

Safety Data Sheet

Selenium

acc. to OSHA HCS (29CFR 1910.1200) and WHMIS 2015 regulations

Document owner: **MMC Laboratory**

Effective Date:
02 May 2017

Revision Date:
17/06/2000

Revision No:
1

Trade Name: Selenium

1. IDENTIFICATION OF THE SUBSTANCE / PREPARATION AND OF THE COMPANY

1.1. Identification of the substance or preparation :

1.2. Product Name :

Selenium

1.3. Chemical Name:

Selenium

1.4. Manufacturer:

Merck KgaA
64271 Darmstadt
Germany
Tel: ++49 (0)615172-0

1.5. Emergency Telephone No

Tel: ++49 (0)6151/722440
Fax: ++49 (0)6151/719833

2. COMPOSITION / INFORMATION ON INGREDIENTS

Components:	CAS and EC No.	Weight %	Danger symbol	R and S-phrases
Selenium	7782-49-2	100	T: Toxic	R: 23/25-33 S: 20/21-28.1-45

3. HAZARDS IDENTIFICATION

3.1. NFPA Ratings (scale 0-4):

Health=2 Fire=0 Reactivity=0

EU CLASSIFICATION: T Toxic; R 23/25-33; EC Classification may be inconsistent with independently researched data.

3.2. Emergency Overview:

COLOR: red, gray or black

PHYSICAL FORM: solid

ODOR: odorless

MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation.

3.3. Potential Health Effects:

INHALATION:

Short term exposure: irritation, lack of sense of smell, metal fume fever, lung congestion.

Long term exposure: garlic odor, digestive disorders.

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SKIN CONTACT:

Short term exposure: irritation

Long term exposure: same as effects reported in short term exposure.

EYE CONTACT:

Short term exposure: irritation (possibly severe)

Long term exposure: same as effects reported in short term exposure.

INGESTION:

Short term exposure: same as effects reported in short term inhalation, metallic taste.

Long term exposure: same as effects reported in long term inhalation, sterility, heart damage, liver damage.

3.4. Carcinogen Status:

OSHA: N

NTP: N

IARC: N

4. FIRST AID MEASURES

4.1. Inhalation:

When safe to enter area, remove from exposure. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Keep warm and at rest. Get medical attention immediately.

4.2. Skin Contact:

Remove contaminated clothing, jewelry, and shoes immediately. Wash with soap or mild detergent and large amounts of water until no evidence of chemical remains (at least 15-20 minutes). For burns, cover affected area securely with sterile, dry, loose fitting dressing. Get medical attention immediately.

4.3. Eye Contact:

Wash eyes immediately with large amounts of water or normal saline, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

4.4. Ingestion:

If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

4.5. Note to Physician:

For inhalation, consider oxygen. For ingestion, consider gastric lavage and catharsis. Consider oxygen.

5. FIRE FIGHTING MEASURES

5.1. Fire and Explosion Hazard:

Negligible fire hazard.

5.2. Extinguishing Media:

Regular dry chemical, carbon dioxide, water, and regular foam.

Large fires:

Use regular foam or flood with fine water spray.

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5.3. Fire Prevention:

Store in cool dry place.
Keep containers closed.
Keep away from sources of heat and ignition.

5.4. Fire fighting:

Move container from fire area if it can be done without risk. Do not attempt to extinguish fire unless flow of material can be stopped first. Use extinguishing agents appropriate for surrounding fire. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Consider downwind-evacuation if material is leaking.

6. ACCIDENTAL RELEASE MEASURES

Occupational Spill:

Do not touch spilled material. Stop leak if possible without personal risk.

Small Spills: Absorb with sand or other non-combustible material. Collect with absorbent into suitable container.

Small dry spills: Collect spilled material in appropriate container for disposal. Move containers away from spill to a safe area.

Large spills: Dike for later disposal. Keep unnecessary people away, isolate hazard areas and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Resource Center at (800) 424-8802 (USA) or (202) 426-2675 (USA).

7. HANDLING AND STORAGE

Store and handle in accordance with all current regulations and standards.
Keep separated from incompatible substances.
Dissolve in strong hydrochloric acid solution.
Keep in closed container.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1. Exposure Limits:

SELENIUM AND COMPOUNDS (as Se): 0.2 mg/m³ OSHA TWA 0.2 mg/m³ ACGIH TWA

0.2 mg/m³ NIOSH recommended TWA 10 hour(s)

0.1 mg/m³ DFG MAK 4 times/shift (total dust)

0.1 mg(Se)/m³ UK OES TWA

MEASUREMENT METHOD: Particulate filter; Acid; Atomic absorption spectrometry;

NIOSH 11(7) # S190

Immediately dangerous to life or health at 1 mg/m³ as Se.

