

Zochem LLC (Zochem South)
600 Printwood Drive
Dickson, TN 37055, USA
CustomerService@Zochem.com
PHONE +1 (615) 446-8791
FAX +1 (615) 446-8789
www.zochem.com



Zochem ULC (Zochem North)
1 Tilbury Court, Brampton
Ontario, L6T 3T4, Canada
CustomerCare@Zochem.com
PHONE +1 (800) 324-1806
FAX +1 (905) 453-2920
www.zochem.com

SAFETY DATA SHEET

ZINC OXIDE

This SDS Compliant for use in **European Union member countries only**. This SDS not valid outside EU/ EEA.
REACH Numbers: 01-2119463881-32-0065 (Zochem ULC, Canada), 01-2119463881-32-0201 (Zochem LLC, USA)

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product identifier: ZINC OXIDE

Product Code: This SDS is valid for all zinc oxide product codes or grades

Synonyms: ZINKOXID, OXYDE DE ZINC, OSSIDO DI ZINCO, ZINKOXIDE,
OXIDO DEL CINC, TLENED CYNKU

1.2 Relevant identified uses of the substance/mixture and uses advised against:

Common uses include:

- Rubber compound
- Coloring agents, pigments
- Food/feedstuff additives
- Fuels and fuel additives
- Intermediates
- Laboratory chemicals
- Lubricants and lubricant additives
- Plating agents and metal surface treating agents
- Process regulators, other than polymerization or vulcanization processes
- Component in batteries
- Corrosion inhibitors and anti-scaling agents
- Fertilizers
- Pharmaceutical substance
- Photosensitive agents and other photo-chemicals
- Process regulators, used in vulcanization or polymerization processes
- Processing aid, not otherwise listed
- Semiconductors

List of Generic Exposure Scenarios (GES) uses is provided in a supplement extended SDS GES table.

No uses advised against

1.3 Details of the supplier of the safety data sheet:

Reach Only Representative (Ireland) Ltd., Swinford Ireland.
Email: alerts@RORltd.com. Website www.rorltd.com. Tel: +44 (0) 1565 748111
RRN's: 01-2119463881-32-0065 (Zochem ULC, Canada), 01-2119463881-32-0201 (Zochem LLC, USA).
OR address for correspondences: Booths Park 1, Chelford Road, Knutsford, Cheshire, WA16 8GS, UK
For additional information contact Zochem (Website: www.zochem.com)
600 Printwood Drive, Dickson, TN 37055-3010 U.S.A., Phone: +1 615 446-8791

1.4 Emergency telephone number: +44(0) 1565 748111, +(1)901-833-2118, +(1)647-237-7222

Section 2: HAZARD IDENTIFICATION

2.1 Classification of the substance or mixture:

Classification according to Regulation (EC) No 1272/2008 (CLP/GHS) as amended by 2016/1179:

Aquatic Acute 1: H400 Very toxic to aquatic life, M factor 1

Aquatic Chronic 1: H410 Very toxic to aquatic life with long lasting effects, M factor 1

2.2 Labelling according to Regulation (EC) No 1272/2008 (CLP/GHS) in EEA member countries:

Hazard: H410: Very toxic to aquatic life with long lasting effects.

Signal word: Warning. Hazard pictogram: GHS09 environment



Precautionary: P273: Avoid release to the environment. P391: Collect spillage.

P501: Dispose of contents/container as hazardous or special waste in accordance with local law.

Note, "Preparations" containing >25% or greater zinc oxide will also be classified as "Environmentally Hazardous Substance." Preparations contains <= 25% zinc oxide (and if the preparation or mixture contains no other classified component), the preparation or mixture is not EU CLP or GHS regulated.

2.3 Other hazards: None.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS AND IMPURITIES

<u>3.1 Constituent/Ingredient</u>	<u>Range</u>	<u>CAS no.</u>	<u>EC/EINECS</u>	<u>Other</u>
Zinc Oxide (ZnO)	99-100%	1314-13-2	215-222-5	

3.2 Additional information of impurities:

Contains naturally occurring inorganic impurities less than SDS reporting de minimis.

