SAFETY DATA SHEET

Updated on 05/03/2025

1. Material Identification

Product Name: Selenium OxidesCatalog Number: io-406809CAS Number: 7446-08-4Identified uses: Laboratory chemicals, manufacture of chemical compoundsCompany: lonz

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2) Acute toxicity, oral (Category 3) Acute toxicity, dermal (Category 3) Acute toxicity, inhalation (Category 3) Specific target organ toxicity, single exposure (Category 1)

Pictogram(s)



GHS Hazard Statements

- >> H301 (100%): Toxic if swallowed [Danger Acute toxicity, oral]
- >> H314 (10.2%): Causes severe skin burns and eye damage [Danger Skin corrosion/irritation]
- >> H318 (10.2%): Causes serious eye damage [Danger Serious eye damage/eye irritation]
- >> H331 (89.8%): Toxic if inhaled [Danger Acute toxicity, inhalation]
- >> H373 (100%): May causes damage to organs through prolonged or repeated exposure [Warning Specific target organ toxicity, repeated exposure]
- >> H400 (52.3%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]
- >> H410 (100%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

Precautionary Statement Codes

>> P260, P261, P264, P264+P265, P270, P271, P273, P280, P301+P316, P301+P330+P331, P302+P361+P354, P304+P340, P305+P354+P338, P316, P317, P319, P321, P330, P363, P391, P403+P233, P405, and P501

Health Hazards:

- >> Absorption of selenium may be demonstrated by presence of the element in the urine and by a garlic-like odor of the breath. Inhalation of dust can cause bronchial spasms, symptoms of asphyxiation, and pneumonitis. Acute symptoms of ingestion include sternal pain, cough, nausea, pallor, coated tongue, gastrointestinal disorders, nervousness, and conjunctivitis. Contact with eyes causes irritation. (USCG, 1999)
- >> Special Hazards of Combustion Products: Sublimes and forms toxic vapors when heated in fire. (USCG, 1999)
- >> Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.

3. Composition/Information On Ingredients

Chemical name: Selenium OxidesCAS Number: 7446-08-4Molecular Formula: O2SeMolecular Weight: 110.9700 g/mol

4. First Aid Measures

First Aid:

- >> Consult physician after all exposures to this compound.
- >> INHALATION: remove victim to fresh air; give oxygen if needed.
- >> INGESTION: induce vomiting; follow with gastric lavage and saline cathartics.
- >> EYES: flush immediately and thoroughly with water.
- >> SKIN: flush with water. (USCG, 1999)

First Aid Measures

Inhalation First Aid

>>> Fresh air, rest. Half-upright position. Artificial respiration may be needed. Refer for medical attention.

Skin First Aid

>> Remove contaminated clothes. Rinse skin with plenty of water or shower. Refer for medical attention .

Eye First Aid

>> First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Do NOT induce vomiting. Refer for medical attention .

5. Fire Fighting Measures

- >> Excerpt from ERG Guide 151 [Substances Toxic (Non-Combustible)]:
- >> SMALL FIRE: Dry chemical, CO2 or water spray.
- >> LARGE FIRE: Water spray, fog or regular foam. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal. Avoid aiming straight or solid streams directly onto the product.
- >> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. For massive fire, use unmanned master stream devices or monitor nozzles; if this is impossible, withdraw from area and let fire burn. (ERG, 2024)
- >> In case of fire in the surroundings, use appropriate extinguishing media.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

- >> Excerpt from ERG Guide 151 [Substances Toxic (Non-Combustible)]:
- >> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

- >> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.
- >> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

>> Evacuate danger area! Consult an expert! Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment.

7. Handling And Storage

Safe Storage:

>> Separated from food and feedstuffs. Dry.

8. Exposure Control/ Personal Protection

- >> 0.2 [mg/m3], as Se
- >> 0.2 [mg/m3], as Se
- >> 0.2 mg/m

MAK (Maximale Arbeitsplatz Konzentration)

>> (as Se, inhalable fraction): 0.02 mg/m

Inhalation Risk:

>> Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed.

Effects of Short Term Exposure:

>> The substance is corrosive to the eyes, skin and respiratory tract. Inhalation may cause lung oedema. The substance may cause effects on the eyes. This may result in allergic-type reaction of the eyelids (rose eye). Medical observation is indicated.

Effects of Long Term Exposure:

>> Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the respiratory tract, gastrointestinal tract, central nervous system and liver. This may result in nasal irritation, persistent garlic odour, stomach pain, nervousness and liver impairment.

Radiation Limits and Potential:

Compounds with radiation potential have unstable radioactive isotope(s), which can emit high-energy ionizing radiation through radioactive decay. Radiation limits are the permissible upper bounds of radiation doses. An example of radiation limits is the annual limit on intake (ALI), which is the limit for the amount of radioactive material taken into the body of an adult worker by inhalation or ingestion in a year.

>> OCCUPATIONAL VALUES FOR SELENIUM (Class W, oxides, hydroxides, carbides, and elemental Se. Class D, all compounds except those given for W) [Table#1969]

Exposure Prevention

>> PREVENT DISPERSION OF DUST! STRICT HYGIENE!

