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SAFETY DATA SHEET

ZINC OXIDE

This SDS Compliant for use in **European Union member countries only**.
This SDS not valid outside EU/ EEA. REACH Number: 01-2119463881-32-0065 (Zochem);

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

A complete list of uses for which Generic Exposure Scenarios (GES) were prepared is provided in the 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. OR contact information: 44(0) 1565 748111, email: alerts@RORltd.com,
www.rorltd.com Address: Booths Park 1, Chelford Road, Knutsford, Cheshire, WA16 8GS, UK

Tel: +44 (0) 1565 748111 Email: alerts@RORltd.com. Website www.rorltd.com.

RRN: 01-2119463881-32-0065 (Zochem ULC, Canada), 01-2119463881-32-0201 (Zochem LLC, USA).

For additional information contact:

Zochem (Website: www.zochem.com)

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Attention: John Stourac +1 312-813-4620, or Khalid Abdullah +1 905-453-4100 x 4229

1.4 Emergency telephone number: +44(0) 1565 748111, +1 312-813-4620

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/organisation	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)	

DNELs: Workers

Inhalation, systemic effects, long term: 5mg Zn/m³

Inhalation, local effects, long term: 0.4 mg Zn/m³ (respirable fraction) (Creutzenberg O., 2013).

Dermal, systemic effects, long term: 83 mg Zn/kg bw/day

General population

Inhalation, systemic effects, long term: 2.5mg Zn/m³

Dermal, systemic effects, long term: 83 mg Zn/kg bw/day

Oral, systemic effects, long term: 0.83 Zn/kg bw/day

PNECs derived for the zinc ion:

Compartment (Environment)	PNEC value for Zn ion (*added value)
Freshwater	20.6* µg/L
Saltwater	6.1* µg/L
STP	100 µg/L
Freshwater sediment	117.8* mg/kg sediment d.w. A generic bioavailability factor of 0.5 is applied by default: PNEC _{bioav} : 235.6 mg/kg sediment d.w.
Saltwater sediment	56.5* mg/kg sediment d.w. A generic bioavailability factor of 0.5 is applied by default: PNEC _{bioav} : 113 mg/kg sediment d.w.
Soil	35.6* mg/kg soil d.w. A generic bioavailability/ageing factor of 3 is applied by default: PNEC _{bioav} : 106.8 mg/kg soil d.w.
Oral	No potential for bioaccumulation

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 degrades with CO₂ (in ambient air) to ZnCO₃ zinc carbonate. Rate is accelerated with higher m²/g surface area or damp storage conditions. Shelf life one year from date of manufacturing (dom) for grades >= 8.0 m²/g surface area, and all rubber applications. Shelf life is eighteen months from dom for all other grades and applications. Rubber is particularly sensitive to ZnCO₃ hard white particulates not dispersing.

Section 11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects for zinc oxide:

Acute toxicity:*

Result	Species	Dose	Exposure	References
LC50 Inhalation Dusts and mists	Rat	>5.7 mg/L	4 hours	Klimisch and Freisberg (1982)
LD50 Oral	Rat	15000 mg/kg	NA	Löser (1972)
LD50 Oral	Rat	>5000 mg/kg	NA	Löser (1977)

*With LD₅₀ values consistently exceeding 2,000 mg/kg bw, slightly soluble compounds such as, zinc oxide (LD₅₀ ranges between 5,000 and 15,000mg/kg bw) show low level of acute oral toxicity, not leading to classification for acute oral toxicity. Zinc oxide is shown to be of low acute inhalation toxicity (i.e., LC50 values of > 5.7 mg/L/4hrs), not leading to classification for acute inhalation toxicity.

Route(s) Of Entry: 1. Inhalation. 2. Dermal. 3. Eyes. 4. Digestion.

Irritation/Corrosion:

Skin:	Not irritant (rabbit; Löser, 1977; Lansdown, 1991)
Eye:	Not irritant (rabbit; Van Huygevoort, 1999e; Thijssen, 1978; Löser, 1977)
Respiratory tract:	Not irritant (Klimi-sh et al, 1982)
Ingestion:	None (zinc oxide is used as a human vitamin supplement).

Sensitization: No sensitizing effects known (Van Huygevoort, 1999 g, h)

Germ cell mutagenicity: No biologically relevant genotoxic activity. (Based on cross-reading between Zn compounds; no classification for mutagenicity required) (Chemical Safety report (CSR) ZnO 2015).

