

## 1. Material Identification

**Product Name** : Zinc sulfate

**Catalog Number** : io-3232

**CAS Number** : 7733-02-0

**Identified uses** : Laboratory chemicals, manufacture of chemical compounds

**Company** : IonZ

>> 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)

### Note

>> Pictograms displayed are for 99.9% (953 of 954) of reports that indicate hazard statements. This chemical does not meet GHS hazard criteria for 0.1% (1 of 954) of reports.

### Pictogram(s)



### GHS Hazard Statements

>> H302 (94.3%): Harmful if swallowed [Warning Acute toxicity, oral]

>> H318 (99.8%): Causes serious eye damage [Danger Serious eye damage/eye irritation]

>> H400 (96.6%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

>> H410 (94.3%): Very toxic to aquatic life with long lasting effects [Warning Hazardous to the aquatic environment, long-term hazard]

### Precautionary Statement Codes

>> P264, P264+P265, P270, P273, P280, P301+P317, P305+P354+P338, P317, P330, P391, and P501

### Health Hazards:

>> Inhalation of dust causes irritation of nose and throat. Ingestion can cause irritation or corrosion of the alimentary tract. Contact with eyes or skin causes irritation. (USCG, 1999)

>> Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:

>> Some may burn but none ignite readily. Containers may explode when heated. Some may be transported hot. For UN3508, Capacitor, asymmetric, be aware of possible short circuiting as this product is transported in a charged state. Polymeric beads, expandable (UN2211) may evolve flammable vapours. (ERG, 2024)

>> Not combustible.

### 3. Composition/Information On Ingredients

**Chemical name** : Zinc sulfate  
**CAS Number** : 7733-02-0  
**Molecular Formula** : O4SZn  
**Molecular Weight** : 161.4000 g/mol

### 4. First Aid Measures

#### First Aid:

- >> INHALATION: move to fresh air.
- >> INGESTION: induce vomiting, followed by prompt and complete gastric lavage, cathartics, and demulcents.
- >> EYES or SKIN: flush with water. (USCG, 1999)

#### First Aid Measures

##### Inhalation First Aid

- >> Fresh air, rest. Seek medical attention if you feel unwell.

##### Skin First Aid

- >> Rinse skin with plenty of water or shower.

##### Eye First Aid

- >> Rinse with plenty of water for several minutes (remove contact lenses if easily possible).

##### Ingestion First Aid

- >> Rinse mouth. Give one or two glasses of water to drink. Refer for medical attention .

### 5. Fire Fighting Measures

- >> Excerpt from ERG Guide 171 [Substances (Low to Moderate Hazard)]:
- >> CAUTION: Fire involving Safety devices (UN3268) and Fire suppressant dispersing devices (UN3559) may have a delayed activation and a risk of hazardous projectiles. Extinguish the fire at a safe distance.
- >> SMALL FIRE: Dry chemical, CO2, water spray or regular foam.
- >> LARGE FIRE: Water spray, fog or regular foam. Do not scatter spilled material with high-pressure water streams. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.
- >> FIRE INVOLVING TANKS: 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. (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 171 [Substances (Low to Moderate Hazard)]:
- >> 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.

- >> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.

## 7. Handling And Storage

### Safe Storage:

- >> Dry. Provision to contain effluent from fire extinguishing. Store in an area without drain or sewer access.

### Storage Conditions:

- >> Zinc sulfate ophthalmic solutions should be stored in tightly closed containers at temperatures not exceeding 40 °C, freezing should be avoided.

## 8. Exposure Control/ Personal Protection

### MAK (Maximale Arbeitsplatz Konzentration)

- >> (respirable fraction): 0.1 mg/m

### Inhalation Risk:

- >> A harmful concentration of airborne particles can be reached quickly when dispersed, especially if powdered.

### Effects of Short Term Exposure:

- >> The substance is severely irritating to the eyes. The substance is irritating to the gastrointestinal tract and respiratory tract.

### Exposure Prevention

- >> PREVENT DISPERSION OF DUST!

### Inhalation Prevention

- >> Use local exhaust or breathing protection.

### Skin Prevention

- >> Protective gloves.

### Eye Prevention

- >> Wear safety spectacles.

### Ingestion Prevention

- >> Do not eat, drink, or smoke during work.

### Exposure Control and Personal Protection

#### Maximum Allowable Concentration (MAK)

- >> 0.1 [mg/m<sup>3</sup>] (respirable fraction), 2 mg/m<sup>3</sup> (inhalable fraction) for Zn inorg. cmpnds[German Research Foundation (DFG)]

## 9. Physical And Chemical Properties

### Molecular Weight:

>> 161.4

**Exact Mass:**

>> 159.880871

**Physical Description:**

>> Anhydrous zinc sulfate is a colorless crystalline solid. Zinc sulfate is also obtained as a hexahydrate,  $\text{ZnSO}_4 \cdot 6\text{H}_2\text{O}$ , and as a heptahydrate  $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$ . All forms are soluble in water. All are noncombustible. The primary hazard is the threat posed to the environment. Immediate steps should be taken to limit its spread to the environment. It is used in the production of rayon, as a feed supplement, and as a fertilizer ingredient.

