SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form: Substance
Physical state: Solid
Substance name: MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90
Product code: AKM528
Formula: C4H6MnN2S4
Synonyms: 1,2-ETANEDIYLBI(CARBAMADODITHIOIC ACID), MANGANESE 2+ SALT; [ETHYLENE(DITHIOCARBAMATO-KAPPA(2)S,S')(DITHIOCARBAMATO)]MANGANESE; MANGANESE N,N-ETHYLENEBIS(DITHIOCARBAMATE); MANEB
Chemical family: METAL COMPOUND

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture: Chemical intermediate
For research use only

1.3. Details of the supplier of the safety data sheet

GELEST, INC.
11 East Steel Road
Morrisville, PA 19067
USA
T 215-547-1015 - F 215-547-2484 : (M-F): 8:00 AM - 5:30 PM EST
info@gelest.com - www.gelest.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US classification
Water-react. 3 H261
Eye Irrit. 2A H319
Repr. 2 H361
Aquatic Acute 1 H400
Full text of H statements: see section 16

2.2. Label elements

GHS-US labeling
Hazard pictograms (GHS-US): GHS02 GHS07 GHS08 GHS09
Signal word (GHS-US): Warning
Hazard statements (GHS-US): H261 - In contact with water releases flammable gases
H319 - Causes serious eye irritation
H361 - Suspected of damaging fertility or the unborn child
H400 - Very toxic to aquatic life
Precautionary statements (GHS-US): P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P231 + P232 - Handle under inert gas. Protect from moisture
P264 - Wash hands thoroughly after handling
P273 - Avoid release to the environment
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337 + P313 - If eye irritation persists: Get medical advice/attention
P370 + P378 - In case of fire: Use media other than water to extinguish
P391 - Collect spillage
P402 + P404 - Store in a dry place. Store in a closed container
P405 - Store locked up
MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90
Safety Data Sheet

P501 - Dispose of contents/container to licensed waste disposal facility

2.3. Other hazards
No additional information available

2.4. Unknown acute toxicity (GHS US)
No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance
Substance type: Mono-constituent
Name: MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90
CAS No: 12427-38-2
EC no: 235-654-8

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier (CAS No)</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manganese(II) ethylenebis(dithiocarbamate)</td>
<td>12427-38-2</td>
<td>90 - 100</td>
<td>Water-react. 3, H261, Eye Irrit. 2A, H319, Repr. 2, H361, Aquatic Acute 1, H400</td>
</tr>
</tbody>
</table>

3.2. Mixture
Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures
First-aid measures general: Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell, seek medical advice.

First-aid measures after skin contact: Wash with plenty of soap and water. Get medical advice/attention.

First-aid measures after eye contact: Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion: Never give anything by mouth to an unconscious person. Get medical advice/attention.

4.2. Most important symptoms and effects, both acute and delayed
Symptoms/injuries: Suspected of damaging fertility or the unborn child.
Symptoms/injuries after inhalation: May be harmful if inhaled. May cause irritation to the respiratory tract.
Symptoms/injuries after skin contact: May cause mild skin irritation. May cause sensitization.
Symptoms/injuries after eye contact: Causes serious eye irritation.
Symptoms/injuries after ingestion: May be harmful if swallowed.

4.3. Indication of any immediate medical attention and special treatment needed
No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media
Unsuitable extinguishing media: Do not use straight streams.

5.2. Special hazards arising from the substance or mixture
Fire hazard: In contact with water releases flammable gases. May ignite if heated in air. Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.

5.3. Advice for firefighters
Firefighting instructions: Exercise caution when fighting any chemical fire. Use water spray to cool exposed surfaces.
Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Avoid contact with skin and eyes. Do not breathe dust.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel
Protective equipment: Wear protective equipment as described in Section 8.
Emergency procedures: Evacuate unnecessary personnel.
6.1.2. For emergency responders
Protective equipment: Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions
Prevent entry to sewers and public waters. Notify authorities if product enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up
For containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.
Methods for cleaning up: Collect spillage. Sweep or shovel spills into appropriate container for disposal.

6.4. Reference to other sections
See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage
7.1. Precautions for safe handling
Precautions for safe handling: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid contact with skin and eyes. Do not breathe dust. Avoid dust formation. Handle under inert gas. Protect from moisture. Use only outdoors or in a well-ventilated area.
Hygiene measures: Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities
Storage conditions: Keep container tightly closed. Store locked up. Store in a dry place. Store in a closed container.
Incompatible materials: Strong oxidizing agents.
Storage area: Store in a well-ventilated place. Store away from heat.

