

SAFETY DATA SHEETS (SDS)

1. PRODUCT IDENTIFICATION

PRODUCT NAME: **Dense Fused ZIRCONIA - YTTRIA STABILIZED**

SYNONYMS: Yttria-Stabilized Zirconium Oxide

FORMULA: ZrO₂ (Zirconium Oxide)

RECOMENDED USES: Yttria-stabilized Zirconia uses are based on its hardness, chemical inertness, ion-conducting properties, optical properties and high thermal properties. Applications include uses for: tooth crowns, refractory, thermal barrier coatings, jewelry and knife blade production.

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2. HAZARD IDENTIFICATION

Classification of a Substance or Mixture:

- The substance is not classified as hazardous according to the Globally Harmonized System (GHS) regulations within the USA.
- The substance is not classified as hazardous according to the CLP regulation.

Label Element:

GHS Label Elements

- The substance is not classified as hazardous according to the Globally Harmonized System (GHS) regulations within the USA.
- The substance is not classified as hazardous according to the CLP regulation.

Hazard Pictogram: Not Regulated

Signal Word: Not Regulated

Hazard-determining Component of Labeling: None.

Hazard Statements: Not Regulated

Precautionary Statements: Not Regulated

Hazard Description:

WHMIS Symbols: Not hazardous under WHMIS.

Classification System:

NFPA ratings (scale 0 - 4):



Health = 1
Fire = 0
Reactivity = 0

HMIS-Ratings (scale 0 - 4):

HEALTH	**1
FIRE	0
REACTIVITY	0

* Indicates a long term health hazard from repeated or prolonged exposures.

HMIS Long Term Health Hazard Substances: None of the ingredients are listed.

Other Hazards: There are no other hazards not otherwise classified that have been identified.

· Results of PBT and vPvB Assessment

- **PBT:** Not applicable.
- **vPvB:** Not applicable.

3. COMPOSITION / INFORMATION ON INGREDIENTS

Mixtures:

Components:

CAS No. 1314-23-4: EC nr. 215-227-2 Reg.nr: 01-2119486976-14-XXXX	<u>Zirconia Dioxide</u> Substance with a Community workplace exposure limit.	<u>43-92%</u>
CAS No. 1314-36-9: EC nr: 215-233-5	<u>Yttrium (III) Oxide</u> Substance with a Community workplace exposure limit.	<u>6-55%</u>
CAS No. 12055-23-1: EC nr. 235-013-2 Reg.nr: 01-2119967820-31-XXXX	<u>Hafnium Dioxide</u> Substance with a Community workplace exposure limit	<u>1-2%</u>

Additional Information:

For the listed ingredients, the identity and exact percentages are being withheld as a trade secret.

4. FIRST-AID MEASURES

Description of First Aid Measures (No special measures required):

- **If Swallowed:** Rinse out mouth and drink plenty of water. Do not induce vomiting; immediately call for medical help.
- **If on Skin:** Brush off loose particles. Wash with soap and water. If skin irritation is experienced, consult a doctor.
- **If in Eyes:** Remove contacts if possible if worn. Rinse opened eye for several minutes under running water. If symptoms persist, consult a doctor.
- **If Inhaled:** If breathing is difficult - Remove person to fresh air and keep comfortable for breathing.
If experiencing respiratory symptoms or feels unwell - Seek immediate medical attention.

Most important symptoms and effects, both acute and delayed:

- May cause gastro-intestinal if ingested. Nausea in case of ingestion.
- Slight irritant effect on eyes.
- Breathing difficulty, coughing

Indication of any immediate medical attention and special treatment needed: Treat symptomatically.

5. FIRE FIGHTING MEASURES

FLASH POINT: Not Applicable

FLAMMABLE LIMITS: **LEL:** Not Applicable **UEL:** Not Applicable (Product is NOT flammable)

AUTO IGNITION TEMPERATURES: Not Applicable.

EXTINGUISHING MEDIA: Use media appropriate for surrounding fire and that suit the environment.

FIRE AND EXPLOSION HAZARDS: Non-flammable, non-combustible. Product will not burn.

