

Zinc



Safety Data Sheet

Section 1: Identification

1.1 Product Identifier

Product Name:	Zinc
Product Form:	Solid
Chemical Family:	Metal
CAS Number:	7440-66-6
Molecular Formula:	Zn
Molecular Weight:	65.39

1.2 Other Means of Identification

Synonyms: Zinc Element, Zinc Metal, UN 1436, ZN, DLA25228, RTECS ZG8600000

1.3 Recommended Uses

Recommended Use: Variety of laboratory, mechanical, and industrial applications

1.4 Manufacturer, Importer, or Responsible Party

Responsible Party: Defense Logistics Agency Strategic Materials
8725 John J. Kingman Road
Fort Belvoir, Virginia 22060
(703) 767-5525

1.5 Emergency Phone Number

Emergency Phone Number: (800) 424-9300 (CHEMTREC)
(703) 527-3887 (CHEMTREC INTERNATIONAL)

Section 2: Hazard(s) Identification

2.1 Classification of Chemical per OSHA CFR 1910.1200

Skin Irritation:	Category 2
Eye Irritation:	Category 2B
Respiratory Sensitization:	Category 1B

2.2 Label Elements

Signal Word: DANGER



Symbol(s):

Hazard Statements: Causes skin and eye irritation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Precautionary Statements:

Prevention: Wear protective gloves. Wash exposed skin thoroughly after handling. Avoid breathing dust. In case of inadequate ventilation, wear respiratory protection

Response: If on skin, wash with plenty of water. If skin irritation occurs, get medical advice and/or attention. Take off contaminated clothing and wash it before reuse. If in eyes, rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice and/or attention. If inhaled and breathing is difficult, remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms, call a doctor.

Storage: No specific storage requirements.

Disposal: Dispose of contents and container in accordance with all federal, state, and local regulations.

2.3 Other Hazards

Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode.

2.4 Unknown Acute Toxicity

Does not apply to this product.

Section 3: Composition / Information on Ingredients

3.1 Chemical Name

Chemical Name: Zinc
Formula: Zn
Composition: 100%
Molecular Weight: 65.39 g/mol

3.2 Common Names/Synonyms

Synonyms: See **Section 1.2** for common names and synonyms.

3.3 CAS Number/Unique Identifiers

CAS Number: 7440-66-6
EIN Number (EINECS): 231-175-3

3.4 Impurities/Stabilizing Additives

No data available.

Section 4: First-Aid Measures

4.1 Description of First-Aid Measures

Inhalation: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

Skin Contact: Remove contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

Eye Contact: In case of contact or suspected contact, flush eyes with plenty of water for at least 15 minutes. Remove contacts/glasses while flushing. Get immediate medical attention.

Ingestion: If swallowed, get medical attention.

4.2 Most Important Symptoms/Effects, both Acute and Delayed

Inhalation (Acute): Irritation, nausea, vomiting, diarrhea, difficulty breathing, headache.
Inhalation (Chronic): Digestive disorders.
Eye Contact (Acute): Irritation (possibly severe), tearing.
Eye Contact (Chronic): Not known.
Skin Contact (Acute): Irritation (possibly severe)
Skin Contact (Chronic): No information on significant adverse effects.

Ingestion (Acute):	Nausea, diarrhea, stomach pain, dizziness, hyperactivity or drowsiness, kidney damage.
Ingestion (Chronic):	Hair loss, headache, hyperactivity, lung damage, kidney damage, liver damage.

4.3 Indication of immediate Medical Attention/Special Treatment

Antidote:	Calcium disodium edetate/dextrose, intravenous; calcium disodium edetate/procaine, intramuscular.
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Section 5: Fire Fighting Measures

5.1 Suitable Extinguishing Media

Dolomite, dry powder for metal fires, dry sand, graphite, soda ash, sodium chloride. Burning zinc reacts chemically with Halon and CO₂ gas extinguishers. Do not get water directly on material.

5.2 Specific Hazards

Negligible fire and explosion hazard in bulk form. Dust/air mixtures may ignite or explode. Zinc powder or dust in contact with water or damp air evolves hydrogen. The heat of reaction is sufficient that the hydrogen may ignite.

5.3 Special Protective Equipment and Precautions

Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Use extinguishing agents appropriate for surrounding fire. Avoid inhalation of material or combustion by-products.

