containers, avoid generating dust. **[Include other information based on your company's procedures]**

14.7 Transport in bulk according to Annex II of MARPOL73/78 and ISBC code: Include code or not applicable.

SECTION 15: REGULATORY INFORMATION: [Delete as appropriate and include regulatory information specific to your country...]

15.1 Safety, health and environmental regulations/legislation for the substance:

UN GHS - UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS):

"According to Chapter 1.5.2 of the UN Globally Harmonized System of Classification and Labeling of Chemicals (GHS) safety data sheets (SDS) are only required for substances and mixtures that meet

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the harmonized criteria for physical, health or environmental hazards. This product does not meet these criteria

EU CLP – Classification Labeling and Packaging Regulation:
According to Article 59(2)(b) of (EC) No 1272/2008 (CLP), which amends REACH article 31(1), safety data sheets (SDS) are only required for substances and mixtures that meet the harmonised criteria for physical, health or environmental hazards. Since this product does not meet these criteria, a SDS according to 453/2010/EC is not issued. In order to communicate relevant HSE-(health, safety and environmental-) information, this product safety information (PSI) is provided instead.

EU REACH – Registration, Evaluation and Authorisation of Chemicals:
REACH article 31(7) requires relevant exposure scenarios from the Chemical Safety Report (CSR) to be annexed to the SDS. However, according to REACH Annex I, section 0. (Introduction), subsection 0.6. no 4 and 5, exposure scenarios are only required for hazard-classified substances or mixtures. Since this product is not hazard-classified according to CLP, there is no requirement for exposure scenarios."

SECTION 16: OTHER INFORMATION:

16.1 Sources of key data:

1. Assem, F. L., et al, (2011); The Mutagenicity and carcinogenicity of inorganic manganese compounds: A synthesis of the evidence, Journal of toxicology and environment, part B

2. Atwal S and Tremain SP (2009). MnO (Erachem): Determination of Oxidising Properties. Testing laboratory: Harlan Laboratories Limited, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK. Report no.: 2702-0016. Owner Company: International Manganese Institute, 17 Rue Duphot, 75001 Paris, FRANCE. Report date: 2009-09-14.

3. Atwal SS and Woolley SM (2009). MnO: Determination of Melting/Freezing Temperature and Flammability (Solids). Testing laboratory: Harlan Laboratories Limited, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK. Report no.: 2702-0039. Owner Company: International Manganese Institute, 17 Rue Duphot, 75001 Paris, FRANCE. Report date: 2009-08-19.
4. Bounds, S. V. J., (2009); TOXICOKINETIC ASPECTS: *Assessment of Toxicological Endpoints for the Registration, Evaluation and Authorisation of Chemicals*, Regulation (EC) No. 1907/2006 (REACH)- MANGANESE AND ITS INORGANIC COMPOUNDS

5. Flanders L (2009). MnCl (Eramet): L5178Y TK +/- Mouse Lymphoma Assay. Testing laboratory: Harlan Laboratories Ltd, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK. Report no.: 2702-0037. Owner Company: International Manganese Institute, 17 Rue Duphot, 75001 Paris, FRANCE. Report date: 2009-11-17.

6. Griffiths DR (2010). MnO: Acute Inhalation Toxicity (Nose Only) Study In The Rat. Testing laboratory: Harlan Laboratories Ltd, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK. Report no.: 2702/0092. Owner Company: International Manganese Institute, 17 Rue Duphot, 75001 Paris, FRANCE. Report date: 2010-01-25.

7. Jenkinson, J., (2009); GENOTOXICITY ASPECTS: *Assessment of Toxicological Endpoints for the Registration, Evaluation and Authorisation of Chemicals,* Regulation (EC) No. 1907/2006 (REACH)- MANGANESE AND ITS INORGANIC COMPOUNDS

8. Komura J and Sakamoto M (1991). Short-term oral administration of several manganese compounds in mice: physiological and behavioural alterations caused by different forms of manganese. Bulletin of Environmental, Contamination and Toxicology, 46:921-928.

9. Komura J and Sakamoto M (1992). Effects of Manganese forms on biogenic amines in the brain and behavioural alterations in the mouse: long-term oral administration of several manganese compounds. Environmental research, 57:34-44.

10. McGough, D and Jardine, L (2016) A two-generation inhalation reproductive toxicity study upon the exposure to manganese chloride; Journal of Neurotoxicology

11. Morris A & Durward R (2009). MnCl2 (Eramet): Chromosome Aberration Test in Human Lymphocytes In Vitro. Testing laboratory: Harlan Laboratories Ltd, Shardlow Business Park, Shardlow, Derbyshire, DE72 2GD, UK. Report no.: 2702-0036. Owner Company: International Manganese Institute, 17 Rue Duphot, 75001 Paris, FRANCE. Report date: 2009-11-23.

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