Inhalation Prevention

>> Use local exhaust or breathing protection.

Skin Prevention

>> Protective gloves. Protective clothing.

Eye Prevention

>> Wear face shield or eye protection in combination with breathing protection.

Ingestion Prevention

>> Do not eat, drink, or smoke during work. Wash hands before eating.

Exposure Control and Personal Protection

Maximum Allowable Concentration (MAK)

>> 0.02 [mg/m3], as Se, inhalable fraction[German Research Foundation (DFG)]

9. Physical And Chemical Properties

Molecular Weight:

>> 110.97

Exact Mass:

>> 111.90635

Physical Description:

- >> Selenium dioxide appears as a white or creamy-white volatile lustrous crystal or crystalline powder with a pungent sour smell. Melting point 340 deg C. Density 3.954 g / cm3. Toxic by ingestion and inhalation.
- >> LUSTROUS WHITE HYGROSCOPIC CRYSTALS OR POWDER. ITS YELLOWISH GREEN VAPOUR HAS A PUNGENT SOUR SMELL.

Color/Form:

>> Lustrous tetragonal needles; yellowish green vapor

Odor:

>> Vapor has a pungent sour smell

Taste:

The sensation of flavor perceived in the mouth and throat on contact with a substance.

>> Acidic taste; leaves a burning sensation.

Boiling Point:

>> 599 °F at 760 mmHg (sublimes) (USCG, 1999)

Melting Point:

>> 340 °C under pressure

Solubility:

>> Soluble in concentrated sulfuric acid

>> Solubility in water, g/100ml at 20 °C: 40

Density:

>> 3.95 at 68 °F (USCG, 1999) – Denser than water; will sink

>> Density (at 15 °C): 3.95 g/cm³

Vapor Pressure:

>> 12.5 mm Hg at 70 °C; 20.2 mm Hg at 94 °C; 39.0 mm Hg at 181 °C; 760 mm Hg at 315 °C; 848 mm Hg at 320 °C

>> Vapor pressure, kPa at 70 °C: 1.65

Stability/Shelf Life:

>> Stable to light and heat.

Decomposition:

>> When heated to decomposition ... emits toxic fumes of /selenium/.

Corrosivity:

The ability of a chemical to damage or destroy other substances when it comes into contact.

>> In presence of water will corrode most metals

Odor Threshold:

>> 0.0002 mg/cu m

Refractive Index:

>> Index of refraction: less than 1.76 at 20 $^{\circ}\text{C/D}$

10. Stability And Reactivity

>> In presence of water will corrode most metals (USCG, 1999). Readily soluble in water forming selenious (selenous) acid.

>> Strong Oxidizing Agent

11. Toxicological Information

Toxicity Summary:

>>> Selenium readily substitutes for sulfur in biomolecules and in many biochemical reactions, especially when the concentration of selenium is high and the concentration of sulfur is low. Inactivation of the sulfhydryl enzymes necessary for oxidative reactions in cellular respiration, through effects on mitochondrial and microsomal electron transport, might contribute to acute selenium toxicity. Selenomethionine (a common organic selenium compound) also appears to randomly substitute for methionine in protein synthesis. This substitution may affect the structure and functionability of the protein, for example, by altering disulfide bridges. Inorganic forms of selenium appear to react with tissue thiols by redox catalysis, resulting in formation of reactive oxygen species and causing damage by oxidative stress. (L619)

Carcinogen Classification:

This section provides the International Agency for Research on Cancer (IARC) Carcinogenic Classification and related monograph links. In the IARC Carcinogenic classification, chemicals are categorized into four groups: Group 1 (carcinogenic to humans), Group 2A (probably carcinogenic to humans), Group 2B (possibly carcinogenic to humans), and Group 3 (not classifiable as to its carcinogenicity to humans).

>> 3, not classifiable as to its carcinogenicity to humans. (L135)

Health Effects:

>> Chronic oral exposure to high concentrations of selenium compounds can produce a disease called selenosis. The major signs of selenosis are hair loss, nail brittleness, and neurological abnormalities (such as numbness and other odd sensations in the extremities). Animal studies have shown that selenium may also affect sperm production and the female reproductive cycle. (L619)

Exposure Routes:

>> The substance can be absorbed into the body by inhalation of its aerosol and by ingestion.

>> Oral (L619); inhalation (L619); dermal (L619)

Inhalation Exposure

>> Burning sensation. Cough. Laboured breathing. Sore throat. Shortness of breath. Symptoms may be delayed.

Skin Exposure

>> Redness. Pain. Skin burns. Blisters.

Eye Exposure

>> Redness. Pain. Severe deep burns.

Ingestion Exposure

>> Abdominal pain. Burning sensation. Sore throat. Shock or collapse.