Section 6: Accidental Release Measures

6.1 Personal Precautions, Protective Equipment, and Emergency Procedures

Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (US SARA Section 304). If release occurs in the US and is reportable under CERCLA Section 103, notify the National Response Center at (800)-424-8802 or (202)-426-2675. Regulatory information is described in **Section 15.0**.

6.2 Methods and Materials for Containment and Cleaning Up

As an 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. Eliminate all ignition sources. Do not get water on spilled substance. Keep unauthorized personnel away. Stay upwind, keep out of low areas, and ventilate the area before entry. Cover with dry earth, sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. Sweep spilled substance into containers, and then remove to safe place. Personal protection: self-contained breathing apparatus. Personal protective equipment is discussed in **Section 8.3**.

Small Spill

- Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
- Dike for later disposal; do not apply water unless directed to do so.

Powder Spill

- Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.
- **DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.**

Section 7: Handling and Storage

7.1 Precautions for Safe Handling

Handle in accordance with all current regulations and standards.

7.2 Conditions for Safe Storage

Store in accordance with all current regulations and standards. Finely divided zinc compounds, can be fire and explosion hazard if stored in damp places, or sources of spontaneous combustion. Store the metal in a cool, dry place, and keep residues thoroughly wet until disposal. Hydrogen is evolved, especially under acid and alkaline conditions. Protect from physical damage. Store in a well-ventilated area. Keep separated from incompatible substances. Incompatible materials are identified in **Section 10.5**.

Section 8: Exposure Controls / Personal Protection

8.1 Exposure LimitsAs Zinc Oxide:

OSHA TWA (Respirable dust fraction)	5 mg/m ³
OSHA TWA (Total dust)	15 mg/m ³
OSHA TWA (Total particulate)	10 mg/m ³ (Vacated by 58 FR 35338, June 30, 1993)
OSHA TWA (Fume)	5 mg/m ³
OSHA STEL (Fume)	10 mg/m ³ (Vacated by 58 FR 35338, June 30, 1993)
ACGIH TWA (Respirable fraction)	2 mg/m ³
ACGIH STEL (Respirable fraction)	10 mg/m ³
NIOSH REL TWA 10 hour(s) (Fume)	5 mg/m ³ (Also dust)
NIOSH REL Ceiling (Dust)	15 mg/m ³
NIOSH REL STEL (Fume)	5 mg/m ³
DFG MAK (Respirable fraction)	1 mg/m ³ (Peak limitation category – I, with excursion factor of 1 (Also fume))

8.2 Appropriate Engineering Controls

Ventilation:

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

8.3 Individual Protection Measures

Eye Protection:

Eye protection not required under normal conditions.

Clothing:

Protective clothing is not required under normal conditions.

Gloves:

Wear protective gloves.

Respirator:

The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA:

50 mg/m³

1. Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100.
2. Any supplied-air respirator.

125 mg/m³

1. Any supplied-air respirator operated in a continuous-flow mode.
2. Any powered, air-purifying respirator with a high-efficiency particulate filter.

250 mg/m³

1. Any air-purifying, full-facepiece respirator equipped with an N100, R100, or P100 filter.
2. Any supplied-air respirator with a tight-fitting facepiece that is operated in a continuous-flow mode.
3. Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter.
4. Any self-contained breathing apparatus with a full facepiece.
5. Any supplied-air respirator with a full facepiece.

500 mg/m³

1. Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode.

Unknown Concentrations/IDLH:

1. Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

2. Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.

Escape:

1. Any air-purifying, full facepiece respirator equipped with an N100, R100, or P100 filter.
2. Any appropriate escape-type, self-contained breathing apparatus.

Section 9: Physical and Chemical Properties

9.1 Appearance

Physical State:

Solid

Physical Description:

Bluish-white lustrous metal in pig, ingot, or tub form which may develop a white carbonate coating on exposure to moist air.

9.2 Odor

Odorless.

9.3 Odor Threshold

Not applicable.

9.4 pH

Not applicable.

9.5 Melting/Freezing Points

Melting Point:

420°C (788°F)

Freezing Point:

No data available.

9.6 Initial Boiling Point and Boiling Range

Boiling Point:

907°C (1,665°F)

9.7 Flash Point

Not determined.