Product may contain processing aid at customer request.

After manufacturing, during material handling and storage, the hygroscopic ZnO product absorbs some moisture from humidity in air, and product also slowly degrades with CO₂ in air forming zinc carbonate.

Section 4: FIRST AID MEASURES

4.1 Description of first aid measures:

In case of skin contact: Wash with soap and water.

In case of eye contact: Rinse with plenty of water and seek medical advice.

In case of Ingestion: Drink plenty of water; do not induce vomiting; call a physician.

In case of Inhalation: Move to fresh air. Keep warm and at rest.

4.2 Most important symptoms and effects, both acute and delayed:

Acute: Dry cough, headache. Chronic: None (overexposure has no lasting effects).

4.3 Indication of any immediate medical attention and special treatment needed:

Bad cough or headache. Move person to fresh air. No special treatment known.

Excess dust must naturally purge or absorb.

Section 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media: None. Zinc oxide will not burn.

Use extinguishing media appropriate for the surrounding fire.

5.2 Special hazards: None. Hazardous decomposition product(s): None.

5.3 Advise for firefighters: Avoid release of fire control water containing zinc oxide to the environment.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures:

Wear protective clothing, dust respirator, and goggles in bulk excess dust conditions.

Shovel up spills into appropriate labeled container.

Dry spills, not mixed with other chemicals, may be recyclable. Contact Zochem.

6.2 Environmental precautions:

Avoid release to the environment.

6.3 Methods and material for containment and cleaning up:

Recover the product by vacuum.

If sweeping unavoidable, use soft bristles to reduce creation of airborne dust.

Section 7: HANDLING AND STORAGE

7.1 Precautions for safe handling:

Wear protective clothing, dust respirator, and goggles in bulk excess dust conditions.

7.2 Conditions for safe storage, including any incompatibilities: Keep dry. Germany TRGS 510 Annex 4,

Class 13 Non-combustible solids that cannot be assigned to other storage class.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Country/organization	8 hour-TWA	15 min-STEL mg/m ³
Germany (MAK)	5 mg/m ³ (fume) 6 mg/m ³ (dust)	Inhalable dust = 10 mg/m ³ Respirable dust = 3 mg/m ³
France (INRS)	5 mg/m ³ (fume) 10 mg/m ³ (dust)	
UK (OEL)	5 mg/m ³ (fumes) 10 mg/m ³ (dust)	TWA – 8 hour: 5 mg/m ³ (nuisance dust) STEL – 15 minutes: 10 mg/m ³ (nuisance dust)
The Netherlands	5 mg/m ³ (fumes)	
Sweden	5 mg/m ³ (fumes)	
Denmark	4 mg/m ³ (fumes) 10 mg/m ³ (dust)	
USA (Zinc Oxide)	5 mg/m ³ (fumes) 15 mg/m ³ (dust; total) 5 mg/m ³ (dust; respirable)	

Section 8.1.4

DNELS

Route of exposure	Workers				General population			
	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic
Oral	Not required				No hazard identified		Not required	No hazard identified
Inhalation	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified

Dermal	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified	No hazard identified
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PNECS relative to zinc ion

Environmental protection target	PNECs
Freshwater	14.4 µg/L
Freshwater sediments	146.9 mg/kg sediment dw
Marine water	7.2 µg/L
Marine sediments	162.2 mg/kg sediment dw
Food chain	No potential for bioaccumulation
Microorganisms in sewage treatment	100 µg/L
Soil (agricultural)	83.1 mg/kg soil dw
Air	No hazard identified

PNECS relative to Zinc Oxide

Environmental protection target	PNECs
Freshwater	17.9 µg/L
Freshwater sediments	182.8 mg/kg sediment dw
Marine water	9 µg/L
Marine sediments	201.9 mg/kg sediment dw
Food chain	No potential for bioaccumulation
Microorganisms in sewage treatment	124.5 µg/L
Soil (agricultural)	103.4 mg/kg soil dw
Air	No hazard identified