HAZARDOUS DECOMPOSITION PRODUCTS: None

FIRE FIGHTING INSTRUCTIONS: Wear self-containing respiratory protective device. Wear fully protective suit.

NFPA CLASSIFICATION:

HEALTH: 1

FLAMMABILITY: 0

REACTIVITY: 0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures:

- Avoid formation of dust. Do not breathe dust – use personal protective equipment as required.
- For large spills, used respiratory protective device against the effects of fumes/dust/aerosol.
- For large spills, used protective clothing.
- Ensure adequate ventilation.

Environmental precautions: Prevent entry into waterways and sewers.

Methods and material for containment and cleaning up:

- Pick up mechanically.
- Dispose contaminated material as waste according to item 13.

Reference to other sections:

- See Section 7 for information on safe handling.
- See Section 8 for information on personal protection equipment.
- See Section 13 for disposal information.

7. HANDLING AND STORAGE

HANDLING:

Precautions for safe handling:

- Prevent formation of dust.
- Any deposit of dust which cannot be avoided must be regularly removed.
- Use only in well ventilated areas.
- Avoid breathing dust.

Information about protection against explosions and fires: No special measures required.

Conditions for safe storage, including any incompatibilities:

Storage:

Requirements to be met by storerooms and receptacles:

- Storage in cool, dry conditions in well-sealed receptacles.
- Do not store together with acids or with alkalis (caustic solutions)
- Store away from foodstuffs.

Information about storage in one common storage facility: No further relevant information available.

Specific end use(s): No further relevant information available.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

CONTROL PARAMETERS:

Ingredients with Limit Values That Require Monitoring at the Workplace:

Zirconium dioxide (Cas# 1314-23-4):

PEL (USA)	Long-term value: 5 mg/m ³ as Zr
REL (USA)	Short-term value: 10 mg/m ³ Long-term value: 5 mg/m ³ as Zr
TLV (USA)	Short-term value: 10 mg/m ³ Long-term value: 5 mg/m ³ as Zr

Yttrium (III) Oxide (Cas# 1314-36-9):

PEL (USA)	Long-term value: 1 mg/m ³ (as Y)
REL (USA)	Long-Term Value: 1 mg/m ³ (as Y)
TLV (USA)	Long-Term Value: 1 mg/m ³ (as Y)

Hafnium dioxide (Cas# 12055-23-1):

PEL (USA)	Long-term value: 0.5 mg/m ³ as Hf
REL (USA)	Long-term value: 0.5 mg/m ³ as Hf
TLV (USA)	Long-term value: 0.5 mg/m ³ as Hf

DNELs: No further relevant information available.

PNECs: No further relevant information available.

Additional information: The lists that were valid during the creation were used as basis.

EXPOSURE CONTROLS:

Personal Protective Equipment (PPE):

General Protective and Hygienic measures:

- The usual precautionary measures for handling chemicals should be followed.
- Keep away from foodstuffs, beverages and feed.
- Wash hands before breaks and at the end of work.
- Avoid contact with the eyes.
- Avoid close or long term contact with the skin.
- Do not inhale dust.

Respiratory Protections:

- Use suitable respiratory protective device in case of insufficient ventilation.
- For spills, respiratory protection may be advisable.
- Wear appropriate NIOSH approved respirator when ventilation is inadequate and occupational exposure limits are exceeded.

Protection of Hands:

- Wear gloves for the protection against mechanical hazards according to OSHA and NIOSH rules.
- Gloves are advised for repeated or prolonged contact.

Eye protection:

- Follow relevant national guidelines concerning the use of protective eyewear.
- Use safety glasses or goggles as necessary to prevent dust and particles from entering the eye.

Body protection:

- Protective work clothing.

Limitation and supervision of exposure into the environment:

- No special requirements.

Risk management measures:

- No special requirements (see section 7 for additional information.).