Occupational exposure limits in other countries are 0,1 mg/m³ (Austria, Denmark, Finland, Japan, Germany, Hungary, Poland, Sweden, Switzerland, and UK) or 0,2mg/m³.

8.2. Ventilation:

Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

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8.3. Eye Protection:

Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

8.4. Clothing:

Wear appropriate chemical resistant clothing.

8.5. Gloves:

Wear appropriate chemical resistant gloves.

8.6. Respirator:

The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. Measurement Element: Selenium (Se)

1 mg/m³ Any dust and mist respirator. Any dust, mist, and fume respirator. Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter. Any powered, air-purifying respirator with a dust and mist filter. Any powered, air-purifying respirator with a dust, mist, and fume filter. Any supplied-air respirator. Any self-contained breathing apparatus with a full facepiece.

Escape - Any air-purifying respirator with a full facepiece and a high-efficiency particulate filter. Any appropriate escape-type, self-contained breathing apparatus.

For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

8.7. Biomonitoring:

Urinary levels of selenium are a reasonable measure of exposure and dosage. Urinary selenium is normally less than 100 pg/t.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	Metal-like solid
ODOUR AND APPEARANCE	Amorphous or crystalline, red to grey/black, odourless.
ODOUR THRESHOLD	No data
DENSITY	4,81 g/cm ³ .
VAPOUR PRESSURE	10 mm Hg @ 429 °C
FLAMMABILITY	Not listed.
AUTO-FLAMMABILITY	Not listed
BOILING POINT	685 °C
MELTING POINT	200 °C
SOLUBILITY IN WATER	Insoluble.

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SOLVENT SOLUBILITY

Soluble: sulfuric acid, chloroform, methylene iodide, benzene, quinoline, nitric acid, ether, alkali solutions, and selenium oxychloride. Very slightly soluble: carbon disulfide
Insoluble: alcohol

10. STABILITY AND REACTIVITY

10.1. Reactivity:

Stable at normal temperatures and pressure.

10.2. Conditions To Avoid:

Avoid heat, flames, sparks and other sources of ignition. Avoid generating dust. Keep out of water supplies and sewers.

10.3. Incompatibilities:

Combustible materials, oxidizing materials, halogens, metals, metal carbide, metal salts, metal oxides, bases
SELENIUM:

ALKALI METAL AMIDES: Produces explosive products

ALKALINE EARTH METAL AMIDES: Produces explosive products

BARIUM PEROXIDE: Ignites at 265 C

BROMINE PENTAFLUORIDE: Violent reaction and possible ignition

CADMIUM: Possible explosion when heated

CHLORINE TRIFLUORIDE: Reacts violently, ignition often occurring

CHROMIC ANHYDRIDE: Violent reaction

FLUORINE: Ignites on contact

LITHIUM SILICIDE: Incandescent reaction

METAL ACETYLIDES: Incandescent reaction on heating

METAL CARBIDES: Incandescent reaction on heating

METAL CHLORATES (EXCEPT ALKALI): Incandescent reaction in the presence of water

METALS: Contact of many metals with selenium results in incandescence

NITROGEN TRICHLORIDE: Explodes on contact

ORGANIC MATERIALS + OXYGEN: May result in explosive oxidation

OXIDIZERS (STRONG): Fire and explosion hazard

PHOSPHORUS: Incandescent reaction when heated

POTASSIUM: Incandescence reaction with possible explosion

POTASSIUM BROMATE: Violent, explosive reaction

SILVER BROMATE: Violent explosive reaction

SILVER OXIDE: Ignition on grinding

SODIUM PEROXIDE: Forms explosive mixture

TIN (POWDERED): Extremely exothermic, incandescent reaction

ZINC: Possible explosion on heating

10.4. Hazardous Decomposition:

Thermal decomposition products: selenium

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10.5. Polymerization:

Will not polymerize.

