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SAFETY DATA SHEET

ZINC OXIDE

This SDS Compliant for use in P.R.C., Japan, Republic of Korea (ROK), Singapore and where zinc oxide is transportation regulated. This SDS is **not** valid in North America, Europe and most other jurisdictions where ZnO is not transportation regulated.

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

1.1 Product name: ZINC OXIDE

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

Synonyms: Chinese white

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

No uses advised against

1.3 Manufacturer/Supplier of the safety data sheet: (website: www.zochem.com)

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1.4 Emergency phone numbers (+1): 901-833-2118, 647-237-7222

Section 2: HAZARD IDENTIFICATION

2.1 Classification of the substance or mixture:

Aquatic Acute 1: H400 Very toxic to aquatic life.

Aquatic Chronic 1: H410 Very toxic to aquatic life with long lasting effects.



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

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>
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

Zinc oxide will not burn.

Hazardous decomposition product(s): None.

Use extinguishing media appropriate for the surrounding fire.

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
USA (Zinc Oxide)	5 mg/m ³ (fumes) 15 mg/m ³ (dust; total) 5 mg/m ³ (dust; respirable)	
USA (Lead)	5 ug/m ³	
USA (Cadmium)	5 ug/m ³	

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 dust conditions.

Protection for skin: Recommend long sleeves in bulk 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 OSHAS18000) for good work, training, cleaning, PPE and hygiene practices.

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.
pH:	Neutral, 6.8 to 8 (7.37 nominal)
Melting / Freezing point:	Will not freeze. Will not melt.* Malleable above 300°C/572F No exothermic or endothermic peaks are observed. No oxidation or decomposition was observed. Sublimation temperature 1975°C.
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.
Vapour pressure:	Not applicable (melting point above 300°C).
Vapour density:	Not applicable.
Relative density/Specific Gravity:	5.68 g/cm ³ .
Water solubility:	Negligible (solubility of Zn in ZnO is 2.9 mg/l).
Soluble:	In bases and acids
Partition coefficient n-octanol-water:	Not applicable to inorganic substance.
Decomposition temperature:	Not applicable.
Viscosity:	Not applicable.
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 and rubber applications, and 18 mos from DOM for <8 m²/g and other applications. Usability depends on storage and handling after product leaves the manufacture which may be less than the testing expiration. Product may settle in > 6 months causing clumping. Processes sensitive to clumping should pre-screen product before use or use in > 6 months. ZnO slowly degrades to ZnCO₃ zinc carbonate by reacting with CO₂ in ambient air, with degradation accelerated by product or packaging becoming damp, higher m²/g surface area, higher humidity storage, or product exposure to air. Bags should be used within one month after opening. Bags stored in $>65\%$ RH (relative humidity) should be used within six months. Problem with degraded product may include clumping, increased hard particulates, decreased ZnO assay, increased LOI, and reduced m²/g. Rubber is particularly sensitive to hard white particulates not dispersing.

Section 11. TOXICOLOGICAL INFORMATION

11.1 Information on acute toxicity toxicological effects for zinc oxide:

Result	Species	Dose	Exposure	Refs
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. Eye: Not irritant. Respiratory tract: Not irritant
 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.

Carcinogenicity: Not a NTP/IARC carcinogen.

Reproductive toxicity: No evidence of reproduction toxicity.

Specific target organ toxicity (single exposure):

No experimental or epidemiological sufficient evidence for specific target organ toxicity

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).

Section 12: ECOLOGICAL INFORMATION

12.1 Toxicity

<u>Substance</u>	<u>Result</u>	<u>Species</u>	<u>Dose</u>	<u>Exposure</u>	<u>Reference(s)</u>
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

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.

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: May be subject to local regulations.

Section 14. TRANSPORT INFORMATION

This material is not transportation regulated in the U.S.A.

Table for transportation information within P.R.C., Japan, Republic of Korea, and where transportation authorities regulate zinc oxide as transportation Class 9 (if net wt. per container above threshold):

Table 14.1

	IMDG	IATA
Number	UN3077	UN3077
Proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Oxide), Marine pollutant (Zinc oxide)	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc Oxide)




	IMDG	IATA
Transport hazard Classes(es)	9 	9 
Hazard identification number	Sea (IMO): not regulated	IATA Label: Miscellaneous
Packing group	III	III
Environmental hazards	Yes, Dangerous to the Environment	Yes
Special precautions for users	No	Yes (see below)

Table 14.2 Package label:

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

Table 14.3 Package label:

ZINC OXIDE		Component: ZINC OXIDE 99-100%	
Warning		UN No.: 3077 UN Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.	
Very toxic to aquatic life, Very toxic to aquatic life with long lasting effects			
Prevention:	Avoid release to the environment.		
Spill:	Collect spillage		
Disposal:	Dispose of contents/container in accordance with local regional/national/international regulation.		
Please refer to Safety Data Sheet (SDS)			
Supplier: Zochem			Tel: +1 800 324 1806
Address: 1 Tilbury Court, Brampton, Ontario			Post code: L6T 3T4
Chemical Accident emergency call: (China: +86 21 6858 7078, M: +86 138 0194 2487)			

For Industrial Use Only

Section 15. REGULATORY INFORMATION

15.1 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

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

15.3 Nano: This product is not nano (per EU regulation proposal of nano as 50% particles <0.1um).

15.4 P.R.C. Inventory/List. Zinc oxide is listed on P.R.C. IECSC and meets P.R.C. REACH as an existing substance.

15.5 Other Inventories/Lists. This material is listed as follows: Australia AICS: listed; Canada DSL: listed; Canada NDSL: not listed; USA TSCA: listed; Europe EINECS: listed; Europe ELINCS: not listed; ASIA-PAC:

listed; Japan ENCS/METI/CSCL: listed, (Japan export List i.1~15 & List ii N/A, List 1.16 applicable); Philippines PICCS: listed; New Zealand HSNO: listed; Korea KECL/TCCL: listed; Korea K-REACH: listed KE-65565; Taiwan TCSI: listed (up to 100kg/yr without Taiwan REACH registration);

15.6 Food Contact.

- P.R.C.: complies with GB 9685-2008 and is listed on food colorant MoH Positive List for Additives.
- EU: Listed EC 10/2011, compliant with EC 1935/2004, is GMP EC 2023/2006 (SML is 25 mg/kg as Zn).
- US: Listed as a GRAS (Generally Recognized As Safe) at 21CFR182.8991.
- Canada: Health Canada has issued a Letter of No Objection

15.7 Other.

- Zochem's zinc oxide is Kosher certified and Halal compliant.
- Zochem's zinc oxide is RoHS, WEEE and ELV compliant.
- Zinc oxide is not USDOT regulated.

15.8 K-REACH (Republic of Korea (ROK)). It is the responsibility of the importer to comply with K-REACH registration requirements for this substance. This substance is transportation Class 9 Dangerous Goods in the ROK per the zinc oxide substance K-REACH registration.

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.