9. PHYSICAL AND CHEMICAL PROPERTIES
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Information on basic physical and chemical properties:**GENERAL INFORMATION:**

- **Appearance:**
 - **Form:** Grain or Powder
 - **Color:** Yellow
- **Odor:** Odorless
- **Odor threshold:** Not determined.
- **pH-value at 20 °C (68 °F):** Not applicable.
- **Change in condition**
 - **Melting point/Melting range:** 2500 °C
 - **Boiling point/Boiling range:** Not applicable.
- **Flash point:** Not applicable.
- **Flammability (solid, gaseous):** Not determined.
- **Auto-ignition temperature:** Not determined.
- **Decomposition temperature:** Not determined.
- **Self igniting:** Product is not.
- **Danger of explosion:** Product does not present an explosion hazard.
- **Explosion limits:**
 - **Lower:** Not determined.
 - **Upper:** Not determined.
- **Oxidizing properties:** Non-oxidizing.
- **Vapor pressure:** Not determined.
- **Specific Gravity/Relative Density** 5.6 to 5.7 g/cc. Water=1
- **Vapor density** Not applicable.
- **Evaporation rate** Not applicable.
- **Solubility in / Miscibility with water:** Insoluble.
- **Viscosity:**
 - **Dynamic:** Not applicable.
 - **Kinematic:** Not applicable.

OTHER INFORMATION: No further relevant information available.

10. STABILITY AND REACTIVITY

Reactivity: No dangerous reaction known under conditions of normal use.

Chemical Stability: Stable under normal temperatures and pressures.

- **Thermal decomposition / conditions to be avoided:** No decomposition if used and stored according to specifications.

Possibility of hazardous reactions: Reacts with strong acids and alkali. As the product is supplied it is not capable of dust explosion; however enrichment with fine dust causes risk of dust explosion.

Conditions to avoid: Prevent formation of dust. Avoid acids.

Incompatible materials: Oxidizers, strong bases, strong acids.

Hazardous decomposition products: Toxic metal compounds.

11. TOXICOLOGICAL INFORMATION

INFORMATION ON TOXICOLOGICAL EFFECTS:

Acute toxicity: Based on available data, the classification criteria are not met.

LD/LC50 values that are relevant for classification: None.

Primary irritant effect:

- **Skin corrosion/irritation:** Based on available data, the classification criteria are not met.
- **Serious eye damage/irritation:** Based on available data, the classification criteria are not met.
- **Respiratory or skin sensitization:** Based on available data, the classification criteria are not met.

Carcinogenic Categories:

- **IARC (International Agency for Research on Cancer):** None of the ingredients are listed.
- **NTP (National Toxicology Program):** None of the ingredients are listed.
- **OSHA-Ca (Occupational Safety & Health Administration):** None of the ingredients are listed.
- **Probable routes of exposure:** Ingestion, inhalation, eye contact & skin contact.

Repeated Dose Toxicity: Long term inhalation of product dust may cause pulmonary disease.

Germ cell mutagenicity: Based on available data, the classification criteria are not met.

Carcinogenicity: Based on available data, the classification criteria are not met.

Reproductive toxicity: Based on available data, the classification criteria are not met.

STOT-single exposure: Based on available data, the classification criteria are not met.

STOT-repeated exposure: Based on available data, the classification criteria are not met.

Aspiration hazard: Based on available data, the classification criteria are not met.

Medical Conditions Aggravated By Exposure: Pre-existing skin and respiratory conditions may be aggravated by exposure.

Inhalation:

- **Acute (Immediate):** Dust may produce mechanical irritation. Inhalation can cause coughing and shortness of breath.
- **Chronic (Delayed):** Excessive dust inhalation may affect the breathing function. Chronic overexposure to dusts of this material may cause lung damage/disease, including pulmonary disease or decreased lung function.

Skin:

- **Acute (Immediate):** May cause mechanical irritation resulting in skin abrasions.
- **Chronic (Delayed):** No data available.

Eye:

- **Acute (Immediate):** Exposure to dust may cause mechanical irritation. Abrasive action may cause damage to outer eye surface.
- **Chronic (Delayed):** No data available.

Ingestion:

- **Acute (Immediate):** No data available.
- **Chronic (Delayed):** Ingestion of large quantities may result in gastrointestinal irritation and eventually interference with phosphate absorption which results in rickets.
- **Carcinogenic Effects:** No effects expected.

