

3. COMPOSITION/INFORMATION ON INGREDIENTS

Classification of the chemical substance or/mixture:

Mixture

Chemical name or common name:

Zirconium dioxide

Synonyms:

Zirconia

Concentration or concentration range:

Chemical name or common name	Abbreviation	Concentration or concentration range	Reference number in Gazetted List in Japan		CAS No
			Japanese Chemical Substances Control Law (JCSCL)	Japanese Industrial Safety and Health Law	
Zirconium dioxide	-	80 ~ 96%	(1)-563	EXISTING chemical substances	1314-23-4
Hafnium dioxide	-	Not more than 5%	(1)-737	Existing chemical substances	12055-23-1
Yttrium oxide	-	4 ~ 10%	(1)-560	Existing chemical substances	1314-36-9
Molding aid component	-	Not more than 5%	Not available	Not available	Not available

Chemical formula:

<Zirconium dioxide> ZrO₂

<Hafnium dioxide> HfO₂

<Yttrium oxide> Y₂O₃

Component subject to regulation:

Ingredients	Japanese Industrial Safety and Health Law	Japanese PRTR Law (Pollutant Release and Transfer Register)
Zirconium dioxide	Japanese Industrial Safety and Health Law (Article 57-1 of the Law) - Labeling, etc Number 313	Not applicable to the specified chemical substances of Japanese PRTR Law
Hafnium dioxide	Japanese Industrial Safety and Health Law (Article 57-1 of the Law) - Labeling, etc Number 438	Not applicable to the specified chemical substances of Japanese PRTR Law
Yttrium trioxide	Japanese Industrial Safety and Health Law (Article 57-1 of the Law) - Labeling, etc Number 54	Not applicable to the specified chemical substances of Japanese PRTR Law
Molding aid component	Not applicable to the substances for labelling/deliver of documents required in Japanese Industrial Safety and Health Law	Not applicable to the specified chemical substances of Japanese PRTR Law

PRTR Law shows the information for each chemical substance since April, 2010.

Impurities and stabilizing additives which contribute to the classification of GHS: No information available

4. FIRST AID MEASURES

A. IF INHALED:

Remove a victim to fresh air and keep at rest in a position comfortable for breathing. If you feel unwell: Call a physician.

B. IF ON SKIN:

Wash skin with plenty of water and soap. If any symptoms such as blister and pain occur: Get medical advice, as required.

C. IF IN EYES:

Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Even if effects on visual acuity are not observed soon: Get medical advice surely since damage may occur.

D. IF SWALLOWED:

Call a physician immediately. Rinse mouth.

E. Most important effects and symptoms:

No information available.

F. Protection for first-aid responders:

No information available.

G. Note to physician:

No information available.

5. FIRE FIGHTING MEASURES

A. Extinguishing Media:

- This product itself will not burn. Water spray, dry chemical powder

B. Unsuitable extinguishing media:

- No information available

C. Specific hazards arising from the chemical if burning:

- No information available

D. Specific fire fighting measures:

- Fight fire from upwind side.
- Keep people away from around the fire generation site.
- Take any appropriate measures so that the materials which may influence the environment are not washed away by the fire fighting water.

E. Special protective equipment for fire fighter:

- During fire-fighting, wear heat resistance gloves, safety goggles, and breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES**A. Personal precautions, protective equipment and emergency procedures.**

- Keep people away from around the leakage site by encircling it with a rope.
- Work from upwind side and guide people away from downwind of the leakage.
- Exercise caution because the spill site is slippery.
- During working, wear rubber gloves, safety glasses, protective clothing, and a dust/mist filtering respirator so as to prevent adhering powder to the skin and inhalation of dust.

B. Environmental precautions

- Exercise caution so as not to drain the leaked product into rivers, etc. but to minimize the adverse events on the environment.

C. Methods and material for containment and cleaning up

- Sweep the scattered product and collect it into an empty container which can be closed tightly. Remove dust by methods such as vacuuming by which dust is not scattered.