11. TOXICITY INFORMATION:

11.1. Toxicity Data:

6700 mg/kg oral-rat LD50; 33 mg/kg/8 hour(s) inhalation-rat LCLo; 6 mg/kg intravenous-rat LD50; 2500 ug/kg intravenous-rabbit LDLo

11.2. Carcinogen Status:

IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3

11.3. Local Effects:

Irritant: inhalation, skin, eye

11.4. Acute Toxicity Level:

Slightly Toxic: ingestion

11.5. Medical Conditions Aggravated By Exposure:

Gastrointestinal disorders, immune system disorders or allergies, kidney disorders, liver disorders, respiratory disorders, skin disorders and allergies

11.6. Tumorigenic Data:

480 mg/kg oral-mouse TDLo/60 day(s) continuous

11.7. Reproductive Effects Data:

34 mg/kg oral-mouse TDLo multigenerations

11.8. Health Effects

11.8.1. Inhalation:

ACUTE EXPOSURE:

SELENIUM: Inhalation may cause irritation of the upper respiratory tract with sneezing and coughing. Dust of metallic selenium may collect in the nostrils and produce catarrh, anosmia, and epistaxis. Exposure to selenium dust at air concentrations of 33 mg/m³ for 8 hours resulted in death in 10% of the rats tested. The major pathologic finding was interstitial pneumonitis. A brief exposure to high concentrations of fume produced severe irritation of the nose and throat followed by headache in exposed workers. One case of transient dyspnea was reported. Large quantities of fume may produce pulmonary edema within 1 to 4 hours after exposure. Metal fume fever, an influenza-like illness, may occur due to the inhalation of freshly formed metal oxide particles sized below 1.5 microns and usually between 0.02-0.05 microns. Symptoms may be delayed 4-12 hours and begin with a sudden onset of thirst, and a sweet, metallic or foul taste in the mouth. Other symptoms may include upper respiratory tract irritation accompanied by coughing and a dryness of the mucous membranes, lassitude and a generalised feeling of malaise. Fever, chills, muscular pain, mild to severe headache, nausea, occasional vomiting, exaggerated mental activity, profuse sweating, excessive urination, diarrhea and prostration may also occur. Tolerance to fumes develops rapidly, but is quickly lost. All symptoms usually subside within 24-36 hours.

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CHRONIC EXPOSURE:

SELENIUM: Repeated or prolonged exposure has been reported to cause a metallic taste in the mouth, a garlic odour of the breath and sweat, bronchial and nasopharyngeal irritation, pallor, coated tongue, nervousness, depression, fatigue, vestibulo toxicity and gastrointestinal disturbances. Liver injury has been produced in experimental animals. Selenium compounds may affect the kidneys.

11.8.2.Skin Contact:

ACUTE EXPOSURE:

SELENIUM: Contact with dust or fumes may cause irritation.

CHRONIC EXPOSURE:

SELENIUM: Repeated or prolonged exposure may cause dermatitis.

11.8.3.Eye Contact:

ACUTE EXPOSURE:

SELENIUM: High concentrations of fume may cause severe irritation.

CHRONIC EXPOSURE:

SELENIUM: Repeated or prolonged exposure to irritants may cause conjunctivitis.

11.8.4.Ingestion:

ACUTE EXPOSURE:

SELENIUM: Elemental selenium is poorly absorbed from the gastrointestinal tract. Ingestion of selenium compounds may cause severe irritation and disturbances of the gastrointestinal tract and a metallic taste in the mouth.

CHRONIC EXPOSURE:

SELENIUM: Repeated or prolonged ingestion may cause effects similar to those as detailed in chronic inhalation. In addition, symptoms may include partial loss of hair and nail changes. Additional data reported in animals includes anemia, liver, kidney and heart damage, sterility and congenital defects.

12. ECOLOGICAL INFORMATION:

Water

Because there are chemical similarities between selenium and sulphur, selenium can replace sulphur in some biologically important substances and thereby cause toxic effects. The toxic effects are similar in cold- and warm-water adapted fish.

Selenium toxicity effects observed in fish include changes in feeding behaviour and equilibrium, pathological changes, deformities, hematological (blood) changes and death. Fish are generally less sensitive to selenium than are invertebrates. Toxic effects of selenium that have been recorded in invertebrates include immobilisation, reduced survival and reduced reproduction.

Selenium is passed up through the aquatic food chain and accumulates in the liver of mammals and fish; it may therefore pose a threat to predators. Selenium undergoes biological methylation in sediments, a process similar to mercury methylation. Selenomethionine is ten times more toxic than inorganic selenium.