>> COLOURLESS HYGROSCOPIC CRYSTALS.

**Color/Form:**

>> Colorless, orthorhombic crystals

**Melting Point:**

>> 212 °F (USCG, 1999)

**Solubility:**

>> Solubility: 54.480 lb/100 lb water /Heptahydrate/

>> Solubility in water, g/100ml at 20 °C: 22 (good)

**Density:**

>> 1.96 at 68 °F (USCG, 1999) – Denser than water; will sink

>> 3.8 g/cm<sup>3</sup>

**LogP:**

>> -0.07

**Stability/Shelf Life:**

>> There is ... /a/ tendency for solutions of zinc sulfate to form slight cloudiness due to separation of basic salt formed through partial hydrolysis.

**Decomposition:**

>> When heated to decomposition it emits toxic fumes of /sulfur oxides and zinc oxide/.

>> 680 °C

## 10. Stability And Reactivity

>> Water soluble. Efflorescent in air. Aqueous solutions are acidic.

## 11. Toxicological Information

**Toxicity Summary:**

>> Anaemia results from the excessive absorption of zinc suppressing copper and iron absorption, most likely through competitive binding of intestinal mucosal cells. Unbalanced levels of copper and zinc binding to Cu,Zn-superoxide dismutase has been linked to amyotrophic lateral sclerosis (ALS). Stomach acid dissolves metallic zinc to give corrosive zinc chloride, which can cause damage to the stomach lining. Metal fume fever is thought to be an immune response to inhaled zinc. (L48, L49, A49)

**Evidence for Carcinogenicity:**

Evidence that this chemical does or may cause cancer. The information here is collected from various sources by the Hazardous Substances Data Bank (HSDB).

>> CLASSIFICATION: D; not classifiable as to human carcinogenicity. BASIS FOR CLASSIFICATION: Based on inadequate evidence in humans and animals. HUMAN CARCINOGENICITY DATA: Inadequate. ANIMAL CARCINOGENICITY DATA: Inadequate. /Zinc and compounds/

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**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).

>> No indication of carcinogenicity to humans (not listed by IARC).

**Health Effects:**

>> Chronic exposure to zinc causes anemia, ataxia, lethargy, and decreases the level of good cholesterol in the body. It is also believed to cause pancreatic and reproductive damage. (L49)

**Exposure Routes:**

>> The substance can be absorbed into the body by ingestion.

>> Inhalation (L49) ; oral (L49) ; dermal (L49)

**Inhalation Exposure**

>> Cough. Sore throat.

**Skin Exposure**

>> Redness.

**Eye Exposure**

>> Redness. Pain.

**Ingestion Exposure**

>> Abdominal pain. Nausea. Vomiting.

>> Ingestion of large doses of zinc causes stomach cramps, nausea, and vomiting. Acute inhalation of large amounts of zinc causes metal fume fever, which is characterized by chills, fever, headache, weakness, dryness of the nose and throat, chest pain, and coughing. Dermal contact with zinc results in skin irritation. (L49)

**Toxicity Data:**

>> LD50: 57 mg/kg (Oral, Mouse) (T13) LD50: 71.7 mg/kg (Intraperitoneal, Mouse) (T13) LD50: 40 mg/kg (Intravenous, Rat) (T81)

**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

>> Intermediate Oral: 0.3 mg/kg/day (L134) Chronic Oral: 0.3 mg/kg/day (L134)

**Treatment:**

Treatment when exposed to toxin

>> Zinc poisoning is treated symptomatically, often by administering fluids such as water or milk, or with gastric lavage. (L49)

**Interactions:**

>> The effects of intraperitoneal pretreatment, 48 hr beforehand, with zinc sulfate (22, 44 or 88 mg/kg) were studied on gastric ulceration, gastric secretion and changes in stomach wall mast cell counts induced after 4 hr by reserpine (5 mg/kg) given intraperitoneally to intact (unoperated for pylorus occlusion) or pylorus-occluded rats. Zinc sulfate dose-dependently antagonized the gastric actions of reserpine by preventing ulceration in the ruminal and glandular segments of the stomach, reducing acid secretion, and inhibiting mast cell degranulation which occurred mainly in the glandular mucosal layer. The relationship between these findings and the action of zinc on gastric mast cell is discussed.