7.3. Specific end use(s)
No additional information available

SECTION 8: Exposure controls/personal protection
8.1. Control parameters

<table>
<thead>
<tr>
<th>Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA ACGIH ACGIH TWA (mg/m³)</td>
</tr>
<tr>
<td>USA OSHA OSHA PEL (TWA) (mg/m³)</td>
</tr>
</tbody>
</table>

8.2. Exposure controls
Appropriate engineering controls: Handle in an enclosing hood with exhaust ventilation.
Personal protective equipment: Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection: Neoprene or nitrile rubber gloves.
Eye protection: Chemical goggles. Contact lenses should not be worn.
Skin and body protection: Wear suitable protective clothing.
Respiratory protection: Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified dust and mist (teal cartridge) respirator.

SECTION 9: Physical and chemical properties
9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Powder.</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>265.28 g/mol</td>
</tr>
<tr>
<td>Color</td>
<td>Yellow.</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Refractive index</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point</td>
<td>131 °C decomposes</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>No data available</td>
</tr>
<tr>
<td>Flash point</td>
<td>No data available</td>
</tr>
</tbody>
</table>
MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90  
Safety Data Sheet

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>In contact with water releases flammable gases</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>&lt; 0.1 mm Hg @ 25°C</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative density</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>VOC content</td>
<td>&lt; 3 %</td>
</tr>
<tr>
<td>Solubility</td>
<td>Slightly. Soluble in water.</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Log Kow</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No data available</td>
</tr>
<tr>
<td>9.2. Other information</td>
<td>No additional information available</td>
</tr>
</tbody>
</table>

**SECTION 10: Stability and reactivity**

**10.1. Reactivity**  
No additional information available

**10.2. Chemical stability**  
Slowly oxidizes to Mn+3 compound in air at room temperature.

**10.3. Possibility of hazardous reactions**  
No additional information available

**10.4. Conditions to avoid**  
Do not heat in air.

**10.5. Incompatible materials**  
Strong oxidizing agents.

**10.6. Hazardous decomposition products**  
Organic acid vapors. Manganese oxide fumes.

**SECTION 11: Toxicological information**

**11.1. Information on toxicological effects**

**Acute toxicity**  
Not classified

**MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90 (12427-38-2)**

<table>
<thead>
<tr>
<th>Toxicity information</th>
<th>RTECS Number: OP0700000</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>3000 mg/kg</td>
</tr>
<tr>
<td>LD50 oral mouse</td>
<td>2600 mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rat</td>
<td>&gt; 5000 mg/kg</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>3000.000 mg/kg body weight</td>
</tr>
</tbody>
</table>

**Skin corrosion/irritation**  
Not classified

**Serious eye damage/irritation**  
Causes serious eye irritation.

**Respiratory or skin sensitization**  
Not classified

**Germ cell mutagenicity**  
Not classified

**Carcinogenicity**  
Not classified

**Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)**

**IARC group**  
3 - Not classifiable

**Reproductive toxicity**  
Suspected of damaging fertility or the unborn child.
oral, rat: TDLo: 770 mg/kg (11D preg) Specific Developmental Abnormalities: Eye, ear; Specific Developmental Abnormalities: Craniofacial (including nose and tongue); Specific Developmental Abnormalities: Musculoskeletal system
oral, rat TDLo: 770 mg/kg (11D preg) Effects on Fertility: Post-implantation mortality (e.g, dead and/or resorbed implants per total number of implants); Specific Developmental Abnormalities: Body wall; Specific Developmental Abnormalities: Central nervous system

**Specific target organ toxicity (single exposure)**  
Not classified

05/18/2016 EN (English US) SDS ID: AKM528
Specific target organ toxicity (repeated exposure) : Not classified
Aspiration hazard : Not classified
Potential Adverse human health effects and symptoms : Chronic Toxicity: Experimental teratogenic and reproductive effects reported. Men exposed to manganese compound dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. Emotional disturbances such as uncontrollable laughter and spastic gait are found in more advanced cases.
Symptoms/injuries after inhalation : May be harmful if inhaled. May cause irritation to the respiratory tract.
Symptoms/injuries after skin contact : May cause mild skin irritation. May cause sensitization.
Symptoms/injuries after eye contact : Causes serious eye irritation.
Symptoms/injuries after ingestion : May be harmful if swallowed.
Reason for classification : Expert judgment