9.8 Evaporation Rate

Not applicable.

9.9 Flammability

No data available.

9.10 Upper/Lower Explosive Limits

Lower Explosive Limit:

0.5 oz/ft³

9.11 Vapor Pressure

Water = 1:

1mmHg @ 487°C

9.12 Vapor Density

No data available.

9.13 Relative Density

Water = 1:

7.14

9.14 Solubility(ies)

Soluble:

Acids and Alkalies

Insoluble:

Water

9.15 Partition Coefficient

No data available.

9.16 Auto-Ignition Temperature

No data available.

9.17 Decomposition Temperature

No data available.

9.18 Viscosity

No data available.

Section 10: Stability and Reactivity

10.1 Reactivity

Produces flammable gases on contact with water. May ignite on contact with water or moist air. May be ignited by heat, sparks, or flames. May re-ignite after fire is extinguished.

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

Acids:	Evolves hydrogen gas which may be ignited by the heat of the reaction.
Alkalis:	Evolves hydrogen gas which may be ignited by the heat of the reaction.
Aluminum (powder):	Possible ignition.
Aluminum-Magnesium Alloy + Rusted Steel:	May spark on impact.
Ammonium Nitrate:	Violent reaction or formation of explosive mixture.
Ammonium Sulfide:	May explode in a closed container.
Arsenic:	Incandescent reaction when heated.
Arsenic Trioxide:	Explosive reaction on heating.
Bromomethane:	Forms flammable compounds.
Cadmium:	Incandescent reaction.
Calcium Chloride:	Evolves hydrogen gas which may be ignited by the heat of the reaction.
Carbon Disulfide:	Incandescent reaction.
Carbon Tetrachloride + Methanol:	Extremely vigorous reaction.
Chlorates:	Forms shock-sensitive mixtures.
Chlorinated Rubber:	Violent or explosive reaction at elevated temperatures.
Chromic Anhydride:	Violent reaction and possible ignition.
Cobalt Halide (Methanolic Solution) + Iron Pentacarbonyl:	Violent reaction.
Ethyl Acetoacetate + Tribromoneopentyl Alcohol:	May react explosively.
Halocarbons:	Possible violent reaction with ignition.
Halogens:	Possible ignition.
Hydrazine Nitrate:	Ignites on warming.
Hydroxylamine:	May ignite or explode when heated.
Interhalogens:	Violent reaction and possible ignition.
Lead Azide:	Increased sensitivity to explosive decomposition.
Manganese Dichloride:	Explosive reaction when heated.
Metal Oxides:	Possible ignition or incandescent reaction.
Nitric Acid:	Incandescent reaction.
2-Nitroanisole + Sodium Hydroxide:	Exothermic reaction.
Nitrobenzene:	May form pyrophoric residue.
Nitryl Fluoride:	Incandesces when warmed.
Oxidizers (Strong):	Fire and explosion hazard.
Peroxyformic Acid:	Violent explosion on contact.
Potassium Nitrate:	Explosive reaction on heating.
Potassium Peroxide:	Incandescent reaction.

Rhodium Halides (Methanolic Solution) + Iron Pentacarbonyl:	Violent Reaction.
Ruthenium Halides (Methanolic Solution) + Iron Pentacarbonyl:	Violent Reaction
Selenium:	Incandescent reaction.
Seleninyl Bromide:	Ignition.
Silver + Electrolytes (Batteries):	May spontaneously combust.
Sodium Peroxide:	Incandescent reaction.
Sulfur:	Violent reaction.
Tellurium:	Incandescent reaction.
Water:	Produces flammable gases.
Zinc Chloride:	May increase flammability.

10.4 Conditions to Avoid

None reported.

10.5 Incompatible Materials

Acids, bases, metals, oxidizing materials, reducing agents, halocarbons, metal salts, halogens, combustible materials, amines, metal oxides.

Safe storage of the material is discussed in **Section 7.2**.

10.6 Hazardous Decomposition Products

Thermal Decomposition Products: Oxides of zinc.

Section 11: Toxicological Information

11.1 Likely Routes of Exposure

Routes of entry include inhalation, skin contact, eye contact, and ingestion.

11.2 Symptoms

See **Section 4.2** for symptoms related to the physical, chemical, and toxicological characteristics.