Carcinogenicity: Not a NTP/IARC carcinogen.
 No experimental or epidemiological evidence exists to justify classification of zinc compounds for carcinogenic activity (based on cross-reading between Zn compounds; no classification for carcinogenicity required) (Chemical Safety report (CSR) Zinc Oxide 2015)

Reproductive toxicity: No evidence of reproduction toxicity.
 No experimental or epidemiological evidence exists to justify classification of zinc compounds for reproductive or developmental toxicity (based on cross-reading between Zn compounds; no classification for reproductive toxicity required) (Chemical Safety report (CSR) zinc oxide. 2015)

Specific target organ toxicity (single exposure):
 No experimental or epidemiological sufficient evidence for specific target organ toxicity (single exposure) (no classification for target organ toxicity (single exposure: STOT-SE) required) (Heydon and Kagan, 1990; Gordon *et al.*, 1992; Mueller and Seger, 1985 [Cited in CSR zinc oxide. 2015]).

Specific target organ toxicity:
 Specific target organ toxicity (repeated exposure): None. (Lam et al, 1985, 1988; Conner et al. 1988).
 Specific target organ toxicity (single exposure): None. (Heydon and Kagan, 1990; Gordon et al., 1992; Mueller and Seger, 1985).
 No experimental or epidemiological sufficient evidence for specific target organ toxicity (repeated exposure) (no classification for specific target organ toxicity (repeated exposure: STOT-RE) required) (Lam et al, 1985, 1988; Conner et al., 1988, Ma Hock, 2014, Creutzenberg, 2013 [CSR ZnO 2015])).

Section 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Substance	Result	Species	Dose	Exposure	Reference(s)
Zinc oxide	LC50 Inhalation Dusts & mists	Rat	>5.7 mg/L	4 hours	Klimisch and Freisberg (1982)
Zinc Oxide	LD50 Oral	Rat	15000 mg/kg	NA	Löser (1972)
Zinc Oxide	LD50 Oral	Rat	>5000 mg/kg	NA	Löser (1972)

Zinc oxide is not an acute oral or acute inhalation toxic.

12.1.1. Acute aquatic toxicity

Acute EC50 0.413 mg/l Zn, 48 hour – Ceriodaphnia dubia
 Acute LC50 0.136 mg/l Zn, 72 hour – Selenastrum capricornutum
 62% solubilization capacity at 1 mg/l at pH 8:
 for pH <7: 0.67 mg Zn/l (48 hr Ceriodaphnia dubia test cfr. above).
 for pH >7-8.5: 0.21 mg Zn/l (72 hr Selenastrum capricornutum test cf. above)

12.1.2. Chronic aquatic toxicity: freshwater – 20.6 PNEC value for Zn ion, algae reduced reproductive

12.1.3. Chronic aquatic toxicity: marine waters - 6.1* µg/L PNEC value for Zn ion

12.1.4. Sediment toxicity: freshwater - 117.8* mg/kg sediment d.w. PNEC value for Zn ion. A generic bioavailability factor of 0.5 is applied by default: PNEC_{bioav}: 235.6 mg/kg sediment d.w.

12.1.4.1 Sediment toxicity: saltwater - 6.1* µg/L PNEC value for Zn ion. A generic bioavailability factor of 0.5 is applied by default: PNEC_{bioav}: 113 mg/kg sediment d.w.

12.1.5. Soil toxicity - 35.6* mg/kg soil d.w. PNEC value for Zn ion. A generic bioavailability/ageing factor of 3 is applied by default: PNEC_{bioav}: 106.8 mg/kg soil d.w.

12.1.6. Toxicity to micro-organisms in STP - 100µg Zn/l PNEC value.

12.2. Persistence and biodegradability – Not Applicable (zinc is an element).

12.3. Bioaccumulative potential – Not Applicable (ZnO does not bioaccumulate or biomagnify).
Zinc is a natural essential element necessary for optimal growth and development of all living organisms, including man. All living organisms have homeostasis mechanisms that actively regulate zinc uptake and absorption/excretion from the body; due to this regulation, zinc and zinc compounds do not bioaccumulate or biomagnify.

12.4. Mobility in soils – Not Applicable.

For zinc (like for other metals) the transport and distribution over the different environmental compartments e.g. the water (dissolved fraction, fraction bound to suspended matter), soil (fraction bound or complexed to the soil particles, fraction in the soil pore water,...) is described and quantified by the metal partition coefficients between these different fractions. In the CSR, a solids-water partitioning coefficient of 158.5 l/kg (log value 2.2) was applied for zinc in soils (CSR zinc 2010).

12.5. Results of PBT and vPvB assessment – Not Applicable (zinc oxide is not PBT or vPvB)

12.6 Other adverse effects – None.

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	<u>III</u>	<u>III</u>	<u>III</u>
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 Aircraft: 400 kg (packing group 956), IATA –Passenger Aircraft: 30 kg (packing group Y956) IATA-Cargo Aircraft: 400 kg (packing group 956) 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.
- Yes, 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.

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.