8.2 Exposure controls/Personal protection:

- Route(s) Of Entry: 1. Inhalation. 2. Dermal. 3. Eyes. 4. Digestion.
 Eye protection: Recommend safety glasses in bulk excess dust conditions.
 Protection for skin: Recommend long sleeves in bulk excess dust conditions.
 Protection for hands: Recommend gloves to reduce drying of skin
 Respiratory protection: Recommend dust filter mask in bulk dust conditions.
 (Must wear respirator of proper type if exposure above 8 hour TWA)

8.2.1 Appropriate engineering controls:

Technical conditions and measures at process level (source) to prevent release:

- Process enclosures closed circuits or semi-enclosures where appropriate.
- Local exhaust ventilation with potential dust and fumes generation.
- Containment of liquid volumes in sumps to collect/prevent accidental spillage.

Technical conditions and measures to control dispersion from source towards the worker:

- Cyclones/filters to minimize dust emissions.
- Good general housekeeping and maintenance practices.

Organizational measures to prevent /limit releases, dispersion and exposure:

- Management system (i.e. ISO9001 or OSHAS18000) for good work, training, cleaning, PPE and hygiene practices.

8.2.3. Environmental exposure control

Technical conditions and measures at process level (source) to prevent release:

Process enclosures and closed circuits where relevant and possible.

Local exhaust ventilation with potential dust generation, dust capturing and removal techniques

Containment of liquid volumes in sumps to collect/prevent accidental spillage.

Technical onsite conditions and measures to reduce discharges, air emissions and releases to soil:

On-site waste water treatment techniques.

Containment of liquid volumes in sumps to collect/prevent accidental spillage

Air emissions are controlled by use of bag-house filters or other air emission abatement devices.

Organizational measures to prevent/limit release from site:

Management system (i.e. ISO9001 or ISO45001) for good work, training, cleaning, PPE and hygiene practices.

SEVESO III compliance (Directive 2011/18/EU), if applicable

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance at 20°C and 1013 hPa:	Solid, powder or pellet/granular
Odor / smell:	Odorless.
Odor threshold:	Not applicable.
Color:	White, off white, cream, grayish, or yellowish.
Vapour pressure:	Not applicable (melting point above 300°C).
Vapour density:	Not applicable.
Relative density/Specific Gravity:	5.68 g/cm ³ .
Partition coefficient n-octanol-water:	Not applicable to inorganic substance.
pH:	Neutral, 6.8 to 8 (7.37 nominal)
Melting / Freezing point:	Will not freeze. Will not melt. Malleable above 300C/572F No exothermic or endothermic peaks are observed. No oxidation or decomposition was observed. Sublimation temperature 1975C.
Boiling point:	Not applicable; the substance decomposes before boiling.
Flash point:	Not applicable to inorganic substances.
Evaporation rate:	Not applicable to solids
Flammability:	Not flammable. Will not burn.
Auto-ignition temperature:	The substance is not auto-flammable.
Upper / lower flammability limits:	Not applicable.
Upper / lower explosive limits:	Not applicable.
Water solubility:	Negligible (solubility of Zn in ZnO is 2.9 mg/l).
Soluble:	In bases and acids
Decomposition temperature:	Not applicable.
Viscosity:	Not applicable.
Explosive properties:	Zinc oxide has no flammability, explosive or self-flammability properties
Granulometry:	D50 1.05 µm, D80 <20 µm
Molecular Weight:	81.38 (ZnO)

Section 10. STABILITY AND REACTIVITY

10.1	Reactivity:	Stable under normal dry air conditions.
10.2	Chemical stability:	Product is stable.
10.3	Possibility of hazardous reactions:	None.