SECTION 12: Ecological information

12.1. Toxicity
Ecology - general : Very toxic to aquatic life.

Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)

| LC50 fish 1 | 0.48 - 0.56 mg/l Bleak (Alburnus alburnus) |

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential
No additional information available

12.4. Mobility in soil
No additional information available

12.5. Other adverse effects
Other adverse effects : This substance may be hazardous to the environment.
Effect on ozone layer : No additional information available
Effect on the global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Sewage disposal recommendations : Do not dispose of waste into sewer.
Waste disposal recommendations : Dispose in a safe manner in accordance with local/national regulations.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number
UN-No.(DOT) : 2968
DOT NA no. : UN2968

14.2. UN proper shipping name
Proper Shipping Name (DOT) : Maneb stabilized against self-heating
Class (DOT) : 4.3 - Class 4.3 - Dangerous when wet material 49 CFR 173.124
Hazard labels (DOT) : 4.3 - Dangerous when wet

Packing group (DOT) : III - Minor Danger
DOT Packaging Exceptions (49 CFR 173.xxx) : 151
DOT Packaging Non Bulk (49 CFR 173.xxx) : 213
DOT Packaging Bulk (49 CFR 173.xxx) : 242

14.3. Additional information
Emergency Response Guide (ERG) Number : 135
Other information : No supplementary information available.
Transport by sea

DOT Vessel Stowage Location
B - (i) The material may be stowed “on deck” or “under deck” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length; and (ii) “On deck only” on passenger vessels in which the number of passengers specified in paragraph (k)(2)(i) of this section is exceeded

DOT Vessel Stowage Other
13 - Keep as dry as reasonably practicable.34 - Stow “away from” foodstuffs.52 - Stow “separated from” acids

Air transport

DOT Quantity Limitations Passenger aircraft/rail
25 kg
(49 CFR 175.27)

DOT Quantity Limitations Cargo aircraft only
100 kg
(49 CFR 175.75)

SECTION 15: Regulatory information

15.1. US Federal regulations

<table>
<thead>
<tr>
<th>MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90 (12427-38-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSCA Exemption/Exclusion</td>
</tr>
<tr>
<td>CAUTION: This material is supplied for research and development purposes subject to the R&amp;D exemption under TSCA, 40 CFR 720.36, and must meet the requirements of the exemption, including supervision by a &quot;technically qualified individual&quot; as defined by 40 CFR 720.3(ee). The use of this material for &quot;commercial purposes&quot; as defined by 40 CFR 720.3(r) is not permitted in the United States</td>
</tr>
</tbody>
</table>

Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)
Subject to reporting requirements of United States SARA Section 313
Not listed on the United States TSCA (Toxic Substances Control Act) inventory
SARA Section 313 - Emission Reporting 1.0 %

15.2. International regulations

Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Japanese ISHL (Industrial Safety and Health Law)
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Japanese Pollutant Release and Transfer Register Law (PRTR Law)
Listed on INSQ (Mexican national Inventory of Chemical Substances)
Listed on CICR (Turkish Inventory and Control of Chemicals)

15.3. US State regulations

<table>
<thead>
<tr>
<th>MANGANESE(II) ETHYLENEBIS(DITHIOCARBAMATE), tech-90(12427-38-2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. - California - Proposition 65 - Carcinogens List</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Developmental Toxicity</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)

<table>
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<tr>
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</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Female</td>
</tr>
<tr>
<td>No</td>
</tr>
<tr>
<td>U.S. - California - Proposition 65 - Reproductive Toxicity - Male</td>
</tr>
<tr>
<td>No</td>
</tr>
</tbody>
</table>

Manganese(II) ethylenebis(dithiocarbamate) (12427-38-2)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

05/18/2016
EN (English US)
SDS ID: AKM528
6/7
SECTION 16: Other information

Abbreviations and acronyms

Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development.

Full text of H-phrases:

<table>
<thead>
<tr>
<th>H-Phrase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H261</td>
<td>In contact with water releases flammable gases</td>
</tr>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
<tr>
<td>H361</td>
<td>Suspected of damaging fertility or the unborn child</td>
</tr>
<tr>
<td>H400</td>
<td>Very toxic to aquatic life</td>
</tr>
</tbody>
</table>

HMIS III Rating

Health: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability: 3 Serious Hazard

Physical: 1 Slight Hazard

Prepared by safety and environmental affairs.

Date of issue: 05/18/2016 Version: 1.0

SDS US (GHS HazCom 2012) - Custom

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

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