South Africa

Wastewater limit value	< 0,02 mgte dissolved selenium
Water quality guideline - livestock watering	< 0,05 mgte selenium
Target water quality range - aquatic ecosystems	< 2 pgte selenium
Chronic effect value - aquatic ecosystems	5 pg/t selenium
Acute effect value - aquatic ecosystems	30 pg/t selenium

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United States

Federal drinking water standard	< 50 pgte selenium
Arizona drinking water standard	< 45 pgte selenium
Connecticut drinking water standard	< 10 pgte selenium
Maine drinking water standard	< 10 pgte selenium
Minnesota drinking water standard	< 30 pgte selenium
CERCLA reportable quantity	100 lb/45,4 Kg selenium
EPA Maximum contamination level and goal (CWA)	50 pg/t selenium

Ecotoxicity:

FISH TOXICITY:

1000 ug/L 96 hour(s) LC50 (Mortality) Fathead minnow (Pimephales promelas)

INVERTEBRATE TOXICITY:

115 ug/L 21 hour(s) MATC(Growth) Water flea (Daphnia magna)

ALGAL TOXICITY:

7930 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

PHYTOTOXICITY:

2400 ug/L 4 hour(s) EC50 (Growth) Duckweed (Lemna minor)

FATE AND TRANSPORT:

BIOCONCENTRATION:

322 ug/L 21 hour(s) BCF (Residue) Water flea (Daphnia magna) 5 ug/L

13. DISPOSAL CONSIDERATIONS:

Recycle if possible. Hazardous Waste Number(s): D010. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 1.0 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION:

UN No: 2658

CLASSIFICATION: DOT 6.1 Poison

15. REGULATORY INFORMATION:

15.1. Airborne Threshold Limit Values

See 8.1

15.2. Canadian Ingredients Disclosure List -

Listed for Se concentrations of 0,1%

15.3. Summary of U.S.A. regulatory listings:

ACGIH TLV list "Threshold Limit Values for 1992-1993"

ATSDR Toxicology Profile available (NTIS** PB/90/182155/AS)

California Assembly Bill 2588 Air Toxics "Hot Spots" Chemicals.

Canadian Ingredient Disclosure List. 20/01/88 Canada Gazette part II, Vol. 122.

Clean Air Act of November 15, 1990. List of pollutants.

Clean Water Act Section 307 Priority Pollutants

EPA TSCA 8(a) Preliminary Assessment Information Rule - effective 05/16/88

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EPA TSCA Chemical Inventory List 1989
EPA TSCA Chemical Inventory List 1990
EPA TSCA Chemical Inventory List 1992
EPA TSCA Test Submission (TSCATS) Database - April 1990
EPA TSCA Test Submission (TSCATS) Database - September 1989
Massachusetts Substance List.
New Jersey Right To Know Substance List. (December 1987)
OSHA Air Contaminant (Table Z-1-A). 54 FR 4332, Jan. 19, 1989 and revised.
Pennsylvania Hazardous Substance List
RCRA Hazardous Waste
RCRA Toxicity Characteristics (TC) list dated March 29, 1990
SARA Section 110 Priority List of CERCLA Hazardous Substances
SARA Section 313 Toxic Chemicals List SELENIUM [7782-49-2]
Wisconsin Air Toxics Control Regulation NR-445 (December 1988)

15.4. International Regulations: EU Risk and Safety Phrases:

R: 23/25-33 Toxic by inhalation and if swallowed. Danger of cumulative effects.
S: 1/2-20-21-28b-45 Keep locked up and out of reach of children.
When using, do not eat or drink.
When using, do not smoke.
After contact with skin, wash immediately with plenty of soap and water.
In case of accident, or if you feel unwell, seek medical advice immediately (show the label where possible).
The Netherlands: Building Materials Decree
Maximum selenium immission 15mg/m² 100yr.

OTHER INFORMATION:

Prepared by: Manganese Metal Company (Pty) Ltd
Telephone: +27 013 7594600
Preparation date: December 1999.

16. REFERENCES:

16.1. 1998 TLVs and BEIs, Threshold limit Values for Chemical Substances and Physical Agents, ACGIH.

16.2. Hamilton & Hardy. Industrial Toxicology.

16.3. National Library of Medicine, Bethesda MD, USA

16.4. NIOSH Pocket guide to Chemical Hazards, No. 97-140

Notice to the Reader

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17. AMENDMENT HISTORY

The following information documents the last changes

Date	Revised by	Changes
27 August 2017	S Kampers Parsley Studios	Changed MMC logo and the document format, no changes to the actual content of the document was made.