- 10.4 Conditions to avoid: Keep from getting wet (will damage substance usefulness).
 10.5 Incompatible materials: Heated magnesium. Chlorinated rubber above 215C.
 10.6 Hazardous decomposition: None.
 10.6.1 Decomposition: Product decomposes in acids and bases.
 10.6.2 Degradation: Slow degrade to zinc carbonate (not hazardous).*

*ZnO testing expiration is 12 mos from date of manufacturing (DOM) for ≥ 8.0 m²/g surface area, rubber applications, and product stored under roof only. Testing expiration is 18 months from DOM for <8 m²/g and other applications. ZnO processing ability depends on storage and handling after product leaves the manufacture. Bags should be used within one month after opening. Bags stored in $>65\%$ RH (relative humidity) should be used within six months. Product may settle when stored > 6 mos causing clumping agglomerates. Processes sensitive to clumping should pre-screen product before use or use within 6 mos. ZnO slowly degrades to zinc carbonate (ZnCO₃) by reacting with CO₂ in ambient air. Degradation process is accelerated by moisture (e.g. higher m²/g surface area, higher humidity storage, product exposure to air, or product or packaging becoming damp). Degraded product may have increased hard particulates and LOI, and decreased ZnO assay and reduced m²/g. An LOI test $>500^{\circ}\text{C}$ is a leading indicator of ZnCO₃ degradation. Rubber is particularly sensitive to hard white particulates.

Section 11. TOXICOLOGICAL INFORMATION

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

a) Acute Toxicity – classification criteria not met

Values provided for ZnO	Effect dose/ concentration	Species	Method
Acute oral toxicity	LD50 >2000 mg/kg bw	Rat	OECD 401 & OECD 423
Acute inhalation toxicity	LC50 >5.7 mg/L	Rat	OECD 403
Acute dermal toxicity	LD50 >2000 mg/kg bw	Rat	OECD 402

b) Skin corrosion / irritation - classification criteria not met

Not irritant

c) Serious eye damage/irritation - classification criteria not met

Species	Method	Result
New Zealand white rabbits	OECD 405	Not irritant

d) Skin Sensitisation - classification criteria not met

Species	Method	Result
Guinea pigs	OECD 406	Not sensitizing

e) Germ cell mutagenicity – classification criteria not met

Based on the weight of the evidence from the existing in vitro and in vivo genotoxicity assays available, it is concluded that the zinc category substances do not have biologically relevant genotoxic activity. Consequently, no classification for germ cell mutagenicity is applicable.

This conclusion is in line with those achieved by other regulatory reviews of the genotoxicity of zinc compounds (WHO, 2001; SCF, 2003; EU RAR, 2004, MAK, 2009). Hence, no classification and labelling for mutagenicity is required.

f) Carcinogenicity

No adequate experimental animal studies are available to evaluate the carcinogenicity of zinc compounds in humans.

g) Reproductive toxicity – classification criteria not met

Neither the impairment of fertility nor the developmental toxicity of the zinc category substances are considered endpoints of concern for humans. Based on the available information in experimental animals as well as in humans, there is no reason to classify any of the zinc category substances for reproductive toxicity in accordance with regulation (EC) 1272/2008.

h) Specific Target Organ Toxicity – STOT-single exposure

Of significance for **humans** is the occurrence of metal fume fever following exposure to ultrafine particles of special grades of zinc oxide in context of very specific operations such as cutting or welding of galvanised steel. However in light of responsible care and since no studies are available that allow the establishment of a NOAEL for metal fume fever with a reasonable degree of certainty, a LOAEL (5 mg ZnO/m³) for 2 hours (showed the typical metal fume fever symptoms beginning 4 to 8 hours after exposure and disappearing within 24 hours) can be used for metal fume fever based on the study by Gordon *et al.* (1992).

i) Specific Target Organ Toxicity- STOT-repeated exposure- Animal data – classification criteria not met

No animal or human sufficient evidence for specific target organ toxicity (repeated oral/inhalation exposure). In accordance with the criteria of regulation (EC) 1272/2008, none of the zinc category substances is classified for Specific target organ toxicity by repeated exposure (STOT-RE).

j) Aspiration hazard

No data available – not classifiable due to data lacking

11.2 Information on other hazards

11.2.1. Endocrine disrupting properties: Substance is not classified as an endocrine disruptor. Zinc is essential and has no known endocrine disrupting properties.