**Antidote and Emergency Treatment:**

>> Treatment of overdose: Dilute with milk or water. Specific treatment: Intramuscular or intravenous edetate calcium disodium ... /Zinc supplements/

**Human Toxicity Excerpts:**

>> /HUMAN EXPOSURE STUDIES/ In a double-blind cross-over trial 47 healthy volunteers (26 females and 21 men) ingested zinc sulfate capsules containing 220 mg zinc sulfate, three times a day with each meal (resulting in a total daily dose of 150 mg Zn<sup>2+</sup> ie, ca 2.1 and 2.5 mg Zn<sup>2+</sup>/kg bw /day for males and females, respectively) for six weeks. Plasma zinc and copper levels, plasma cholesterol, plasma low-density-lipoprotein (LDL) and high-density-lipoprotein (HDL) cholesterol, serum ceruloplasmin and erythrocyte superoxide dismutase (ESOD) were determined. In 84% of the women and 18% of the men symptoms were reported which included headaches, nausea, vomiting, loss of appetite and abdominal cramps. The study authors reported that the gastric discomfort went together with lower body weights and taking the capsules

with small meals (breakfast or morning tea) or no food. Plasma zinc levels rose significantly in both men and women (36% and 57%, respectively). Plasma copper levels did not change significantly. Total plasma cholesterol and HDL were unchanged in both sexes. In females the LDL cholesterol decreased significantly from 2.38 to 2.17 mmol/L. In females a decrease was also found in serum ceruloplasmin (13% reduction) and in ESOD (ca. 20% reduction).

#### Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ The dermal irritancy of ... zinc ... sulfate ... was examined in 3 animal models. In the open-patch tests involving 5 daily applications ... zinc sulfate (1% aqueous solution) ... /was/ not overtly irritant, but induced marginal epidermal hyperplasia ...[Bingham, E.; Cohrssen, B.; Powell, C.H.; Patty's Toxicology Volumes 1-9 5th ed. John Wiley & Sons. New York, N.Y. (2001), p. 2:263]

#### Non-Human Toxicity Values:

>> LD50 Rat oral 2949 mg/kg

#### Protein Binding:

In this section, "protein binding" refers to the degree to which medications attach to plasma proteins (i.e., proteins within the blood, such as human serum albumin, lipoprotein, glycoprotein and globulins). A drug's efficiency may be affected by the degree to which it binds to plasma proteins. The less bound a drug is, the more efficiently it can traverse cell membranes or diffuse.

>> Zinc is 60% bound to albumin; 30 to 40% bound to alpha-2 macroglobulin or transferrin; and 1% bound to amino acids, primarily histidine and cysteine.

## 12. Ecological Information

#### ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms. It is strongly advised not to let the chemical enter into the environment.

## 13. Disposal Considerations

#### Spillage Disposal

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Do NOT let this chemical enter the environment. Sweep spilled substance into covered containers. If appropriate, moisten first to prevent dusting.

#### Disposal Methods

>> SRP: The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational exposure or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal, aquatic, and plant life; and conformance with environmental and public health regulations.

>> Chemical Treatability of Zinc; Concentration Process: Ultrafiltration; Chemical Classification: Metals; Scale of Study: Continuous flow, pilot scale; Type of Wastewater Used: Industrial wastewater; Results of Study: 0.38 ppm effluent concentration. /Zinc/

>> Chemical Treatability of Zinc; Concentration Process: Miscellaneous sorbents; Chemical Classification: Metals; Scale of Study: Literature review; Type of Wastewater Used: Unknown; Results of Study: Final concentration reduced to 0.1 ppb; SiO<sub>2</sub> + CaO slags used. /Zinc/

>> The proprietary Sulfex process (Permutit Co) has been applied to zinc wastes. The process involves addition of ferrous sulfide, which gradually releases sulfide to precipitate the zinc ... . /Zinc/

>> For more Disposal Methods (Complete) data for ZINC SULFATE (11 total), please visit the HSDB record page.

## 14. Transport Information

#### DOT

Zinc sulfate  
9  
UN Pack Group: III  
Reportable Quantity of 1,000 lb or 454 kg

#### IATA

Zinc sulfate  
9,  
UN Pack Group: III

## 15. Regulatory Information

### 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.

>> EPA 5000 ug/L /Zinc/

### 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.

>> Zinc sulfate 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: Sulfuric acid, zinc salt (1:1)

##### REACH Registered Substance

>> Status: Active Update: 27-03-2023 <https://echa.europa.eu/registration-dossier/-/registered-dossier/15488>

>> Status: Cease Manufacture Update: 28-05-2018 <https://echa.europa.eu/registration-dossier/-/registered-dossier/25400>

##### New Zealand EPA Inventory of Chemical Status

>> Zinc sulphate: Does not have an individual approval but may be used under an appropriate group standard

## 16. Other Information

#### Other Safety Information

##### Chemical Assessment

>> IMAP assessments – Soluble zinc salts: Human health tier II assessment

"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. lonz is not responsible for any damages resulting from handling or contact with the product incorrectly."