

Printing date 07/22/2021

Reviewed on 07/22/2021

## 1 Identification

- **Product name**
- **Trade name:** Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD
- **Item number:** 98-4060
- **CAS Number:**  
73138-26-8
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**  
Strem Chemicals, Inc.  
7 Mulliken Way  
NEWBURYPORT, MA 01950  
USA  
info@strem.com
- **Information department:** Technical Department
- **Emergency telephone number:**  
EMERGENCY: CHEMTREC: + 1 (800) 424-9300  
During normal opening times: +1 (978) 499-1600

## 2 Hazard(s) identification

- **Classification of the substance or mixture**



GHS02 Flame

Flam. Sol. 1 H228 Flammable solid.



GHS08 Health hazard

Muta. 2 H341 Suspected of causing genetic defects.

- **Label elements**
- **GHS label elements**  
The substance is classified and labeled according to the Globally Harmonized System (GHS).
- **Hazard pictograms**



GHS02



GHS08

- **Signal word** Danger
- **Hazard-determining components of labeling:**  
Bis(cyclopentadienyl)manganese, 98+% (Manganocene)
- **Hazard statements**  
H228 Flammable solid.  
H341 Suspected of causing genetic defects.
- **Precautionary statements**  
P231 Handle under inert gas.  
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.  
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

(Contd. on page 2)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 1)

P403+P233 Store in a well-ventilated place. Keep container tightly closed.  
 P422 Store contents under inert gas.  
 P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

- **Classification system:**
- **NFPA ratings (scale 0 - 4)**



- **HMIS-ratings (scale 0 - 4)**



- **Other hazards**
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.

### 3 Composition/information on ingredients

- **Chemical characterization: Substances**
- **CAS No. Description**  
 73138-26-8 Bis(cyclopentadienyl)manganese, 98+% (Manganocene)

### 4 First-aid measures

- **Description of first aid measures**
- **After inhalation:** Supply fresh air; consult doctor in case of complaints.
- **After skin contact:** Generally the product does not irritate the skin.
- **After eye contact:** Rinse opened eye for several minutes under running water. Then consult a doctor.
- **After swallowing:** If symptoms persist consult doctor.
- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed** No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed**  
 No further relevant information available.

### 5 Fire-fighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:** Use fire fighting measures that suit the environment.
- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
- **Protective equipment:** No special measures required.

US

(Contd. on page 3)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 2)

**6 Accidental release measures**

- **Personal precautions, protective equipment and emergency procedures**  
Wear protective equipment. Keep unprotected persons away.
- **Environmental precautions:** No special measures required.
- **Methods and material for containment and cleaning up:**  
Dispose contaminated material as waste according to item 13.  
Ensure adequate ventilation.
- **Reference to other sections**  
See Section 7 for information on safe handling.  
See Section 8 for information on personal protection equipment.  
See Section 13 for disposal information.
- **Protective Action Criteria for Chemicals**

· **PAC-1:**

Substance is not listed.

· **PAC-2:**

Substance is not listed.

· **PAC-3:**

Substance is not listed.

**7 Handling and storage**

- **Handling:** Handle under inert gas.
- **Precautions for safe handling** Open and handle receptacle with care.
- **Information about protection against explosions and fires:**  
Keep ignition sources away - Do not smoke.  
Protect against electrostatic charges.  
Keep respiratory protective device available.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:** Store contents under inert gas.
- **Requirements to be met by storerooms and receptacles:** No special requirements.
- **Information about storage in one common storage facility:** Not required.
- **Further information about storage conditions:**  
Keep receptacle tightly sealed.  
Store in cool, dry conditions in well sealed receptacles.
- **Specific end use(s)** No further relevant information available.

**8 Exposure controls/personal protection**

- **Additional information about design of technical systems:** No further data; see item 7.
- **Control parameters**
- **Components with limit values that require monitoring at the workplace:** Not required.
- **Additional information:** The lists that were valid during the creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
- **General protective and hygienic measures:**  
Keep away from foodstuffs, beverages and feed.  
Wash hands before breaks and at the end of work.

(Contd. on page 4)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 3)

- Store protective clothing separately.
- **Breathing equipment:** Not required.
- **Protection of hands:**



Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.  
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.

- Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
- **Material of gloves**  
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
- **Penetration time of glove material**  
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
- **Eye protection:** Safety glasses

**9 Physical and chemical properties**

· **Information on basic physical and chemical properties**

· **General Information**

· **Appearance:**

- **Form:** Crystalline
- **Color:** Brown
- **Odor:** Odorless
- **Odor threshold:** Not determined.

· **pH-value:** Not applicable.

· **Change in condition**

- **Melting point/Melting range:** 172-173 °C (342-343 °F)
- **Boiling point/Boiling range:** 245 °C (473 °F)

· **Flash point:** Not applicable.

· **Flammability (solid, gaseous):** Flammable.

· **Ignition temperature:**

· **Decomposition temperature:** Not determined.

· **Auto igniting:** Not determined.

· **Danger of explosion:** Not determined.

· **Explosion limits:**

- **Lower:** Not determined.
- **Upper:** Not determined.

· **Vapor pressure:** 100-130 hPa (75-98 mm Hg)

- **Density:** Not determined.
- **Relative density** Not determined.
- **Vapor density** Not applicable.