Section 12: ECOLOGICAL INFORMATION

For the zinc substances, Ecotoxicity Reference Values (ERVs) are based on the soluble ion, Zn²⁺, and are determined from the extensive datasets on acute and chronic ecotoxicity testing of soluble zinc salts.

12.1. Toxicity

a) Aquatic toxicity

The available high-quality data were normalized towards two sets of physico-chemical conditions, reflecting the required range of pH. Such normalization is possible because for zinc, well-established bioavailability models (so called “Biotic Ligand Models” or BLMs) exist for algae, invertebrates, and fish, that enable the prediction of **acute** and **chronic** zinc ecotoxicity as a function of physicochemical test conditions. The Acute aquatic toxicity database on zinc contains data on 59 species (5 algae, 29 invertebrates, 21 fish species, 3 amphibians and 1 aquatic plant). The chronic aquatic toxicity database on zinc contains high quality data on 41 species (17 taxonomic groups).

Zinc Ecotoxicity Reference Values for aquatic toxicity

	Endpoint		Zn ⁺⁺ ion concentration	Species
Acute ecotoxicity	NOEC	pH 6	154 µg Zn/l	Daphnia magna
	NOEC	pH 8	41 µg Zn/l	Pseudokirchneriella subcapitata
	NOEC	pH 6	99 µg Zn/l	Pseudokirchneriella subcapitata

Chronic ecotoxicity	NOEC	pH 8	11 µg Zn/l	Pseudokirchneriella subcapitata
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b) Sediment toxicity

Endpoint	Value range	Data source	PNEC extrapolation method
NOEC/ EC10	218 to 1101 µg Zn/l	7 benthic species	Species Sensitivity Distribution

c) Soil toxicity

Endpoint	Value range	Data source	PNEC extrapolation method
NOEC/ EC10	31.2 and 8003.5 mg Zn/kg dry weight (dw)	12 terrestrial plants, 10 invertebrates and 13 microbial endpoints	Species Sensitivity Distribution

d) Toxicity to micro-organisms in STP

Endpoint	Value	Test method	Data source	PNEC extrapolation method
NOEC	100 µg Zn/l	Nitrification inhibition test	Juliastuti et al. 2003	Assessment factor AF = 1

12.2. Persistence and biodegradability

Biodegradation is not applicable to metals/inorganic substances. An analysis on the removal of zinc from the water column has been presented as a surrogate for persistence.

12.3. Bioaccumulative potential

Due to homeostatic control mechanisms, bioaccumulation is not relevant to essential elements in general and to zinc in particular.

12.4. Mobility in soils

Distribution	Transport type	parameter	Result	Method
Soil - water	Adsorption	Log Kp	3.24 (0.30 – 4.31)	OECD 106

12.5. Results of PBT and vPvB assessment

PBT and vPvB criteria are not applicable to inorganic substances.

12.6. Endocrine disruptive properties

Substance is not classified as an endocrine disruptor. Zinc is essential and has no known endocrine disrupting properties.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

This material may be a special or hazardous waste for regulated metals.

Empty packaging may also be regulated in EEA member countries.




To prevent water pollution, do not open release.

Recyclable: Waste material not co-mingled with other substances may be recyclable.

Contact Zochem for further information

Section 14. TRANSPORT INFORMATION

Table for transportation information within the EEA: (European Economic Area).