D. Prevention measures of secondary disaster:

- Use safe tools which will not generate sparks.

7. HANDLING AND STORAGE**A. Handling**

Appropriate engineering controls:

Take facility measures stated in "Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION" and wear protective equipment. Wash hands and face thoroughly and gargle after handling.

Local and entire ventilation:

During handling, handle in a local exhaust ventilated area or a place with general exhaust ventilation.

General precautions:

No information available

Safe handling advice:

No information available

Avoid contact:

No information available

Hygiene measures:

Wash hands thoroughly and gargle after working, and eat and drink.

B. Storage

Appropriate engineering controls:

Keep container tightly closed, and store in a well-ventilated place.
Store in a well-ventilated, cool, and dark place, protected from direct sunlight. Store indoors as a rule.

Safe storage conditions:

No information available

Safe containers and packaging materials:

Store in closable polyethylene containers.
(And store them in protective containers such as cardboard boxes.)

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Facility measures

Since volatile matters will be generated at the time of mixing, processing and molding work. Handling place shall be well ventilated.
Near the handling place it is recommendable to install equipment for washing the eyes and body.
Install local exhaust ventilation facility and ventilation facility to keep the working place under the threshold limit value when dust is generated during heating and in the working place.

Administrative levels

Product In case of dust generation in the working environment, Administrative Control Level (E) of dust of earth, rock, minerals, metals or carbon is defined as follows: $E = 3.0 / (1.19Q + 1)$ mg/m³ where Q is content of free silic acid (%).

Occupational Exposure Limits

Product	0.5 mg/m ³	Respirable dust	Japan Society for Occupational Health, Class 1 dust
Product	2 mg/m ³	Total dust	Japan Society for Occupational Health, Class 1 dust
Zirconium dioxide	5 mg/m ³ (as Zr)	TWL	ACGIH
Zirconium dioxide	10 mg/m ³ (as Zr)	STEL	ACGIH
Hafnium dioxide	0.5 mg/m ³ (as Hf)	TWL	ACGIH
Yttrium oxide	1 mg/m ³ (as Y)	TWL	ACGIH

Personal protective equipment

Respiratory protection: Dust/mist filtering respirator, air-supplied mask, air respirator, etc.

Hand protection: Rubber protective gloves

Eyes Protection: Safety goggles

Skin and body protection: Protective clothing, safety shoes

9. PHYSICAL AND CHEMICAL PROPERTIES

A. Physical State:	Solid (Powder)
B. Color:	White
C. Odor (Odor threshold):	Odorless
D. pH	Not applicable
E. Melting/freezing point	Unknown
F. Boiling point:	Unknown
G. Initial boiling point:	Unknown
H.Boiling range:	Unknown
I. Flash point:	Unknown
J. Evaporation rate:	Unknown
K. Flammability (solid, gas):	Noncombustible
L. Lower flammability or explosive limits:	Unknown
M. Upper flammability or explosive limits:	Unknown
N. Vapor pressure:	Unknown
O. Vapor density:	Unknown
P. Specific gravity (Relative density):	1.0 - 1.5 g/cm ³ (Bulk density)
Q. Solubility:	Unknown
R. Partition coefficient; n-octanol/water:	Unknown
S. Auto-ignition temperature:	Unknown
T. Decomposition temperature:	Unknown
U. Viscosity:	Unknown
V. Other information:	No information available

10. REACTIVITY AND STABILITY

A. Reactivity

- No information available

B. Chemical stability

- Stable at ordinary storage and handling conditions

C. Possibility of hazardous reactions

-Stable at ordinary storage and handling conditions

D. Conditions to avoid

- No information available

E. Incompatible materials

- No information available

F. Hazardous decomposition products

- No information available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Zirconium dioxide	>8, 800 mg/kg	Oral mouse (LD50)	IUCLID
Yttrium oxide	430 mg/kg	Intraperitoneal mouse (LD50)	RTECS
Yttrium oxide	230mg/kg	Intraperitonealrat(LD50)	RTECS

Skin corrosion/Irritation:

-Unknown

Serious eye damage/eye irritation:

- No irritating effect.