>> Short-term oral exposure to high concentrations of selenium may cause nausea, vomiting, and diarrhea. Brief exposures to high levels of elemental selenium or selenium dioxide in air can result in respiratory tract irritation, bronchitis,

difficulty breathing, and stomach pains. Longer-term exposure to either of these air-borne forms can cause respiratory irritation, bronchial spasms, and coughing. (L619)

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

- >> Neurotoxin Other CNS neurotoxin
- >> Occupational hepatotoxin Secondary hepatotoxins: the potential for toxic effect in the occupational setting is based on cases of poisoning by human ingestion or animal experimentation.
- >> Reproductive Toxin A chemical that is toxic to the reproductive system, including defects in the progeny and injury to male or female reproductive function. Reproductive toxicity includes developmental effects. See Guidelines for Reproductive Toxicity Risk Assessment.
- >> Dermatotoxin Skin burns.
- >> Skin Sensitizer An agent that can induce an allergic reaction in the skin.
- >> Toxic Pneumonitis Inflammation of the lungs induced by inhalation of metal fumes or toxic gases and vapors.

Toxicity Data:

>> LD50: 23 mg/kg (Oral, Mouse) (L727) LD50: 4 mg/kg (Dermal, Rabbit) (L727) LD50: 3.6 mg/kg (Intraperitoneal, Rat) (L727) LD50: 9 mg/kg (Intravenous, Mouse) (L727) LD50: 4 mg/kg (Subcutaneous, Rabbit) (L727)

Minimum Risk Level:

The minimal risk level (MRL) is an estimate of the amount of a chemical a person can eat, drink, or breathe each day without a detectable risk to health

>> Chronic Oral: 0.005 mg/kg/day (L134)

Interactions:

>> Acute toxicity tests showed that selenium dioxide (SeO2) was a strong antagonist against mercuric chloride toxicity in goldfish (Carassius auratus). Paradoxically, whole body accumulations of total mercury (Hg) were significantly increased with the admin of selenium (Se).

Antidote and Emergency Treatment:

>> Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand-valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR as necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Selenium and Related Compounds/

Human Toxicity Excerpts:

>> /SIGNS AND SYMPTOMS/ Long-term Exposure: Prolonged exposure to selenium, sodium selenite, sodium selenate, or selenium dioxide may cause paleness, coated tongue, stomach disorders, nervousness, metallic taste and a garlic odor of the breath. ... Prolonged skin contact with selenium oxide or selenium oxychloride may cause skin sensitization.

Non-Human Toxicity Excerpts:

>>/LABORATORY ANIMALS: Acute Exposure/ ... The toxic effects of respiratory exposure to selenium dioxide (SeO2) /were examined/ under conditions similar to those that occur in industry, i.e., heating of selenium ion. In acute studies, white rats were exposed to air concentrations of selenium dioxide of 0.15 - 0.6 mg/L, and all rats died within one-half to 4 hr. Morphological examination of the organs revealed that intraalveolar and perivascular edema occurred in the lungs, and hemorrhages and degenerative changes in the liver, kidney, and heart. In 4 additional studies, all rats survived 4 hr when exposed to doses of 0.09, 0.06-0.07, or 0.03-0.04 mg selenium dioxide/L, but all rats exposed to the highest dose (equal to 5-5.2 mg/kg body weight) died within 24 hr.

Non-Human Toxicity Values:

>> LD50 Mouse (male) oral 16 mg/kg/day

12. Ecological Information

ICSC Environmental Data:

>> The substance is harmful to aquatic organisms.

13. Disposal Considerations

Spillage Disposal

>> Evacuate danger area! Consult an expert! Sweep spilled substance into covered containers. Carefully collect remainder. Then store and dispose of according to local regulations. Personal protection: complete protective clothing including self-contained breathing apparatus. Do NOT let this chemical enter the environment.

Disposal Methods

>> Generators of waste (equal to or greater than 100 kg/mo) containing this contaminant, EPA hazardous waste number D010; U204, must conform with USEPA regulations in storage, transportation, treatment and disposal of waste.

14. Transport Information

DOT

Selenium Oxides 6.1 UN Pack Group: II Reportable Quantity of 10 lb or 4

IATA Selenium Oxides

6.1, UN Pack Group: II

15. Regulatory Information

Federal Drinking Water Standards:

Federal drinking water standards (e.g. maximum containment level (MCL)) for this chemical. These standards are legally enforceable.

>> Maximum contaminant levels for inorganic contaminants: 0.05 mg/L /Selenium/

Federal Drinking Water Guidelines:

Federal drinking water guidelines (e.g. maximum containment level (MCL)) for this chemical. In general, these guidelines are recommendations and not legally enforceable.

>> Maximum contaminant level goals for inorganic contaminants: 0.05 mg/L /Selenium/

State Drinking Water Standards:

State drinking water standards (e.g. maximum containment level (MCL)) for this chemical. These standards are legally enforceable.

>> (AZ) ARIZONA 10 ug/L /Selenium/

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

>> Selenium dioxide is designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: Selenium oxide (SeO2)

REACH Registered Substance

>> Status: Active Update: 14-12-2022 https://echa.europa.eu/registration-dossier/-/registered-dossier/11470

New Zealand EPA Inventory of Chemical Status

>> Selenium oxide: HSNO Approval: HSR003738 Approved with controls

16. Other Information

Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

>> ... Forms toxic vapors when heated in fire.

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."