	<u>ADR/RID</u>	<u>IMDG</u>	<u>IATA</u>
14.1 UN number	UN3077	UN3077	UN3077
14.2 UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Oxide), Marine pollutant (Zinc oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Oxide)
14.3 Transport hazard Classes(es)	9 	9 	9 
	<u>ADR/RID</u>	<u>IMDG</u>	<u>IATA</u>
	<u>Hazard identification number: 90</u>	<u>Sea (IMO): not regulated</u>	<u>IATA Label: Miscellaneous</u>
14.4 Packing group	III	III	III
14.5 Environmental hazards	Yes	Yes, Dangerous to the Environment	Yes
14.6 Special precautions for users	No	No	Yes (see below)
Additional information	Tunnel code (E)	none	
IATA special precautions for users IATA - Passenger & Cargo Aircraft: 1000 kg (Packing Instruction 956 for IBC's) IATA - Passenger & Cargo Aircraft: 400 kg (Packing Instruction 956 for Bags) IATA - Passenger & Cargo Aircraft: 30 kg (Packing Instruction Y956 for Limited Quantity) IATA - S.P.: A97, A158, A179			

Section 15. REGULATORY INFORMATION

15.1 This SDS complies with REACH (EC 1907/2006) and USOSHA 29CFR1910.1200 SDS regulations, and GHS/CLP (Classification, Labelling and Packaging Regulation No. EC 1272/2008).

15.2 Labeling Signal Word: WARNING. See SDS Section 2 (labeling) for additional information.

15.3 EU REACH. OR: Reach Only Representative (Ireland) Ltd. Registration number: 01-2119463881-32-0065 (Zochem ULC, Canada), 01-2119463881-32-0201 (Zochem LLC, USA). OR contact: 44(0) 1565 748111, email: alerts@RORltd.com, Website www.rorltd.com

15.4 SVHC: Zinc oxide is not an SVHC. Impurities are below SVHC or candidate SVHC thresholds.

15.5 Nano: This product is not nano (over 50% of substance particles by number are over 100 nm size).

15.6 Inventory/Lists.

TSCA (U.S.): Yes, listed, notification not required.

DSL (Canada): Yes, listed. NDSL: (Canada): No, not listed, notification not required.

EINECS (Europe): Yes, on Inventory. ELINCS (Europe): No, notification/reporting not required.

Listed on the following lists: ASIA-PAC, SWISS, PICCS (Philippines), ENCS (Japan), AICS (Australia), KECI (Korea), IECSC (China), New Zealand, Taiwan.

15.7 U.S. Regulations:

Transportation: Not transport regulated in the U.S. (USDOT 49CFR172), Canada, or Mexico.
HS Tarriff Class #: 2817.00.0000, preference B

SARA 302: Name listed (zinc). RQ=None, TPQ=None.

SARA 312: Yes, acute hazard, EPCRA Tier 2 must be filed with state and local agencies.

SARA 313: Yes, TRI on Form R must be filed for Zn & Pb Compounds if usage above threshold.

CA Prop. 65: No, ZnO is not a Prop 65 listed substance. Impurities Pb & Cd listed.

CAA 112, 61 HAP: No, not regulated, no Hazardous Air Pollutants (HAP's)

FIFRA 152 et seq.: No, product is not subject to FIFRA registration.

CERCLA 102/103: Zinc is on Name List, RQ=None.

CONEG: Compliant.

ODS/ODC 82: No ozone depleting substances.

USFDA: Approved by FDA. Substance is listed as GRAS at 21CFR182.8991 (GRAS=Generally Recognized as Safe) and may be used in any FDA regulation where use of a GRAS substances is authorized including an ingredient in food and in food contact in rubber articles at 21CFR177.2600(c)(1); Food can linings and coatings at 21CFR175.300(b)(2), and Plastics at 21CFR170.30(d).

15.8 German Water Hazard Class (Stoff Nr. 2187): Class 2.

15.9 Country of Origin (CoO): Transocean shipments from Zochem in North America are normally exported from Zochem ULC Canada. A lesser number of Transocean orders export from Zochem LLC U.S.A.

Section 16. OTHER INFORMATION

16.1 HMIS Hazard Rating (Paint and Coating Industry)

Health	1 (slight)
Flammability	0
Reactivity	0
Personal Protection	E (mask, gloves, and goggles are recommended in bulk dust conditions)

16.2 This SDS provides information to work safety with ZnO substance. It is not a performance or property guarantee. The information is believed accurate utilizing reasonably available published data. We are not responsible for any inadvertent error or omission.