Respiratory sensitization or Skin sensitization:

-Unknown

Germ cell mutagenicity:

-Unknown

Carcinogenicity:

-Unknown

Reproductive toxicity:

-Unknown

Specific target organ toxicity - Single exposure:

-Unknown

Specific target organ toxicity - Repeated exposure:

-Unknown

Aspiration hazard:

-Unknown

12. ECOLOGICAL INFORMATION

A. Ecotoxicity

Fish:

-No information available

Crustacea:

-No information available

Algae:

-No information available

B. Persistence and degradability

-No information available

C. Bioaccumulative potential

-No information available

D. Mobility in soil

-No information available

E. Hazardous to the Ozone layer:

-No information available

E. Other adverse effects

- Product

13. DISPOSAL CONSIDERATIONS

A. Residual wastes:

- In case of disposal by the external service, consign disposal to the disposal-specialized services approved by a prefectural governor.

B. Contaminated containers and packaging:

- In case of disposal of empty containers, remove contents completely beforehand. When disposal of the contaminated containers is consigned, consign to the industrial waste disposal- specialized collector or services approved by a prefectural governor.

14. TRANSPORT INFORMATION

A. International regulations

UN number:	Not available
UN classification:	Not applicable to dangerous goods in United Nations Recommendations on Dangerous Goods

B. Domestic regulations:

- Refer to laws and regulation that are applied. No information available

C. Special precautions:

- No information available

D. Special precautions and conditions in transport:

- Confirm that there is no damage to the container or corrosion leakage before transportation. Load the material by enforcing the prevention measure against Load collapse, so as not to cause inversion, fall, and damage.

In order to prevent mingling of foreign matter, water leakage, and direct rays of the sun, cover the goods with a sheet.

In case of bulk Load, In order to prevent Load collapse, keep the stack low or fix the goods In position.

Conduct transport In consideration of precautions during handling and storage.

15. REGULATORY INFORMATION

A. Product

Industrial Safety and Health Law, Labeling of Names, etc. stated in Article 57, Notifiable Substance stated in Article 57-2, Investigation of Toxicity stated in Article 57-3
 Waste Management and Public Cleansing Law (Industrial Wastes)
 Water Pollution Control Law (Section of Hydrogen Ion Concentration)
 Working Environment Evaluation Standards (Notification No. 79 of Ministry of Labour, 1988), Revised on September 30, 2015 (Notification No. 404 of Ministry of Health, Labour and Welfare)

B. Zirconium dioxide

Industrial Safety and Health Law, Labeling of Names, etc. stated in Article 57, Notifiable Substance stated in Article 57-2,
 Investigation of Toxicity stated in Article 57-3

C. Hafnium dioxide

Industrial Safety and Health Law, Labeling of Names, etc. stated in Article 57, Notifiable Substance stated in Article 57-2,
 Investigation of Toxicity stated in Article 57-3

D. Yttrium oxide

Industrial Safety and Health Law, Labeling of Names, etc. stated in Article 57, Notifiable Substance stated in Article 57-2,
 Investigation of Toxicity stated in Article 57-3

16. OTHER INFORMATION

A. Product

Journal of Occupational Health Vol. 58 (2016) Inhouse measurement: bulk density

B. Zirconium dioxide

Registry of Toxic Effects of Chemical Substances, NIOSH (2006) STN INTERNATIONAL ACGIH, TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (2012)

C. Hafnium dioxide

ACGIH, TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (2012)

D. Yttrium oxide

Registry of Toxic Effects of Chemical Substances, NIOSH (2006) STN INTERNATIONAL ACGIH, TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices (2012)

E. Issued Date

- 2019.03.04

F. Revision No. and Date

- Rev.01, 2020.01.02