11.3 Short and Long Term Effects

Inhalation (Acute):

Inhalation of dust may cause irritation with difficulty in breathing and sneezing. Neurological and psychiatric symptomology including irritability, upper extremity coarse intention tremor, incoordination, and ataxia have also been reported. 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 generalized 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.

Inhalation (Chronic):

Severe gastrointestinal disturbances and hypochromic anemia have been reported, but other chemicals may have contributed to the effects.

Skin Contact (Acute):

Dust may cause mechanical irritation and mild dermatitis in intertriginous areas. Reaction with moisture on skin may result in serious burns.

Skin Contact (Chronic):

300 µg applied to human skin intermittently for 3 days caused mild irritation. Allergic reactions are rare, but have been reported.

Eye Contact (Acute):

Dust may cause mechanical irritation or injury to the surface of the eye, with discomfort, reddening, and tearing. Direct contact may cause serious corneal burns.

Eye Contact (Chronic):

No data available.

Ingestion (Acute):	Large oral doses may cause gastrointestinal distress with stomach cramps, dehydration, electrolyte imbalance, abdominal pain, nausea, vomiting, hematemesis, diarrhea, lethargy, immune system effects, fever, dizziness, tightness in the throat, shock collapse, renal failure, and death. Survivors may have residual nephritis and strictures of the esophagus and pyloric end of the stomach.
Ingestion (Chronic):	Patients taking zinc in amounts 10 times the RDA for months and years have not shown any adverse reactions. Excessive absorption may cause copper-deficiency anemia. Ingestion of approximately 85.7 mg/kg/day for 2 days caused lethargy, lightheadedness, staggering, and difficulty in writing clearly. Two people who ingested 40 ppm in drinking water for several months experienced lack of concentration, drowsiness, mental and physical fatigue, pain in the arms and legs, headache, stiffness, muscle pains, loss of appetite, nausea, weight loss, and lassitude. 90 ppm in the diet for 5 weeks has resulted in a decrease in the HDL cholesterol level. Pancreatic abnormalities have also been observed. A diet of 0.25% in rats caused no injury; above 0.25% there was breakdown of the homeostatic mechanism, growth retardation, hypochromic anemia, and defective mineralization of the bones. Mice fed 500 ppm for 14 months exhibited hypertrophy of the adrenal cortex and changes indicating hyperactivity of the pancreatic islets and pituitary gland; 30,000 ppm for 13 weeks caused liver and kidney damage and some deaths. Cows fed 2% for 2 days developed severe enteritis, with 7 of 40 dying. Severe pulmonary emphysema and changes in the myocardium, kidneys, and liver were observed. Pigs fed >1,000 ppm had reduced food intake and weight gain; at >2,000 ppm, death occurred after 2 weeks. Bone changes were observed in foals fed 5,400 ppm. High dietary levels of zinc have been associated with reduced fetal weights, altered concentrations of fetal iron and copper, and alopecia and reduced growth of offspring in animals.

11.4 Numerical Measures of Toxicity

Irritation Data:	300 µg/3 day(s) – intermittent skin – human mild
Toxicity Data:	
TCL _o (Human):	124 mg/m ³ /50 minute(s) inhalation
LDL _o (Duck):	388 mg/kg oral
TDL _o (Rat):	25 mg/kg intratracheal
LC ₅₀ (Multiple Sp.):	23 gm/m ³ /24 hour(s) (non-mammalian)
LDL _o (Mouse):	5 gm/kg oral
TDL _o (Mouse):	5 gm/kg oral
TCL _o (Woman):	2.4 mg/m ³ /5 year(s) intermittent inhalation
TDL _o (Woman):	70 mg/kg/10 week(s) intermittent oral
Tumorigenic Data:	
TDL _o (Mouse):	12,600 mg/kg oral (46 week(s) continuous)

11.5 Carcinogen Status

OSHA:	Not identified as carcinogenic.
NTP:	Not identified as carcinogenic.
IARC:	Not identified as carcinogenic.