12. ECOLOGICAL INFORMATION

TOXICITY:

Aquatic Toxicity: No further relevant information available.

Persistence & Degradability: No further relevant information available.

BEHAVIOR IN ENVIRONMENTAL SYSTEM:

Bio accumulative Potential: No further relevant information available.

- **Mobility In Soil:** No further relevant information available

12.5 Results of PBT and vPvB assessment:

- **PBT:** Not applicable.
- **vPvB:** Not applicable

Other Adverse Effects: No further relevant information available.

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods:

Recommendation:

- Smaller quantities can be disposed of with household waste.
- Contact the waste processors for recycling information.
- The user of this material has the responsibility to dispose of unused material, residues and containers in compliance with all relevant local, state and federal laws and regulations regarding treatment, storage and disposal for hazardous and nonhazardous wastes.

Uncleaned Packaging:

Recommendation:

- Disposal must be made according to official regulations.

14. TRANSPORT INFORMATION

UN-Number

DOT, ADR, IMDG, IATA: Not Regulated

UN proper shipping name

DOT, ADR, IMDG, IATA Not Regulated

Transport hazard class(s)

DOT, ADR, IMDG, IATA
Class Not Regulated

Packing group DOT, ADR, IMDG, IATA	Not Regulated
Environmental hazards: Marine pollutant:	No
Special precautions for user	Not applicable.
Transport in bulk according to Annex II of MARPOL and the IBC Code	Not applicable.

15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture.

United States (USA)

SARA

- **Section 355 (extremely hazardous substances):** None of the ingredients are listed.
- **Section 313 (Specific toxic chemical listings):** None of the ingredients are listed.
- **TSCA (Toxic Substances Control Act):** All ingredients are listed.

Proposition 65 (California):

- **Chemicals known to cause cancer:** None of the ingredients are listed.
- **Chemicals known to cause reproductive toxicity for females:** None of the ingredients are listed.
- **Chemicals known to cause reproductive toxicity for males:** None of the ingredients are listed.
- **Chemicals known to cause developmental toxicity:** None of the ingredients are listed.

Carcinogenic Categories:

- **EPA (Environmental Protection Agency):** None of the ingredients are listed.
- **IARC (International Agency for Research on Cancer):** None of the ingredients are listed.
- **TLV (Threshold Limit Value established by ACGIH):** CAS# 1314-23-4 Zirconia Dioxide – **A4**
- **NIOSH-Ca (National Institute for Occupational Safety and Health):** None of the ingredients are listed.

Canadian Domestic Substance List (DSL): All ingredients are listed.

National Regulations:

Water hazard class: Generally not hazardous for water.

Directive 2012/18/EU:

Named dangerous substances – ANNEX I: None of the ingredients are listed.

Other regulations, limitations and prohibitive regulations:

- **Substances of Very High Concern (SVHC) according to REACH, Article 57:** None of the ingredients are listed.
- **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

16. OTHER INFORMATION & LAST REVISION DATE

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Abbreviation and acronyms:

ACGIH	American Conference of Governmental Industrial Hygienists
ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road.
CAS	Chemical Abstracts Service
DOT	Department of Transportation
EINEC	European Inventory of Existing Commercial Chemical Substances
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IMDG	International Maritime Dangerous Goods
MSHA	Mine Safety and Health Administration
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
SVHC	Substance of Very High Concern
SARA	Superfund Amendment and Reauthorization Act
TLV	Threshold Limit Value
TSCA	Toxic Substance Control Act

NOTICE:

This material safety data sheet complements the technical data sheets but does not replace them. The information it contains is based on our present knowledge of the product on the date indicated. It is given in good faith. Users should be warned about the risks associated with using the product for a different purpose than that for which it was developed, and particularly for uses for which we are not qualified to give advice.

These regulatory prescriptions are provided with a view to helping users meet their obligations when using this product. This list should not be considered exhaustive and does not exempt users from ensuring that they are not required to comply with any further prescriptions other than those mentioned above concerning product possession and handling for which they are solely responsible.

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LAST REVISION DATE: 11-30-17