(Contd. on page 5)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 4)

· <b>Evaporation rate</b>	Not applicable.
· <b>Solubility in / Miscibility with Water:</b>	Insoluble.
· <b>Partition coefficient (n-octanol/water):</b>	Not determined.
· <b>Viscosity:</b>	
<b>Dynamic:</b>	Not applicable.
<b>Kinematic:</b>	Not applicable.
· <b>Solvent content:</b>	
<b>Organic solvents:</b>	0.0 %
<b>VOC content:</b>	0.0 g/l / 0.00 lb/gl
· <b>Solids content:</b>	100.0 %
· <b>Other information</b>	No further relevant information available.

**10 Stability and reactivity**

- **Reactivity** No further relevant information available.
- **Chemical stability**
- **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
- **Possibility of hazardous reactions** No dangerous reactions known.
- **Conditions to avoid** No further relevant information available.
- **Incompatible materials:** No further relevant information available.
- **Hazardous decomposition products:** No dangerous decomposition products known.

**11 Toxicological information**

- **Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** No irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Additional toxicological information:**
- **Carcinogenic categories**

· **IARC (International Agency for Research on Cancer)**

Substance is not listed.

· **NTP (National Toxicology Program)**

Substance is not listed.

· **OSHA-Ca (Occupational Safety & Health Administration)**

Substance is not listed.

**12 Ecological information**

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.

(Contd. on page 6)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**



(Contd. of page 5)

- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:** Not known to be hazardous to water.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

**13 Disposal considerations**

- **Waste treatment methods**
- **Recommendation:**  
Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packagings:**
- **Recommendation:** Disposal must be made according to official regulations.

**14 Transport information**

· <b>UN-Number</b>	
· <b>DOT, IMDG, IATA</b>	UN1325
· <b>UN proper shipping name</b>	
· <b>DOT</b>	Flammable solids, organic, n.o.s.
· <b>IMDG, IATA</b>	FLAMMABLE SOLID, ORGANIC, N.O.S.
· <b>Transport hazard class(es)</b>	
· <b>DOT</b>	
	
· <b>Class</b>	4.1 Flammable solids, self-reactive substances and solid desensitised explosives
· <b>Label</b>	4.1
· <b>IMDG</b>	
	
· <b>Class</b>	4
· <b>Label</b>	4.1

(Contd. on page 7)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 6)

· **IATA**



· **Class** 4.1 Flammable solids, self-reactive substances and solid desensitised explosives

· **Label** 4.1

· **Packing group** II

· **Environmental hazards:**  
· **Marine pollutant:** No

· **Special precautions for user** Not applicable.

· **EMS Number:** F-A,S-G

· **Stowage Category** B

· **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code** Not applicable.

· **Transport/Additional information:**

· **DOT**

· **Quantity limitations** On passenger aircraft/rail: 15 kg  
On cargo aircraft only: 50 kg

· **UN "Model Regulation":** UN 1325 FLAMMABLE SOLIDS, ORGANIC, N.O.S., 4.1, II

**15 Regulatory information**

· **Safety, health and environmental regulations/legislation specific for the substance or mixture**

· **Sara**

· **Section 355 (extremely hazardous substances):**

Substance is not listed.

· **Section 313 (Specific toxic chemical listings):**

Substance is not listed.

· **TSCA (Toxic Substances Control Act):**

Substance is not listed.

· **Proposition 65**

· **Chemicals known to cause cancer:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for females:**

Substance is not listed.

· **Chemicals known to cause reproductive toxicity for males:**

Substance is not listed.

· **Chemicals known to cause developmental toxicity:**

Substance is not listed.

(Contd. on page 8)

**Safety Data Sheet**  
according to OSHA HCS

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD**

(Contd. of page 7)

· **Carcinogenic categories**

· **EPA (Environmental Protection Agency)**

Substance is not listed.

· **TLV (Threshold Limit Value established by ACGIH)**

Substance is not listed.

· **NIOSH-Ca (National Institute for Occupational Safety and Health)**

Substance is not listed.

· **GHS label elements**

The substance is classified and labeled according to the Globally Harmonized System (GHS).

· **Hazard pictograms**



GHS02 GHS08

· **Signal word Danger**

· **Hazard-determining components of labeling:**

Bis(cyclopentadienyl)manganese, 98+% (Manganocene)

· **Hazard statements**

H228 Flammable solid.

H341 Suspected of causing genetic defects.

· **Precautionary statements**

P231 Handle under inert gas.

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.

P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P403+P233 Store in a well-ventilated place. Keep container tightly closed.

P422 Store contents under inert gas.

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

· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

**16 Other information**

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

· **Department issuing SDS:** Technical Department.

· **Contact:** Technical Director

· **Date of preparation / last revision** 07/22/2021 / -

· **Abbreviations and acronyms:**

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

ACGIH: American Conference of Governmental Industrial Hygienists

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

VOC: Volatile Organic Compounds (USA, EU)

PBT: Persistent, Bioaccumulative and Toxic

(Contd. on page 9)



**Safety Data Sheet**  
**according to OSHA HCS**

Printing date 07/22/2021

Reviewed on 07/22/2021

**Trade name: Bis(cyclopentadienyl)manganese, 98+%, 25-0200, contained in 50 ml Swagelok® cylinder (96-1070)  
for CVD/ALD**

vPvB: very Persistent and very Bioaccumulative  
NIOSH: National Institute for Occupational Safety  
OSHA: Occupational Safety & Health  
TLV: Threshold Limit Value  
PEL: Permissible Exposure Limit  
REL: Recommended Exposure Limit  
Flam. Sol. 1: Flammable solids – Category 1  
Muta. 2: Germ cell mutagenicity – Category 2

(Contd. of page 8)

US