Section 12: Ecological Information

12.1 Ecotoxicity

Fish Toxicity:	840 µg/L 96 hour(s) LC ₅₀ (Mortality) Banded killifish (<i>Fundulus diaphanous</i>)
Invertebrate Toxicity:	45.8 µg/L 72 hour(s) EC ₅₀ (Shell Valve Closure) Swan mussel (<i>Anodonta cygnea</i>)
Algal Toxicity:	65 µg/L 4 hour(s) LC ₅₀ (Population Growth) Diatom (<i>Nitzschia closterium</i>)
Phytotoxicity:	10,000 µg/L 4 hour(s) EC ₅₀ (Growth) Duckweed (<i>Lemna minor</i>)

12.2 Persistence and Degradability

No data available.

12.3 Bioaccumulative PotentialBioconcentration: 7,100 µM 2 hour(s) BCFD (Residue) Duckweed (*Lemna trisulca*) 3.06 µM**12.4 Mobility in Soil**

No data available.

12.5 Other Adverse Effects

No data available.

Section 13: Disposal Considerations

Dispose in accordance with all applicable regulations. Recycle any unused portion of the material for its approved use. 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.

Section 14: Transport Information**14.1 UN Number**

UN Numbers: 1435 (Zinc Ashes, Dross, Residue)
1436 (Zinc Skimmings, Dust, and Powder)

14.2 UN Proper Shipping Name

Zinc Ashes, Zinc Dross, Zinc Residue, Zinc Skimmings, Zinc Dust, and Zinc Powder

14.3 Transport Hazard Class(es)

U.S. Department Of Transportation: No classification assigned.
CA Transportation/Dangerous Goods: No classification assigned.
Land Transport ADR: No classification assigned.
Land Transport RID: No classification assigned.
Air Transport IATA: No classification assigned.
Air Transport ICAO: No classification assigned.
Maritime Transport IMDG: IMO 4.3 (Zinc Powder, Dust or Ashes).

14.4 Packing Group

No classification assigned.

14.5 Environmental Hazards

Toxic pollutant designated pursuant to section 307(a)(1) of the Federal Water Pollution Control Act and is subject to effluent limitations. The secondary Maximum Contaminant Level for public water systems for zinc is 5 mg/L.

14.6 Transport in Bulk

No data available.

14.7 Special Precautions

No data available.

Section 15: Regulatory Information

US Regulations

CERCLA 102A/103 (40 CFR 302.4): Zinc: 1,000 LBS (454 kg) RQ
(Solid metal particles < 100 micrometer diameter)

SARA Title III	
Section 302 (40 CFR 355.30):	Not regulated.
Section 304 (40 CFR 355.40):	Not regulated.
Sections 311/312 (40 CFR 370.21):	Not regulated.
Section 313 (40 CFR 372.65):	Zinc
OSHA Process Safety 29 CFR 1910.119:	Not Regulated
State Regulations: California Proposition 65:	Not Regulated
National Inventory Status: US Inventory (TSCA):	Listed on Inventory
TSCA 12(b) Export Notification:	Not Listed

Section 16: Other Information

The information in this Safety Data Sheet meets the requirements of the United States Department of Labor OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION and regulations promulgated thereunder (29 CFR 1910.1200 et. seq.). This document is intended only as a guide to the appropriate precautionary material handling by a person trained in, or supervised by a person trained in, chemical handling. Exposure to this chemical may have serious adverse health effects. This chemical may interact with other substances. Since the potential uses are so varied, all of the potential hazards of use or interaction with other chemicals or materials cannot be identified on this Safety Data Sheet. The user should recognize that this chemical can cause injury, especially if improperly handled, precautionary measures are not followed, and personal protective equipment not worn. Read and understand all precautionary information prior to use. The Defense Logistics Agency (DLA) shall not be held liable for any damage resulting from handling or from contact with the above chemical.

References:

Chemadvisor, Inc. *Material Safety Data Sheet Product Name: Zinc*. March 13, 2008. (as provided by the Defense Logistics Agency)

American Conference of Governmental Industrial Hygienists. *2013 TLVs® and BEIs®, ACGIH® Publication #0113*. 2013.

Centers for Disease Control and Prevention. *NIOSH Pocket Guide to Chemical Hazards*, <http://www.cdc.gov/niosh/npg/>.

National Institute of Health, Toxicology Data Network. <http://toxnet.nlm.nih.gov/>

US Department of Transportation. *Emergency Response Guidebook*. 2012

NOTE: No data available: no data for this topic found using references listed.

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